PART IV

Price Theory, Firm, and Market Structure:

Perfect Competition

CHAPTER 15

MARSHALL'S THEORY OF PRICES

Marshall's view of production encompassed both diminishing returns and increasing returns to scale. However, he dealt with the former in a somewhat cursory manner because it was restricted to the short period and outcomes in the short period reflected transitory factors. On the other hand, he lavished his energies on increasing returns to scale since it excluded the impact of transitory factors and thus provided a basis on which to explain the systematic long term development of industry. That is, Marshall saw modern industry organized in a manner dictated by the most efficient deployment of plant, equipment and labor. Moreover, modern industry had become increasingly efficient through the use of improved plant and equipment, and the growing subdivision of labor. To explain this progress, Marshall posited increasing output as the mechanism since it could explain increased industrial efficiency through the increased efficiency of the firm—either in terms of external or internal economies, with the latter being more important. In specifying a link between the scale of production and the use of technically advanced machinery, Marshall realized that a recursive relationship existed between them:

> In agriculture and other trades in which a man gains no very great new economies by increasing the scale of his production, it often happens that a business remains of about the same size for many years, if not for many generations. But it is otherwise in trades in which a large business can command very important advantages, which are beyond the reach of a small business. A new man, working his way up in such a trade, has to set his energy and flexibility, his industry and care for small details, against the broader economies of his rivals with their larger capital, their higher specialization of machinery and labour, and their larger trade connection. If then, he can double his production, and sell at anything like his own rate, he will have more than double his profits. This will raise his credit with bankers and other shrewd lenders; and will enable him

> to increase his business further, and to attain yet further economies, and yet higher profits; and this again will increase his business and so on. It seems at first that no point is marked out at which he need stop. And it is true that, if he retained his originality, and versatility and power of initiation, his tact and his good luck for very many years together; he might then gather into his hands the whole volume of production in his branch of trade for his district. And if his goods were not very difficult of transport, nor of marketing, he might extend this district very wide, and attain something like a limited monopoly; that is, of a monopoly limited by the consideration that a very high price would bring rival producers into the field. [Marshall 1972: 238]

However, Marshall found the logic of the recursive process unacceptable as a description of economic reality; rather, in his view, as the firm grew over time, constraints inherent in the growth process would emerge to prevent the logical conclusion from asserting itself. He saw the principal constraint as the diminishing ability of the entrepreneur over time.[1] As a result, the firm would fail to maintain its technical superiority, its goodwill with consumers and buying firms, and its ability to obtain credit needed for expansion. Other constraints inherent in the growth process were the cessation of scale economies above a particular scale of production due to the particular technical characteristics of producing the good or, conversely, the inability of the firm to expand its share of industry output over time due to the particular merits of the good produced. Because the constraints were, in part, particular to the individual firm and non-homogeneous across firms at any point in time, there would exist a spectrum of different size-cost firms within an industry; some firms would be quite cost efficient in comparison to the market price while others would be on the verge of being eliminated from the industry. Over time, given the assumption of no industry growth, firms within or coming into the

[1] Marshall did admit that this constraint had become insignificant with the rise of joint stock companies and the separation of management from ownership. However, in admitting it, he knocked away the

industry would grow, then decline and even exit as the constraints asserted themselves. Hence Marshall envisioned the life cycle of firms in terms of the trees in the forest parable:

> But here we may read a lesson from the young trees of the forest as they struggle upwards through the benumbing shade of their older rivals. Many succumb on the way, and a few only survive; those few become stronger with every year, they get a larger share of light and air with every increase of their height, and at last in their turn they tower above their neighbours, and seems as though they would grow on for ever, and for ever become stronger as they grow. But they do not. One tree will last longer in full vigour and attain a greater size than another; but sooner or later age tells on them all. Though the taller ones have a better access to light and air than their rivals, they gradually lose vitality; and one after another they give places to others, which, through of less material strength, have on their side the vigour of youth. And as with the growth of trees, so was it with the growth of businesses as a general rule before the great recent development of vast joint-stock companies, which often stagnate, but do not readily die. [Marshall 1972: 263]

By positing a spectrum of size-cost firms within an industry, Marshall faced the theoretical problem of determining the short and long period market price. That is, assuming no industry growth, the existence of different size-cost firms in the short period would appear to undermine the existence of a single market price; while in the long period it would appear to be inconsistent with the assumptions of given level of aggregate production for the industry and competitive conditions. To overcome these problems, Marshall introduced the concept of the *representative firm* since it was the costs of the

---

principle constraint that would prevent the logic of the recursive process from asserting itself. [Marshall 1972: 252-3, 263]

representative firm for the given level of aggregate production that was relevant for analyzing the short and long period price:[2]

> …when we come to discuss the causes which govern the supply price of a commodity….[w]e shall have to analyse carefully the normal cost of producing a commodity, relatively to a given aggregate volume of production; and for this purpose we shall have to study *the expenses of a representative producer* for that aggregate volume. [Marshall 1972: 264]

Marshall described the representative firm as "one which had a fairly long life, and fair success, which is managed with normal ability, and which has normal access to the economies, external and internal, which belong to that aggregate volume of production…." (Marshall 1972: 265).

Before using the representative firm to develop his theory of prices, Marshall first had to define and describe the concepts of the *market*, *free competition*, and *equilibrium*.[3] For Marshall, the market was a "place" where homogeneous goods were exchanged at a point in economic time. Thus there was a short period market and a long period market;[4] consequently the supply and demand curves in the market must be of the same time dimension. By defining market with respect to time and place, Marshall essentially assured that the market can be cleared. Marshall viewed the market as being characterized by free competition. In such a market, there would not only exist unimpeded entry and exit, but also a single market price. Moreover, collusion among buyers and sellers would not exist and though everyone acted for himself, the entrepreneur's knowledge of what others were doing was assumed to be generally sufficient to prevent him from taking a lower or paying a higher price than others were doing. Finally free competition included buying and selling relationships between firms in the market and in the economy as a whole as long as they did not permit the firm to charge a price

---

[2] Need to make a statement on how the representative firm is a proxy for the industry—that is as if the industry consists of a single firm. [also a question about aggregation]

[3] See Book 1, chapter 3 above for Marshall's initial discussion of these concepts.

different from the market price. These relationships were called goodwill, contracts, or regular clientele.[5] Because the market is divided up according to goodwill, the representative firm and other firms in the market did not face their own demand curve (whether horizontal or downward sloping). Equilibrium occurred when quantity demanded equals quantity supplied or when the demand price equals the supply price. In such a situation there was no tendency to change. When equilibrium occurred, the amount of the good produced was called the *equilibrium quantity* and its price was called the *equilibrium price*. Such an equilibrium is stable if counter-factual displacements from it creates conditions forcing a return.

Short Period Theory of Prices

To construct his theory of prices, Marshall relied on the representative firm in that the market price represented the equality of the market demand price and the representative firm's supply price. The former was derived from the industry's demand curve while the latter was derived from the representative firm's marginal expenses of production.

In the short period, when normal market demand and supply prevailed, the representative firm's supply price would be its normal average total expenses of production which would also equal its marginal expenses of production or marginal prime costs. That is, $\partial TEP/\partial y = MEP$, hence at normal output ATEP = MEP (see Figure 1 below). However, if market demand is greater than normal, hence making the representative firm's output greater than normal, the representative firm's supply price becomes its marginal expenses of production or marginal prime costs since these are the relevant costs

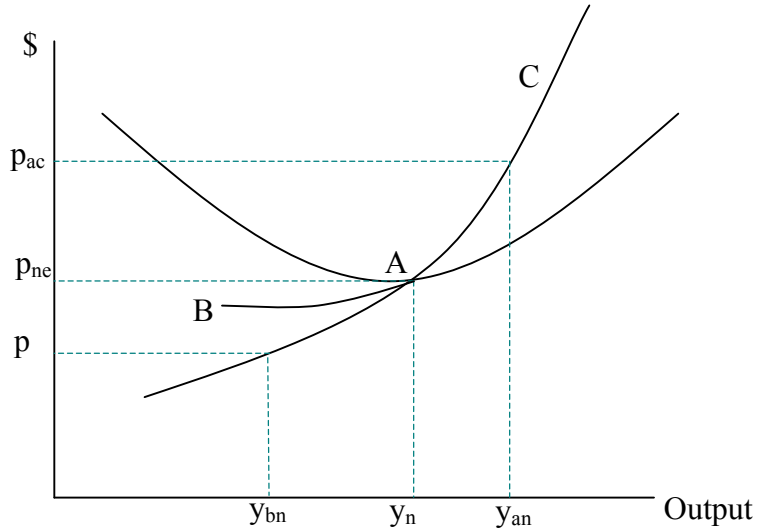
---

[4] Marshall also had a market period market, but that is not dealt with here.
[5] It should be noted that free competition was not defined in terms of firm size or the number of firms. Moreover, by including goodwill and knowledge of other firms' actions, free competition included "non-competitive" and interdependent characteristics. These characteristics of Marshall's competitive market are rejected for a perfectly competitive market.

that must be met in the short period if the aggregate level and the representative firm's level of output are to be maintained:

> The immediate effect of the expectation of a high demand price is to cause people to bring into active work all their appliances of production, and to work them full time and perhaps overtime. [There are problems with diminishing returns here] The supply price is then the money cost of production of that part of the produce which forces the undertaker to hire such inefficient labour (perhaps tired by working overtime) at so high a price and to put himself and others to so much strain and inconvenience that he is on the margin of doubt whether it is worth his while to do it or not. [Marshall 1972: 311]

Figure 15.1



where y_n is normal output;

y_{an} is above normal output;

y_{bn} is below normal output;

p_{ne} is the equilibrium price at y_n output where ATEP = MEP;

p_{ae} is the equilibrium price when output is above normal;

p would be the equilibrium price when output is below normal if the representative firm followed its MEP curve downward; and BAC is the representative firm's supply curve.

Because his empirical investigations showed that the market price did not fall greatly when market demand fell, Marshall argued that the representative firm's supply curve was not equal to marginal expenses of production when market demand was below normal. That is, if market demand was below normal:

> …[entrepreneurs] generally hold out for a higher price: each man fears to spoil his chance of getting a better price later on from his own customers; or, if he produces for a large and open market, he is more or less in fear of incurring the resentment of other producers should he sell needlessly at a price that spoils the common market for all. [Marshall 1972: 311]

Consequently the representative firm's supply price is a "socially" determined market price that is slightly below its normal supply price. Hence the fall in supply is due to the firms cutting production while maintaining the price and to the marginal firms ceasing production when the market price fell slightly:

> The marginal production in this case is the production of those whom a little further fall of price would cause, either from a regard to their own interest or by formal or informal agreement with other producers, to suspend production for fear of further spoiling the market. The price which, for these reasons, producers are just on the point of refusing, is the true marginal supply price for short periods. It is nearly always above, and generally very much above the special or prime cost for raw materials, labour and wear-and-tear of plant, which is immediately and directly involved by getting a little further use out of appliances which are not fully employed. [Marshall 1972: 311]

Thus in Marshall's short period theory of price, there is an asymmetrical relationship between the representative firm's supply price, its marginal expenses of production (or marginal prime costs), and demand: when market demand is normal or greater, its supply price is equal to its marginal expenses of production, while when market demand is below normal, its supply price is equal to the socially determined market price and is above its marginal expenses of production. Hence the representative firms' short period supply curve is BAC in Figure 1 above.

Long Period Theory of Prices

Marshall's long period theory of prices was centered on the problem of increasing returns to scale. As noted above, Marshall realized that the simplistic mathematical logic of increasing returns to scale implied the monopolization of the market by a single firm. Since he believed this was inconsistent with economic reality, Marshall set about to show why increasing returns did not violate his theoretical framework, while at the same time, showing how they could be used to explain the long period market price.

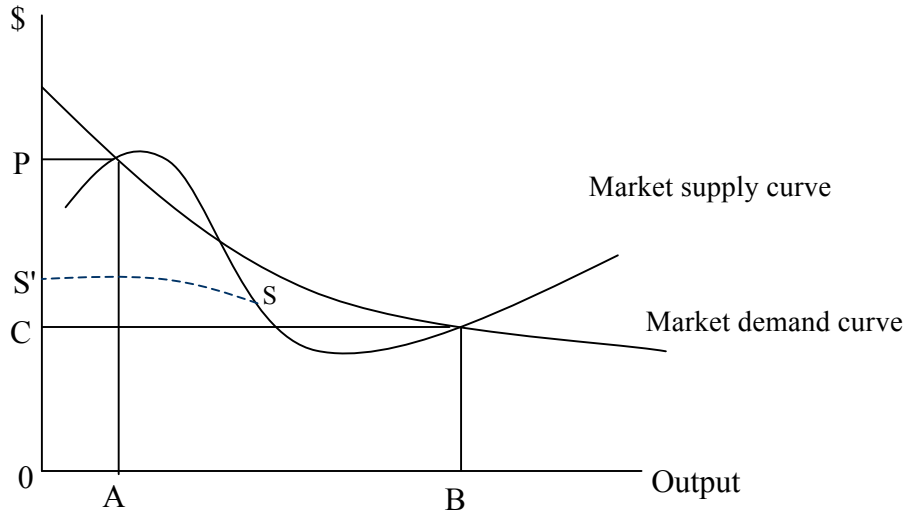
Marshall's theory of prices starts with a long period equilibrium where the market is neither growing nor contracting. In such a situation, the long period market demand will equal long period market supply. Moreover, since the representative firm's long period normal output remains unchanged, its long period normal average total expenses of production will be its supply price and equal to the market price. However, because Marshall envisioned the long period as representing a considerable period of time in comparison to the life span of the individual firm, the individual firm's normal average total expenses of production need not equal the long period market price at any point in its entire life cycle. That is, in the long period, the firm can go through its entire life cycle without monopolizing the market because of the inherent constraints it faces mentioned above. Thus, when the market's aggregate rate of production is given and the representative firm's average total and marginal expenses of

production equals the market price, the long period market price can be seen as an "equilibrium" price for the given aggregate rate of production and for the existing configuration of firms within the market. Moreover although the market price is an equilibrium price for the representative firm, it is not an equilibrium price for any actual firm in the market since it will not maintain its current rate of production.

The next aspect of Marshall's theory of prices is to show that increasing returns to scale can generate a downward sloping market supply curve without violating the assumption of free competition. Marshall began his argument by saying that the tendency of a falling market price due to the gradual development of its market was quite different from a firm's tendency to capture new economies as its business increases. Indeed, it was noted above that a firm could encounter economies of scale even if the market did not grow. However, because the aggregate level of industry output and the market price were not determined by the actions of any specific firm in the market, the theory of prices must be explained in terms of the representative firm.

To start the analysis, assume a given level of aggregate output OA with the corresponding equilibrium price of OP (see Figure 2). Now assume there is a disturbance, such as a momentary increase in demand. The immediate short period response would be an increase in the market price; however the long period response would be for the representative firm to expand its output. With its size increased, the representative firm would reap new internal economies; in addition with an increase in market output, it would also reap new external economies. As a result, the representative firm's normal long period marginal expenses of production (and average total expenses of production) would fall. The new stable equilibrium position will occur where the representative firm's marginal (and average total) expenses of production equals the demand price. The net result would be a new market output OB and a lower long period market price OC.

Figure 15.2



To complete the analysis, a number of theoretical points need to be considered. First Marshall assumed that the market supply curve would eventually cut the market demand curve from below: "…if the supply curve be produced sufficiently far towards the right, it must at last lie above the demand curve (Marshall 1972: 665)." As a result, the final equilibrium would be a stable one. Secondly, by discussing increasing returns and the falling supply price with respect to the representative firm, Marshall implicitly assumed that monopolization would not take place. That is, the concept of Marshall's representative firm is only sustainable in free competition; therefore by using it to analyze a downward sloping supply curve, the problem of monopolization has been assumed away.[6] To be fair to Marshall, he believed that the conditions for monopolization would violate his strictures of the long period; therefore if one was to discuss increasing returns and the supply price within the context of the long period, then free competition and the use of the representative firm was permissible. Finally, because the falling supply curve is based on economies of scale, it is irreversible with respect to the

market price. That is, the market price might "slide" down the supply curve, but it cannot "slide" back up the same curve; rather it will take a different route denoted as SS':

> Again, the list of supply prices may have fairly represented the actual fall in the supply price of the thing that takes place when the supply is being increased; but if the demand should fall off, or if for any other reason, the supply should have to be diminished, the supply price would not move back by the course by which it had come, but would take a lower course. The list of supply prices which had held for the forward movement would not hold for the backward movement, but would have to be replaced by a lower schedule….For, when any causal disturbance has caused a great increase in the production of any commodity, and thereby has led to the introduction of extensive economies, these economies are not readily lost. [Marshall 1972: 666]

The implication of this admission is that the long period market supply curve ceases to be a functional relationship and becomes simply a descriptive curve. Consequently Marshall's long period theory of prices simply dissolves.

More here—clearly marginal utility of money changes, hence changing the demand curve and no price quantity relationship.

Section 3 of Appendix H in Principles:

§ 3. It must however be admitted that this theory is out of touch with real conditions of life, in so far as it assumes that, if the normal production of a commodity increases and afterwards again diminishes to its old amount, the demand price and the supply price will return to their old positions for that amount.

Whether a commodity conforms to the law of diminishing or increasing return, the increase in consumption arising from a fall in price is gradual: and, further, habits

---

[6] There is also an issue of the representative firm being a proxy for an industry. In this case, it is not clear what monopoly would mean. In any case, as a proxy for the industry, the representative firm has assumed away the issue of monopoly.

which have once grown up around the use of a commodity while its price is low, are not quickly abandoned when its price rises again. If therefore after the supply has gradually increased, some of the sources from which it is derived should be closed, or any other cause should occur to make the commodity scarce, many consumers will be reluctant to depart from their wonted ways. For instance, the price of cotton during the American war was higher than it would have been if the previous low price had not brought cotton into common use to meet wants, many of which had been created by the low price. Thus then the list of demand prices which holds for the forward movement of the production of a commodity will seldom hold for the return movement, but will in general require to be raised.

CHAPTER 16

THE YEARS OF TURMOIL, 1926 TO 1933

Introduction

Marshall's supply and demand-based theory of prices laid the foundation on which the modern neoclassical theories of perfect and imperfect competition rest. To see this, particular aspects of Marshall's theory of prices need to be summarized. Marshall used independent supply and demand schedules to determine the market price; consequently a change in demand (supply) must not provoke changes in the supply (demand) curve or disturb the other variable held constant under the *ceteris paribus* assumption. That is, the demand and supply schedules are given to the market; hence their "internal" conditions must not contradict each other if there is to be a theory of prices. Specifically, this means that the firm must not have its own downward sloping demand curve and that the downward sloping supply curve does not lead to monopolization. In this context, Marshall tried to argue that the market price had a unique functional relationship with costs and output. In the short period, it was found that such a relationship only existed when market demand was normal or greater, that is when the market price equaled the representative firm's marginal expenses of production (or marginal prime costs). In the long period, the relationship existed only in equilibrium. At all other times, the relationship did not exist. Still, this price-cost-output relationship remained principal property of Marshall's theory of prices, primarily because it lead to two essential properties: (1) changes in market demand (supply) changes market price and output, and (2) the market price is a market clearing price since it equates market quantity demanded with quantity supplied. By using a partial equilibrium framework which separates costs from price, Marshall was able to argue that the long period market price was equal to the representative firm's average total (and marginal) expenses of production—the latter obtained by simply adding up the various cost components. [NEED TO WORK ON MORE]

Prior to Piero Sraffa's attack on Marshall, doubts were expressed as to the theoretical consistency of Marshall's theory of price, especially as to the symmetry of the laws of "diminishing returns' and increasing returns to sale, and to the consistency of increasing returns to scale and competition.[7] However, such heretical questioning was promptly silenced by Marshall or his Cambridge followers.[8] But in 1925, this protective shield was broken with the publication of Sraffa's article, "On the Relations Between Cost and Quantity Produced" (Sraffa 1925). Although the article was in Italian, it came to the attention of the aging F. Y. Edgeworth who, as a co-editor of *The Economic Journal*, decided to invite Sraffa to write a second article in the same vein. When Edgeworth died Keynes, as the other co-editor of the EJ made the request to Sraffa, who responded positively with his famous 1926 article, "The Laws of Returns Under Competitive Conditions" (Sraffa 1926). [Sraffa's work could be considered Marshallian instead of being pure Marshall—discuss]

The Laws of Returns Under Competitive Conditions

Instead of rewriting his 1925 article, Sraffa summarized it in the first five pages (pp. 536-541). The purpose of the 1925 article was to analyze and criticize the law of diminishing returns and the law of increasing returns with respect to their usage by Marshall in his theory of prices. Sraffa noted that originally, the two laws were designed for quite different uses: diminishing returns - for the analysis of rent, and increasing returns for the division of labor. Thus, he suggested that Marshall's coordination of this heterogeneous material for use in his price theory created internal inconsistencies:

> In the tranquil view, which the modern theory of value presents us, there is one dark spot, which disturbs the harmony of the whole. This is represented by the supply curve, based upon the laws of increasing and diminishing returns. That its foundations are less solid than those of the other portions of the structure is

[7] See Bullock (1902).

> generally recognized… they are actually so weak as to be unable to support the weight imposed upon them…(Sraffa 1926: 536).

The difficulties that Sraffa saw in Marshall' price theory revolved around the use of supply and demand curves to determine prices. To use this approach, he argued that the following conditions must hold: perfect competition/free competition and *ceteris paribus* assumption that changes in production or demand and their impact on the industry price must have a negligible impact on other industries, which in turn have a negligible impact on the first industry. This implies that the various industries are independent of each other with respect to production, demand, and price. However, if it can be demonstrated that the changes have non-negligible collateral effects, then Marshall's theory has an error of *ceteris paribus*. In this case a solution to the initial movement can not be found. In particular, if this error of *ceteris paribus* is found in Marshall's theory of prices, then the error violates its methodological construction. Prices would not merely be unstable and causality difficult to establish, the two variables would continuously, and in turn, be the independent and dependent variables. Consequently, there would be no solution and, more significantly, no theory.

Sraffa's Critique of Marshall

Sraffa's critique of Marshall is concentrated on his long period theory of prices with respect to supply curves:

> The really serious difficulties make their appearance when it is considered to what extent the supply curve based on the laws of return satisfy the conditions necessary to enable them to be employed in the study of the equilibrium value of single commodities produced under competitive conditions. This point of view assumes that the conditions of production and the demand for a commodity can be

---

[8] See Coats (1967).

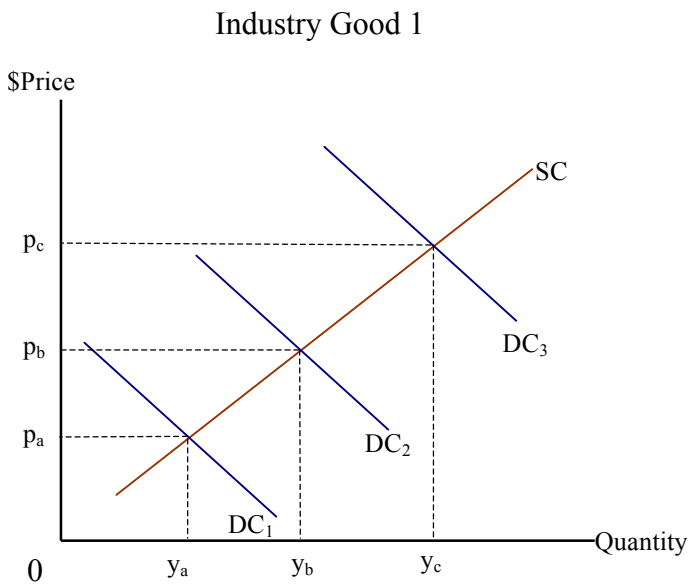
> considered, in respect to small variations, as being practically independent, both in regard to each other and in relation to the supply and demand of all other commodities…the assumption becomes illegitimate, when a variation in the quantity produced by the industry under consideration sets up a force which acts directly, not merely upon its own costs, but also upon the costs of other industries; in such a case the conditions of the 'particular equilibrium: which it was intended to isolate, are upset, and it is no longer possible, without contradiction, to neglect collateral effects (Sraffa 1926: 538-539).

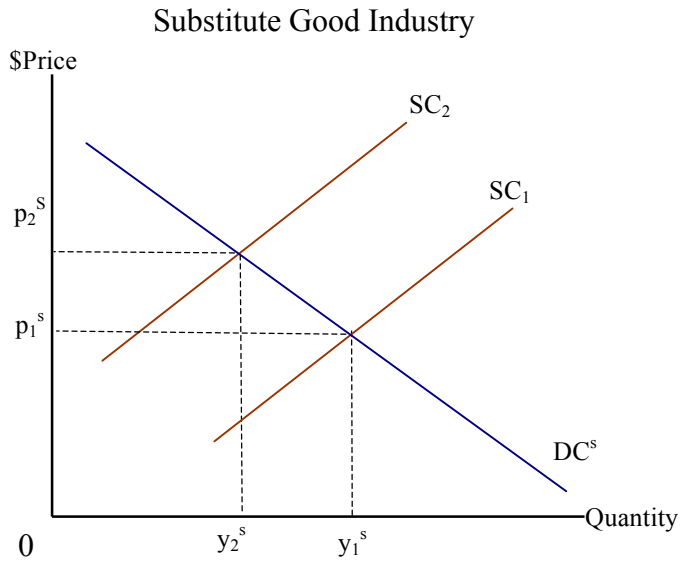
Long period supply curve and "diminishing and constant returns"

To illustrate Sraffa's argument, assume that there exists a factor which is fixed in absolute quantity for the economy as a whole and which is fully utilized. Thus the factor is relatively scarce and its price is an index of its relative scarcity.[9] Now assume that an industry employs this particular factor in a proportion that is greater on average than in the rest of the economy as a whole. Hence, when long period demand for the industry's good increases (which requires that the demand for at least some if not all the other industries in economy have declined), the industry will require more of the fixed factor for production. Because the demand for the factor by the industry is greater than the amount being released from the other industries on average, its factor price increases. However, because the factor could be employed in the production of goods that are substitutes to the one under consideration, then the costs, price, and quantity demanded of the substitute goods would change. Since the quantity demanded of the substitute goods would change, so then will the demand for the original good in question. This is an error of *ceteris paribus*—that is the industry's supply curve has a definite effect on its demand curve. To see this, assume that industry output for good 1 is y_a and price is p_a. Demand shifts to DC_2 and the

[9] This point will be fully explained in Part VII.

industry increases output to y_b. Due to more intensive use of the fixed factor, its factor price rises; thus, the expenses of production and hence the price increase to p_b. However, this also causes a change in the equilibrium price and quantity in the substitute good industry. That is, the increase in input price causes costs in the substitute industry to increase resulting in its supply curve shifting upward from S_1^s to S_2^s. Consequently, the price increase in the substitute good industry from p_1^s to p_2^s causes an increase in demand in the Good 1 industry to DC_3, hence price increases from p_b to p_c. This means that costs in the substitute good industry will increase again and the whole process will repeat itself indefinitely. Thus the upward sloping supply curve in industry 1 affects the position of the demand curve for industry 1. Hence the two curves are not independent of each other—which is fundamentally necessary for there not to be an error of *ceteris paribus*.





If industry 1 employs the fixed factor in a proportion less than the economy average then it can draw off marginal doses of the factor from other industries with no change or little change in the factor's price. Thus, there can be no charge in costs as output increases—that is the supply curve for industry 1 will be *horizontal*. The implication of these two cases is that an upward sloping, *ceteris paribus*, supply curve cannot be sustained, except in that minute class of commodities in the production of which the whole of a factor of production is employed. That is, consider a situation where a factor input is given

but is only used in the production of a single good. Further, assume that the factor is fully used and hence has a positive price reflecting the degree of its relative scarcity. Consequently, if demand for the good increases, the price of the factor input will increase resulting in an upward sloping supply curve. However, because the factor input is not used in any other industry, the increase in its price will not have any collateral effects and hence not result in an error of *ceteris paribus*.

Long period supply curve and increasing returns

External economies cannot be the basis of a downward sloping long period supply curve since they are incompatible with the conditions of the particular equilibrium of a good. For example, as an industry grows the transportation and distribution system surrounding it may grow more efficient, thus lowering costs to the firm. However, this type of occurrence is outside the realm of partial equilibrium which holds all other things (outside the industry) constant in deriving the supply curve. This type of technical progress in the aggregate economy also conflicts with the static analysis. *Internal economies* of scale as manifested in the representative firm cannot be the basis of a downward sloping long period market supply curve. On the one hand, if the long period supply curve is reversible (Sraffa appears to have assumed this), then the constraints Marshall placed on the firm growth cycle are non existent; hence with increasing returns and an expanding market, there is no limit to the size of the firm. However, if Marshall's constraints exist, then the long period market supply curve is irreversible. Therefore, in either case the long period market supply curve based on internal economies of scale cannot exist.

Conclusion

The implication of the above analysis is that the competitive long period theory of prices is restricted to a long period horizontal supply curve or constant returns to scale. But it is precisely under these conditions that demand ceases to play any role in the determination of long period prices. Hence

the *raison d'etre* for the supply and demand approach to long period prices in which variations in both costs and demand have a major role, then it is best to turn away from competition and move towards monopoly:

> It is necessary, therefore, to abandon the path of free competition and turn in the opposite direction, namely, towards monopoly. Here we find a well-defined theory in which variations of cost connected with charges in the dimensions of the individual undertaking play an important part.[10] [Sraffa 1926: 542]

Sraffa's Contribution

In a letter to Keynes (June 1926), Sraffa indicated that he thought that the imperfectly competitive route was a more promising approach to develop a long period theory of prices. Thus, he proposed to direct the constructive part of his 1926 article to the study of market conditions in which the demand curve facing the firm has less than infinite elasticity – that is the firm faces a downward sloping demand curve. He introduced his approach in the following manner:

> Every day experiences shows that a very large number of undertakings… work under conditions of individual diminishing costs. Almost any producer of manufacturing goods, if he could rely upon the market in which he sells his product, being prepared to take any quantity of them from him at the current price, without any trouble on his part except that of producing them, would extend his business enormously. It is not easy, in times of normal activity, to find an undertaking which systematically restricts its own production to an amount less than that which it could sell at the current price, and which is at the

[10] It is interesting to note that Sraffa had abandoned this approach by 1930 and embarked on a new and different kind of analysis in which supply curves, demand curves, and returns to scale were completely discarded. The result of this work was *Production of Commodities by Means of Commodities* (Sraffa, 1960). [more on this]

> same time prevented by competition from exceeding that price. Businessmen, who regard themselves as being subject to competitive conditions, would consider absurd the assertion that the limit to their production is to be found in the internal conditions of production in their firm, which do not permit of the production of a greater quantity without an increase in cost. The chief obstacle against which they have to contend when they want gradually to increase their production does not lie in the cost of production… but in the difficulty of selling the larger quantity of goods without reducing the price, or without having to face increased marketing expenses. This necessity of reducing prices in order to sell a larger quantity of one's own product is only an aspect of the usual *descending demand curve*, with the difference that instead of concerning the whole of a commodity, whatever its origin, *it relates only to the goods produced by a particular firm*; and the marketing expenses necessary for the extension of its market are merely costly efforts to increase the willingness of the market to buy from it – that is, to raise that demand curve artificially (Sraffa 1926: 543, emphasis added).

In suggesting the imperfect competition approach, Sraffa make three important points. First he argued that the individual firm faced a downward sloping demand curve rather than one that was horizontal and had infinite elasticity of demand.[11] As a result perfect competition/free competition could now be characterized as a firm facing a horizontal demand curve, while imperfect competition is characterized as a firm facing a downward sloping demand curve. Second, he emphasized the importance of the price elasticity of the firm's demand curve in the determining of its price and maximum profits. Lastly, Sraffa discussed the ways a firm could

[11] Marshall mentioned that firms could have heir own special markets complete with demand curves, but such cases were not considered important for theoretical analysis. Need to footnote this reference.

protect its market in the long period by increasing its marketing expenditures to invade the market of the firms or to use the same expenditures to create barriers to entry.

Firm Demand Curve and the Marginal Revenue Curve

The response of economists to Sraffa's critique and contribution was swift. Within six years of its publication, Joan Robinson had written her *Economics of Imperfect Competition* and Roy Harrod had presented the bare outlines of an imperfectly competitive theory of prices in a series of three articles in *The Economic Journal* between 1930 and 1932. The reason for such interest varied among economists. Robinson and the Cambridge group were interested in terms of theory. On the other hand, Harrod's interest in Sraffa's article was both theoretical and empirical. One of his major motives in developing an imperfectly competitive theory of prices was to get a better basis for theories of aggregate demand and inflation.[12] Another motive

> … was to get nearer to reality. Orthodox theory had its monopoly theory and its theory of competition… This seemed so highly unrealistic that it seemed worth exploring what would happen if one made some intermediate assumption. No doubt any theory of this sort is only an abstract skeleton, a structure that will have to be revised in many particulars, only a very imperfect model of reality. But I do think it is an immense improvement on the old doctrine. And since the main object was to get near the facts, …. [Harrod to Henderson, 23 Feb. 1936]

The first response of economists was to conceptualize the firm demand curve. As noted above, Marshall's representative firm did not face a demand curve; rather it faced a market price. However, this state of affairs was altered when Sraffa argued that in perfect competition/free competition, the firm faced a horizontal demand curve at the market price while the imperfectly competitive firm faced a downward sloping demand curve. This dichotomy was seized on by Harrod and Robinson. [work on]

---

[12] See Harrod (1936).

Harrod (1930) adopted this dichotomy in his first article on imperfect competition. He first argued that under perfect competition a single firm could not affect the market price by varying its output, hence the demand with which such a firm is confronted may be represented by a horizontal line, that is a horizontal demand curve. Later in the same article, he abandoned the notion of the market demand curve for a good and adopted Sraffa's suggestion of a demand curve for a product of a particular firm. To make the transition, Harrod first used a monopoly example and then, implicitly, extended his argument to a situation in which there was more than one firm in the market. Such a demand curve arose, he argued, when the firm becomes large relative to the market. In a later article, he supported his argument by introducing marketing costs and nonstandardized commodities in a market. Robinson adopted Sraffa's dichotomy by 1932. She acknowledged that in perfect competition a firm faced a horizontal demand curve while in imperfect competition, the firm faced a downward sloping demand cure for its commodity. The firm demand curve was influenced by the total demand for the commodity, by the prices charged by competing firms, by the number of firms, by advertising, by transportation costs, and by other market imperfections.

Once having conceptualized the firm demand curve, economists quickly derived the marginal revenue curve since it could be used to determine prices, output and maximum profits in imperfect competition.[MORE]

Representative Firm

The second response of economists was to reconceptualize the representative firm. Following Sraffa's article, the representative firm came under a twofold attack. On the one hand, it was shown that it could not solve the problem of increasing returns, competitive condition, and the downward sloping long period market supply curve if the curve was assumed to be reversible (for greater discussion see the

representative firm controversy).[13] On the other hand, it was shown that the representative firm was unnecessary for explaining differential rates of return among firms. Robbins (1928) argued that the representative firm concept was not needed to explain different rates of returns to firms within an industry in long period equilibrium. Rather, all one had to do was postulate heterogeneous factors which, by freely moving among different lines of employments would have their own uniform rate of return. In making the argument, he used the notion of freely moving factors, which implied that the factor could be combined with any other set of factors to produce a unit of output. More specifically, the concept of freely moving capital implied that in the long period, the organization of production in terms of plant, equipment, direct inputs, and overhead inputs could easily be adapted to accept any factor. However, if all factors are freely moveable and combinable, then in the last analysis they must be completely malleable, that is technically unspecified. However, it is just this view of the firm – being a collection of technically unspecified factors used in the production of a good – that conflicts with Marshall's view of the firm. Thus by couching the argument as he did. Robbins notably stripped away the last important refuge of the representative firm, he also did away with the representative firm itself.

With the demise of the representative firm, economists quickly devised a replacement called the equilibrium firm. Pigou, in 1928, introduced the concept of the equilibrium firm to handle the problem of the long period decreasing supply price under competitive conditions. The firm was not conceived of in terms of size or output; rather it was any firm that was in equilibrium when the market was in equilibrium. By 1934, the equilibrium firm had become a conceptual centerpiece in both the perfect and imperfect competitive theories of price and endowed with characteristics far different from those Marshall endowed the representative firm and even somewhat different then Pigou's equilibrium firm. [more]

---

[13] Need to footnote this reference—and perhaps expand on it.

CHAPTER 17

THE PERFECTLY COMPETITIVE THEORY OF PRICES

The objective of economists who developed this theory of prices was to rescue economic theory, that is, the economic theory that deals with the allocation of scarce resources among competing ends, from the clutches of imperfect competition:

> …it has to be recognized that a general abandonment of the assumption of perfect competition, a universal adoption of the assumption of monopoly, must have very destructive consequences for economic theory. [Hicks 1946: 83]

To accomplish their objective, a set of assumptions were developed on which a competitive theory of prices was constructed. [more]

Assumptions of Perfect Competition

There are five assumptions. The first two assumptions are:

(1) all firms sell goods that are identical with respect to physical characteristics, location, and time of availability.

(2) consumers are identical from the seller's point of view in that there are no advantages or disadvantages associated with selling to a particular consumer.

These two assumptions ensure the anonymity of firms and consumers. With regard to the firm, it is equivalent to the statement that the product of the firm is indistinguishable from products of others—trademarks, patents, and special brands do not exist. Consumers have no reason to prefer the product of one firm to that of another. The uniformity of consumers ensures that a firm will sell to the highest bidder. Custom and other institutional rules of thumb for distributing output among consumers are

nonexistent. The assumptions help ensure that the firm is a price taker (or faces a horizontal demand curve).[14]

The third assumption is that both firms and consumers are numerous and the sales or purchases of each individual unit are small in relation to the aggregate volume of sales or purchases. This ensures that many sellers face many buyers. If firms are numerous, an individual firm can increase or reduce its output level without noticeably altering the market price. An individual consumer may raise or lower its demand for the good without any perceptible influence on the price. The individual buyer or seller acts as if he/she has no influence on the price and merely adjusts to what he/she considers a given market situation. Thus, buyers are price takers in that they adjust the quantities purchased so that these quantities are optimal for them given the prevailing price, without ever considering that their purchases may, in turn, further affect the price. Sellers observe a market price and adjust quantities sold so that these quantities are optimal from their point of view without considering that their sales may affect the price.

The fourth assumption is that both firms and consumers possess perfect information about the prevailing price and current bids, and they take advantage of every opportunity to increase profits and utility respectively. This assumption guarantees perfect information on both sides of the market. Buyers and sellers possess complete information with respect to the quality and the nature of the product and the prevailing price. Since there are no uniform buyers, entrepreneurs cannot attempt to charge more than the prevailing price. Consumers cannot buy from some entrepreneurs at less than the prevailing price for analogous reasons. Since the product is homogeneous and everybody possesses perfect information, a single price must prevail in a perfectly competitive market. This can be proved by assuming on the contrary that the good is sold at two different prices. By hypothesis, consumers are

[14] They also eliminate Marshall's use of goodwill to divide up the market and effectual competition

aware of the facts that (1) the good can be brought at two different prices and (2) one unit of the good is exactly the same as any other. Since consumers are utility maximizers, they will not buy the good at the higher price. Therefore, a single price must prevail.

The fifth assumption is that entry into and exist from the market is free for both firms and consumers in the long period. This assumption ensures that resources are mobile and always move into occupations from which they derive the greatest advantage. Firms move into markets in which they make profits and leave those in which they incur losses. Resources such as labor tend to be attracted to industries the products of which are in great demand. Inefficient firms are eliminated from the market and are replaced by efficient ones.

Short Period Theory of Prices

To develop a competitive short period theory of prices, the reaction of firms to changes in the parameter under consideration – either output or price – must be ascertained. Then this information can be used to derive supply curves and explain the market price.

Equilibrium of the Firm in the Short Period

Since the firm is a price taker in perfect competition, its only course of action is to adjust its output so as to maximize its profits are the given market price. To model this in a *Marshallian* manner where output is varied given the market price, let us establish a *profit maximizing function* utilizing the total cost function:[15]

maximize economic profits: π = total revenue – total costs

maximize economic profits: $\pi = p_y\, y - [p_1 x_1^e + \ldots + p_h x_h^e + p_{h+1} x_{h+1}^F + \ldots + p_n x_n^F]$

where π is economic profits.

Now differentiating with respect to y, we get:

---

between the firms in the market.

$\partial\pi/\partial y = p_y - \partial[p_1x_1^e + \ldots + p_hx_h^e + p_{h+1}x_{h+1}^F + \ldots + p_nx_n^F]/\partial y$

where $\partial[p_1x_1^e + \ldots + p_hx_h^e + p_{h+1}x_{h+1}^F + \ldots + p_nx_n^F]/\partial y = \lambda^e(\mathbf{p}, y)$ = marginal costs.

Setting equal to zero, we get:

$p_y = \lambda^e(\mathbf{p}, y)$ or price equals marginal cost.

To determine whether we have a profit maximizing position, we take the second derivative:

$\partial^2\pi/\partial y^2 = \partial p_y/\partial y - \partial\lambda^e/\partial y$

and setting equal to zero we find that since p_y is a constant thus making $\partial p_y/\partial y = 0$ and since $\partial\lambda^e/\partial y > 0$ (see Part III, p. 46), then $-\partial\lambda^e/\partial y < 0$. Since the second derivative is negative, $p_y = \lambda^e(\mathbf{p}, y)$ or price equals marginal cost represents the firm's profit maximizing position. That is to maximize economic profits, the firm will supply the amount of output at which its marginal costs equals the market price.

Firm Supply Curve

A supply curve is defined as a locus of points, that is combinations of prices and quantities, in which for each price the association quantity will be such that the firm's profits will be maximized or its losses minimized. Thus the supply curve is represented as $y = f(p_y)$ and is a functional relationship (as opposed to a relation) in which for a given price there will be a single quantity supplied.[16] Although $p_y = \lambda^e(\mathbf{p}, y)$ determines the quantity of output the firm will supply at the given market price in order to maximizes its economic profits, it does not represent a supply curve since output is not a function of p_y. However this is easily dealt with by inverting $p_y = \lambda^e(\mathbf{p}, y)$ with respect to y:

firm supply curve: $y = \lambda^*(\mathbf{p}, p_y)$ where λ^* is the inverse of λ^e.

---

[15] See the appendix to the chapter for the Walrasian approach. [more]

[16] Because the supply curve is based on the behavioral assumption of profit maximization, it is not a technical relationship. If the behavioral assumption is changed then the supply curve would disappear.

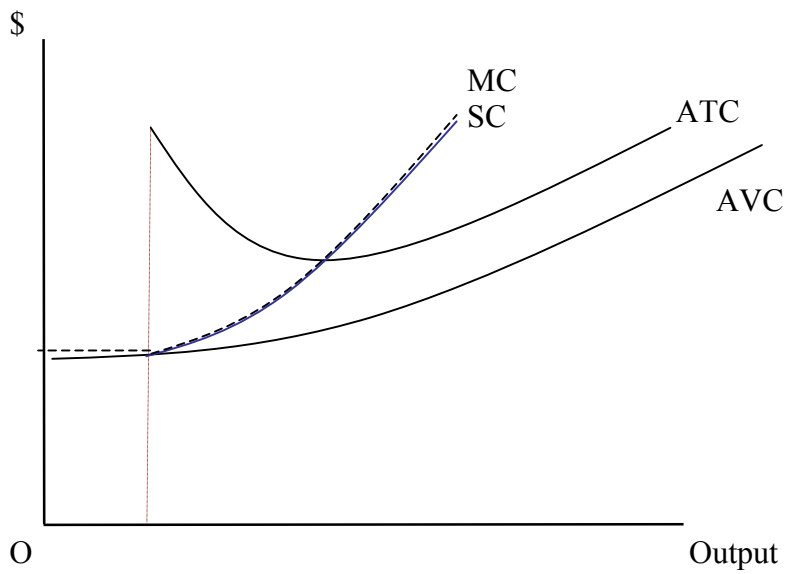
This equation is the firm's supply curve since output is now a function of the output price, p_y. In addition, the slope of the supply curve is positive, that is $\partial y/\partial p_y > 0$ since the slope of the marginal cost curve is also positive.[17] Finally, the firm supply curve can be written in the following manner:

$$y = \lambda^*(p_{h+1}, \ldots, p_n, p_y)$$

$$y > 0 \text{ if } p_y = MC \geq \min AVC$$

$$y = 0 \text{ if } p_y < \min AVC.$$

Figure 17.1



Example

Consider the following short period example. Working with the Cobb-Douglas production function example in Part III, Chapter 13, we find that constant output factor input demand function for x_1 and the marginal cost function are:

$$x_1^e = [y\, x_2^{F(-a)}]^{1/(1-a)}$$

[17] See Chiang (1974: 181–83).

$$mc = \lambda^e = \frac{p_1}{1-a} (y/x_2^{F(a)})^{a/(1-a)}$$

Utilizing the profit maximizing function, we know that in firm equilibrium market price equals marginal cost:

$$p_y = \lambda^e = \frac{p_1}{1-a} (y/ x_2^{F(a)})^{a/(1-a)}$$

Now, rearranging to get y as the dependent variable and p_y as the independent variable, we have

$$y = [(1\text{-}a)/p_1\ p_y]^{(1-a)/a}\ x_2^F$$

which is the supply curve; and

$$\partial y/\partial p_y = [(1\text{-}a)^2/(ap_1)\ p_y]^{(1-2a)/a}\ x_2^F > 0 \quad \text{[check on this]}$$

that is, the supply curve slopes upward.

Market Equilibrium in the Short Period

In Book III Chapter 4, the market demand curve is "derived" by adding together the individual consumer demand functions:

$$y_{md}^e = f^m(\mathbf{p}, M) = \sum y_i = \sum f_i(\mathbf{p}, M_i).$$

As for the market supply curve, since the number of firms in the market in the short period is fixed and since the supply function of each firm contains the same identical parameters, the market supply curve is obtained by horizontally summing up of all the individual firms supply curves:

$$y_{ms}^e = \lambda_m^*(\mathbf{p}, p_y) = \sum \lambda_i^*(\mathbf{p}, p_y).$$

In equilibrium, the quantity supplied equals quantity demanded; or letting p_y^e be the equilibrium market price, then $y_{md}^e(p_y^e) - y_{ms}^e(p_y^e) = 0$. For example, let $y_{md}^e(p_y^e) = -a_1p_y + b_1$ and $y_{ms}^e(p_y^e) = a_2p_y - b_2$, then market equilibrium occurs when $y_{md}^e(p_y^e) = y_{ms}^e(p_y^e)$. Thus solving the system of equations for p_y^e and y_m^e, we get

$$p_y^e = \underline{b_1 + b_2}/a_2 + a_1$$

$y_m^e = \underline{a_2 b_1 - a_1 b_2}/a_2 + a_1$.

Although we have shown that an equilibrium market price can exist, we still have to give a plausible explanation of how it actually emerges.[18] There are two principle explanations of how the market price is determined: the Walrasian auctioneer procedure and the Edgeworth recontracting procedure. [more – without auctioneer cannot get to equilibrium]

Walrasian auctioneer procedure

Let us assume that an auctioneer exists who calls out prices. For each price the auctioneer calls out, the consumers indicate how much they will demand and the firms indicate how much they will supply. For any market price that excess demand exists, the auctioneer will call out a subsequent higher market price; and for any market price for which excess supply exists, the auctioneer will call out a subsequent lower price. It is only when the auctioneer calls out a market price at which the quantity demanded equals quantity supplied that production and exchange are allowed to take place. That is in the Walrasian auction, the goods are not produced and offered to consumers until an equilibrium market price is reached; hence up to that point goods are only conditionally offered.[19]

Edgeworth recontracting procedure

Let us start with buyers and sellers in the market and both are attempting to enter into contracts that are favorable to them. Whenever a buyer and seller enter into a contract, they both reserve the right to *recontract* with any person who makes a more favorable offer. Assume that some consumer makes an initial bid and offers a price p_y^o for the good. This price is recorded and made public by an impartial official of the trading process. Buyers and sellers will attempt to enter into contracts with each other at the price p_y^o. If p_y^o is lower than the equilibrium market price p_y^e, consumers who are willing to buy at

[18] This point has to be dealt with under methodology – issue of getting to equilibrium.
[19] This procedure is also appropriate for the Marshallian procedure where output is the parameter involved – cannot work say why]

this price find that the quantity offered is not sufficient to satisfy their desires. Some of the consumers who have not been able to satisfy their demand will be induced to raise their bids in the hope of tempting sellers away from other consumers. As soon as this higher price p_y^1 is recorded and made public by the official, sellers break their old contracts and recontract at the higher price. As higher prices are offered, the quantity demanded declines, since each consumer demands less. Simultaneously, the quantity offered by sellers increases. The process of recontracting continues as long as the price recorded by the official is below the equilibrium market price, that is as long as the quantity demanded exceeds the quantity supplied. When the equilibrium market price is reached, neither consumers nor producers have an incentive to recontract any further. Recontracting is discontinued and the official signals the firms that they can now fulfill their contracts.

Auctioneer, Recontracting, and False Trades

Both the auctioneer and recontracting procedures are a way of eliminating out of equilibrium transactions. This means that all sales are made simultaneously at the last moment of the short period. No sale is final until all are final, which can only happen when all are made at the same price, for if any were recorded at a different price, one or another of the parties would gain by recontracting. The problem with out of equilibrium transactions—*false trades*—is that if they occur, the original equilibrium that the system is converging to would disappear and with it equilibrium and the possibility of any coherent supply and demand based equilibrium explanation of market outcomes. In place of interest in equilibrium positions would be replaced with interest in the process of sequential transactions itself. [more, references]

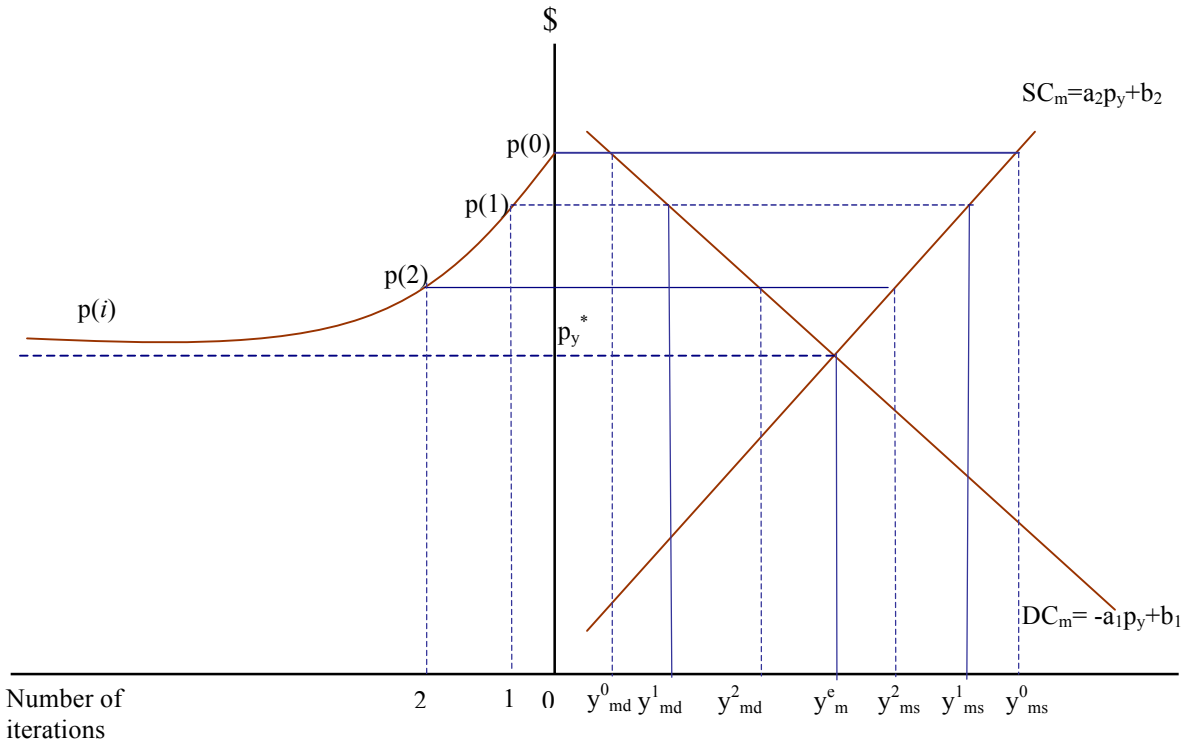
Stability

So far we have just assumed that the Walrasian auctioneer and the Edgeworth recontracting processes lead to an equilibrium position. That is, the conditions under which both adjustment processes

will produce an equilibrium have to be delineated. As noted above, both adjustment processes are iterative in that starting with an initial out of equilibrium market price (or quantity), subsequent out of equilibrium prices (or quantities) are derived with each price (or quantity) being closer to the equilibrium. This convergence process will take place if the absolute value of the slope of the supply curve is greater than that of the demand curve. To show this, let us look at Figure 2 and an example.

Figure 17.2 [reference]

Walrasian Auctioneer or Edgeworth Recontracting Price Adjustment



The procedure describing the out of equilibrium behavior of the market can be represented by the following differential equation:

$$\frac{dp_y}{di} = k[y_{md}(p_y) - y_{ms}(p_y)] \quad k > 0$$

which states that the rate of price change is directly proportional to the size of excess demand (that is $y_{md}(p_y) - y_{ms}(p_y) > 0$) or excess supply (that is $y_{md}(p_y) - y_{ms}(p_y) < 0$), and k being the coefficient of proportionality. Now rearranging the equation and substituting in the linear demand and supply functions from above, we obtain a first-order differential equation in p_y:

$$\frac{dp_y}{di} + k(a_2 - a_1)p_y = k(b_1 - b_2).$$

Solving the equation we get

$$p_{yi} = \underline{b_1 - b_2}/a_2 - a_1 + ce^{-k(a_2 - a_1)i}$$

$$p_{yi} = p_y^e - [p_y^* - p_y(0)]e^{-k(a_2 - a_1)i}$$

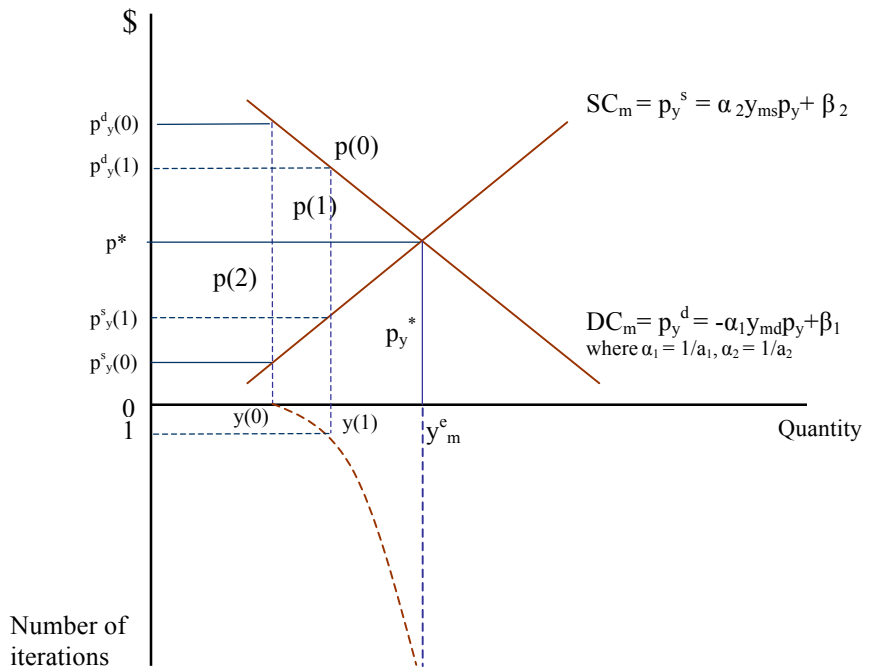
where c is a constant of integration and is equal to $p_y^e - p_y$; and

e is the base of the natural logarithms.

Thus as long as $a_2 - a_1 > 0$ (that is the absolute value of the slope of the supply curve is greater then that of the demand curve), $p_{yi} = p_y^e$ in the limit as i (the number of iterations) $\rightarrow \infty$. More specifically, as long as the demand curve slopes downward and the supply curve slopes upward, the Walrasian and Edgeworth price adjustment procedures will produce a equilibrium. It should be noted that a Walrasian auctioneer output adjustment can also be delineated, but since the conclusions are the same, only Figure 3 will be presented. [?]

Figure 17.3 [reference]

Walrasian Auctioneer or Edgeworth Recontracting Quantity Adjustment



The significant of this discussion of stability lies not only in the delineation of the conditions for the convergence to equilibrium, but it also shows whether a shift in demand or supply will produce a new stable equilibrium position.

Historical digression

Walras' *tatonnement* procedure was first developed to handle a pure exchange economy. In this case, the auctioneer would call out prices and the respondents would call out quantity demanded and quantity offered. However no false trades would be allowed, thus implying that exchange could only take place at the equilibrium price. This process to reach the equilibrium market price is timeless. When Walras passed from his theory of exchange to his theory of production, he introduced the device of fictitious tickets into his account of the adjustment process precisely in order to avoid injecting time into the analysis. He had not done so in the context of his pure exchange theory only because he

regarded the interval between a binding commitment to an exchange contract and its execution as negligible in comparison with the passage of time from the moment a product is ordered to the moment the production is completed and the delivery is actually made. In any appreciable time interval, complications would more likely set in and disturb the structural features that Walras assumed constant in his model. As long as he insisted on retaining his strictly static assumptions in his analysis of the emergence of an equilibrium set of prices via the competitive market process, he had somehow to render his *tatonnement* in production as timeless as his *tatonnement* in pure exchange. He did this by assuming that the auctioneer issued provisional contracts in the form of tickets that were subject to mandatory cancellation until equilibrium set of prices is reached in all markets of the system at once. There would then be no chance for changes in the data of the problem to occur. Thus Walras' *tatonnement* in production was reduced essentially to a replica of his virtually timeless *tatonnement* in pure exchange.

Edgeworth's recontracting process is a process by which traders obtain information about the market. Given preference structures and endowments, traders will enter into contracts on day one and conclude transactions at disequilibrium prices, revealing to the traders the magnitude and sign of the excess demand. On the second day, they enter the market again with the same preference structures and endowments and with increased knowledge about the market. Again they conclude transactions at disequilibrium prices and the process repeats itself. This goes on until the equilibrium price is reached in accordance with the given endowments and preference structures. Although this process takes "days" according to Edgeworth, nothing really changes (that is the parameters of the system remained fixed) so that we can conclude that Edgeworth's theory of recontracting is virtually timeless.

Long Period Theory of Prices

Equilibrium of the Firm in the Long Period

To deal with firm equilibrium in the long period, we first have to introduce the concept of *normal profits*. For the firm to produce in the long period it must be able to get a rate of return that is at least equal to rates of returns in other markets. More specifically, it must be at least equal to the rates of return in the money market [need more]. Consequently, this rate of return on capital is called normal profits and is included as part of the firm's total cost structure. Thus if economic profits are negative for any level of output, the firm will not produce that level of output. The second point that needs to be introduced is the fact that in the long period, the firm's cost structure can be influence by returns to scale. With these two points, let us establish the profit maximizing function utilizing the function coefficient:

maximize economic profits: π = total revenue – total costs

$$\pi = p_y\, y - [p_1x_1^e + \ldots + p_nx_n^e]$$

$$\pi = p_y y - y\lambda^e(\mathbf{p}, y)\varepsilon_f$$

where $p_1x_1^e + \ldots + p_nx_n^e = yATC = yMC\varepsilon_f = y\lambda^e(\mathbf{p}, y)\varepsilon_f$

Now differentiating with respect to y, we get:

$$\underline{\partial\pi}/\partial y = p_y - \underline{\partial[p_1x_1^e + \ldots + p_nx_n^e]}/\partial y$$

$$= p_y - \lambda^e(\mathbf{p}, y)$$

Since MC = $\underline{ATC}/\varepsilon_f$, so when setting the first order conditions to zero, we get:

$$p_y = MC = \lambda^e(\mathbf{p}, y) = \underline{ATC}/\varepsilon_f.$$

Working with the different returns to scale, we there following possibilities. First, if $\in_f = 1$ (constant returns to scale), then p_y = ATC = MC. Therefore when taking the second derivative to determine

whether we have a profit maximizing position, we find that the second derivative is zero, which means that we have neither a profit maximizing or minimizing position. Consequently, the firm is free to produce any amount from zero to infinity and still receive zero economic profits, hence its size (as defined by y) is indeterminate. However, the firm would choose to produce as much as possible because it would grow large relative to the market (and the other firms), and thus acquire market power which it would use to set a price greater than its ATC. This clearly means that constant returns to scale is incompatible with perfect competition because it does not constrain the size of the firm to being 'small' and with no market power.

Secondly, if $\varepsilon_f > 1$ (increasing returns to scale), then $p_y = MC < ATC$. In this case, the firm is making negative economic profits (EP). That is, $EP = y[p_y - ATC] = y[r(y)]$ where $p_y - ATC = r(y)$ and is denoted as economic profit margin. Consequently the firm will not produce when $p_y = MC$ since $MC < ATC$.[20] Moreover, if the firm decides to produce where $p_y = ATC$, then it would minimize its profits (that is make zero economic profits). That is, as indicated by $\underline{\partial r(y)}/\partial y = \underline{\partial[p_y - ATC]}/\partial y = -\underline{\partial ATC}/\partial y > 0$ (since p_y is given) which says that the change in the economic profit margin is positive with increases in output. Consequently, restricting production to $p_y = ATC$ so that $r(y) = 0$ is effectively minimizing economic profits when additional output would result in $r(y) > 0$. Finally, if $p_y > ATC$, then $p_y = ATC + r(y)$, where $\underline{\partial r(y)}/\partial y > 0$ with the limit that as $y \rightarrow \infty$, $ATC \rightarrow 0$ and $r \rightarrow p_y$. Therefore to maximize economic profits, the firm will maximize $\pi = yr(y)$ by increasing y: $\underline{d\pi}/dy = \underline{d(yr)}/dy = r(y) + \underline{ydr(y)}/dy > 0$ which means that positive increases in y generates positive economic profits. To see whether we have a position of profit maximization we take the second derivative that is

$$\underline{d^2\pi}/dy^2 = \underline{2d[r(y)]}/dy + \underline{yd^2r(y)}/dy^2 < 0$$ [21]

[20] This means that the firm's marginal cost curve cannot be the basis for the firm's supply curve.
[21] This result is derived by first setting the first derivative equal to zero which and rearranging terms to produce $\underline{dr(y)}/dy = -\underline{r(y)}/y$. Substituting, the second derivative takes the following form:

which means we have profit maximization. More specifically, it means that the firm will maximize its profits by producing as much as possible, that is by pushing $y \rightarrow \infty$ so that ATC $\rightarrow$ 0 and $r \rightarrow p_y$ which results in maximum $\pi = yr(y)$. But this means that the firm grows large relative to the market and thus acquires market power. Hence increasing returns to scale is incompatible with perfect competition.

Lastly, if $\varepsilon_f < 1$ (decreasing returns to scale), then $p_y = MC > ATC$. In this case, the firm is making positive economic profits. To determine whether we have a profit maximizing position, we take the second derivative and setting equal to zero we find $\underline{\partial^2\pi}/\partial y^2 = \underline{\partial p_y}/\partial y - \underline{\partial\lambda^e(\mathbf{p}, y)}/\partial y < 0$. Since the second derivative is negative, $p_y = \lambda^e(\mathbf{p}, y)$ or price equals marginal cost represents the firm's profit maximizing position. That is to maximize economic profits, the firm will supply the amount of output at which its marginal costs equals the market price and no more. So unlike the cases of constant and increasing returns to scale where the size of the firm is not restricted, thus permitting it to grow 'large' with respect to the market and acquire market power, decreasing returns to scale constrains the size of the firm thus not letting it grow large and acquire market power.

Firm Supply Curve in the Long Period under Different Returns to Scale

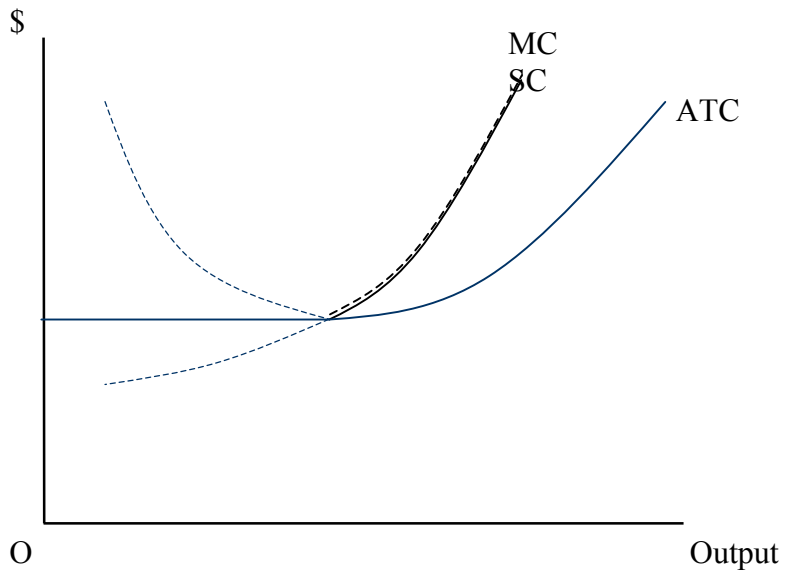
Given the above equilibrium positions of the firm under different returns to scale, we find that constant and increasing returns to scale are inconsistent with perfect competition and hence it is not possible to even talk about firm equilibrium or deriving the firm supply curve. On the other hand, in the case of decreasing returns to scale, the firm will produce where $p_y = MC$, no more and no less. Consequently, as long as $p_y = MC \geq ATC$, the amount the firm will supply in order to maximize its profits is positive; conversely, if $p_y <$ min ATC, the amount it will supply will be zero. Therefore the firm's long period supply curve can be written in the following manner:

$\underline{d^2\pi}/dy^2 = -\underline{2[r(y)/y]} + \underline{yd^2r(y)}/dy^2$. Now taking the limit as $y \rightarrow \infty$, the first term remains negative while the second terms tends to zero since ATC tends towards zero. Hence the overall value of the second derivative is negative.

$y = \lambda^*(\mathbf{p}, p_y)$ where $y > 0$ if $p_y = MC \geq$ min ATC and $y = 0$ if $p_y <$ min ATC.

Figure 17.4

Long Period Firm Supply Curve



Market Equilibrium

Given the above behavioral reaction of the firm, the determination of the long period market equilibrium and the determination of the market price can now be delineated. Let us assume, using a Walrasian auctioneer, that the auctioneer calls out a particular market price, p_{yo}. At such a price, there exists two sets of firms: ones who are marking negative economic profits and ones who are making zero or positive economic profits. The former groups drops out of the market while the latter group stay in and are augmented by the entry of new firms that employ technology that permits them to gain positive economic profit. Moreover, because entry will continue as long as economic profits are positive, the quantity supplied will exceed quantity demanded so that *excess supply* will exist. As a result, the auctioneer lowers the market price it calls out until it reaches the point that the market price equals the minimum average total costs of the firms with the most efficient technology. At this juncture all the

firms will be earning zero economic profits and entry into the market will occur up to the point at which the quantity demanded equals quantity supplied. This final equilibrium position for the market will therefore have the following characteristics:

(1) all firms in the market produce at the minimum point of their ATC cost curve where MC = ATC;

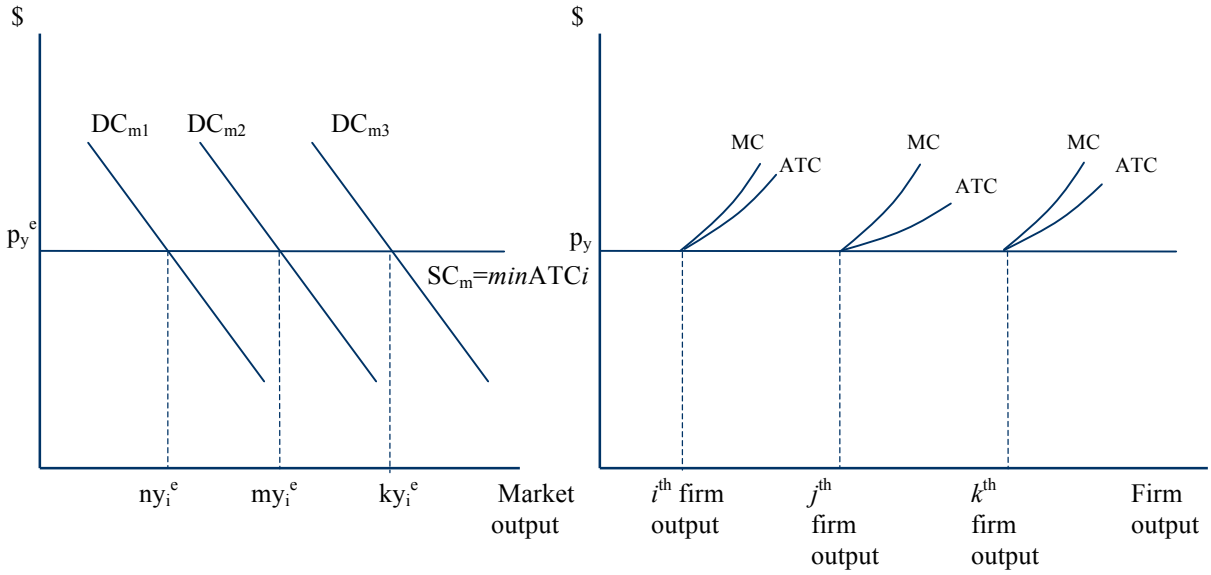
(2) all firms in the market are technologically identical; and

(3) in market equilibrium, $y_{md1}^e(p_y^e) = y_{ms1}^e(p_y^e) = ny_i^e$ where y_i^e is the equilibrium output of the ith firm.

Long Period Market Supply Curve and the Theory of Prices

Starting with the above equilibrium position and assuming that input prices and technology are given, then a rightward shift in demand would increase market output while leaving the minimum average total costs of each firm unchanged, hence leaving the market price unchanged. That is, since minimum average total costs equals p_y^e, the new quantity demanded is $y_{md2}^e(p_y^e) = y_{ms2}^e(p_y^e) = my_i^e$

Figure 17.5 [some problems here]



where m > n. By repeating the procedure when market demand shifts further to the right, market output increases to ky_i while the output of the ith firm does not change and is equal to the output of the kth firm. Thus, we find that the long period market supply curve is horizontal at the market price p_y^e = min ATC—see Figure 5. However since a horizontal supply curve violates the definition of a supply curve where there is one price-one quantity supplied, it is really a supply relation not a supply curve. To get around this problem, often neoclassical economists argued that an increasing long period market supply curve can be generated if the assumption of given input prices is relaxed. That is, assuming that an input is fixed in the economy as a whole and is used in greater proportion in the industry than elsewhere in the economy, greater utilization of the input by the industry in face of increased demand will increase its price thus making the long period market supply curve slope upward. But as Sraffa argued, this violates the *ceteris paribus* assumption under which the supply curve is being constructed and therefore is an inadmissible possibility.[22] Thus there is no long period market supply curve that corresponds to the short period market supply curve. More importantly, there is no long period theory of prices: the market price is determined by technology and market quantity is determined by market demand—the interaction of supply and demand to determine prices and quantities does not exist.

Equilibrium Firm and the Theory of Prices

In the discussion of the firm's long period costs in Part III, Chapter 12, it is argued, implicitly, that the firm had a U-shaped average total cost curve and this assumption is used in the discussion about market equilibrium in the long period. We are now in a position to discuss this point further. As noted above, if the firm's long period average total curve is strictly decreasing or strictly constant, it would grow significantly large to violate the assumption of perfect competition. Moreover, in the context of long period market equilibrium where each firm must earn zero economic profits, if each firm in the

[22] A more detailed discussion here based on the history of the argument etc. [need references for this

market had a strictly increasing average total cost curve, then for market equilibrium to occur, the market price would have to approach zero and the firm would have to produce an infinitesimal small amount of output; and as a consequence, there would be infinite number of firms in the industry. As Varian (1984, p. 87) has stated:

> Increasing average costs, free entry. This combination is rather paradoxical. With increasing average costs, the smaller the scale of production the lower the average costs. Hence the long-run equilibrium should exhibit an infinite number of firms, each supplying an infinitesimal amount of output. This seems rather implausible.

To avoid these unpalatable conclusions and still have a "reasonable" market equilibrium, it is necessary to assume that the firm's average total cost curve is U-shaped. However, the question that must be asked is: "on what basis can we assume that decreasing returns to scale exists in a way that does not fall foul of Sraffa's criticisms?" Hicks resolved this issue by assuming a factor that was scarce to the firm but elastic to the industry, since such a factor would not violate the *ceteris paribus* assumption while at the same time produce an upward sloping average total cost curve.[23]

Hicks identified the factor as the entrepreneur's ability to control the firm as its scale of production increases. That is as the firm's scale of production increases, the services of the entrepreneur combined with the other factor inputs eventually produce decreasing returns to scale because of the entrepreneur's inability to effectively handle the increased size of the firm. However, such an assumption is untenable if the "entrepreneurial factor input" changes technical form as the scale of production increases so as to increase its managerial capability of effectively managing a larger size firm; and the empirical evidence suggests this to be the case.[24] Therefore, since increasing returns to

---

from textbooks]

[23] Get the reference for Hicks.

[24] Get evidence for this; also note Macgregor, Andrews, Chandler, etc.

scale are assumed not to exist over the firm's entire range of production and decreasing returns to scale cannot be sustained, the plausible situation for the competitive firm in the long period is that its production is based on constant returns to scale and thereby has a horizontal average total cost curve. But this means that the size of the firm is unconstrained, thus making the conditions of perfect competition untenable. To escape this predicament, a U-shaped average total cost curve has to be blindly assumed or a long period theory of prices has to be dropped. Yet, even with the U-shaped cost curve, the long period outcome is a horizontal "market supply curve," which suggests that there is no long period theory of prices similar to a short period theory of prices in any case.[25]

Firm and Pure Exchange Model

So far the term "firm" has been used without explaining its role and basis for existence within the perfectly competitive theory of prices. In a pure exchange model, each individual has a given utility (preference) function (structure) and a given vector of endowments. Assuming that the endowments are scarce, the resulting prices will be an index of their relative scarcity and the supply curves for each individual (and for the market) is simply an indirect expression of its utility function. These points can be illustrated in the following example (taken from *Elements of Pure Economics* by L. Walras—page numbers needed). Assume that there are two traders A and B and trader A is endowed with all of good A and trader B is endowed with all good B. Also assume that each trade has a strongly separable utility function of the following form:

$$U^A=\mu_b(y_b)+\mu_a(y_a^T-y_a^0)$$

$$U^B=\mu_a(y_a)+\mu_b(y_b^T-y_b^0)$$

where $U^A(U^B)$ is the utility function of trader A (trader B);

[25] In response to this problem, neoclassical economists generally ignore long period price theory or simply assume that it has the characteristics of short period theory of prices. Evidence from textbooks—get.

$\mu_a(y_a)$ [$\mu_b(y_b)$] represents the total utility of consuming $y_a(y_b)$ amount of good A (B);

$\mu_a(y_a^T-y_a^0)$ [$\mu_b(y_b^T-y_b^0)$] represents the total utility from holding and consuming $y_a^T-y_a^0$ ($y_b^T-y_b^0$) amount offered of good A(B);

y_a^T (y_b^T) is the original stock of good A(B); and

y_a^0 (y_b^0) is the amount offered of good A (B).

The budget constraint for each trader can be written as:

trader A: $y_a^T p_a = (y_a^T-y_a^0)p_a + y_b^d p_b$

trader B: $y_b^T p_b = (y_b^T-y_b^0)p_b + y_a^d p_a$

where y_b^d is the amount of good B demanded by trader A; and

y_a^d is the amount of good A demanded by trader B.

Working with trader A we have the following:

$$L = U^A = \mu_b(y_b)+\mu_a(y_a^T-y_a^0) + \lambda(y_a^T p_a-y_b^d p_b-(y_a^T-y_a^0)p_a)$$

First order conditions:

$$L_{ya} = \mu_a'(y_a^T-y_a^0)\partial(y_a^T-y_a^0) - \lambda\partial(y_a^T-y_a^0)p_a = 0$$

$$L_{yb} = \mu_b'(y_b) - \lambda p_b = 0$$

$$L_\lambda = y_a^T p_a-y_b^d p_b - (y_a^T-y_a^0)p_a = 0 \text{ or } y_b^d p_b = y_a^0 p_a$$

In equilibrium we have:

$$\mu_b'(y_b)/p_b = \lambda = \mu_a'(y_a^T-y_a^0)/p_a \text{ or } p_a/p_b = (y_a^T-y_a^0)/ \mu_b'(y_b)$$

or trader A maximizes its utility when the ratio of the marginal utilities of goods A and B equal the price ratio p_a/p_b. Solving the first order conditions we have

$$y_b^d = f_a(p_a, p_b, y_a^T)$$

$$y_a^0 = f_a(p_a, p_b, y_a^T)p_a/p_b.$$

Working with trader B, we have the following:

$$L = \mu^B = \mu_a'(y_a) + \mu_b(y_b^T - y_b^0) + \lambda(y_b^T p_b - y_a^T p_a - (y_b^T - y_b^0)p_b)).$$

First order conditions:

$$L_{ya} = \mu_a'(y_a) - \lambda p_a = 0$$

$$L_{yb} = \mu_b'(y_b^T - y_b^0)\partial(y_b^T - y_b^0) - \lambda\partial(y_b^T - y_b^0)p_b = 0$$

$$L_\lambda = y_b^T - y_a^d p_a - (y_b^T - y_b^0)p_b = 0 \text{ or } y_a^d p_a = y_b^0 p_b$$

In equilibrium we have

$$\mu_a'(y_a)/p_a = \lambda = \mu_b'(y_b^T - y_b^0)/p_b \text{ or } p_a/p_b = (y_a^T - y_a^0)/\mu_b'(y_b)$$

or trader B maximizes its utility when the ratio of the marginal utilities of goods A and B equal the price ratio p_a/p_b. Solving the first order conditions we have

$$y_a^d = f_b(p_a, p_b, y_b^T)$$

$$y_b^0 = f_b(p_a, p_b, y_b^T)p_b/p_a.$$

Now let us consider equilibrium conditions, for goods A and B. First the demand for good A by trader B is represented by its offer of good B to trader A. That is, if trader B wants good A then it must offer good B for it. Conversely, however, trader B will only get good A if trader A offers part (or all) of its holdings of good A for good B. Therefore, if exchange between traders A and B is to take place both good A and B be simultaneously offered and demanded by both traders. In addition equilibrium will occur only when the quantity demanded equals the quantity supplied of both goods. To make the above discussion more understandable, let us consider the following set of equations:

$y_a^0 = f_a(p_a, p_b, y_a^T)p_a/p_b$ ----|
|----- supply and demand equations for good A
$y_a^d = f_b(p_a, p_b, y_b^T)$ ----------|

$y_b^0 = f_b(p_a, p_b, y_b^T)p_b/p_a$ ----|
|----- supply and demand equations for good B
$y_b^d = f_a(p_a, p_b, y_a^T)$ ----------|

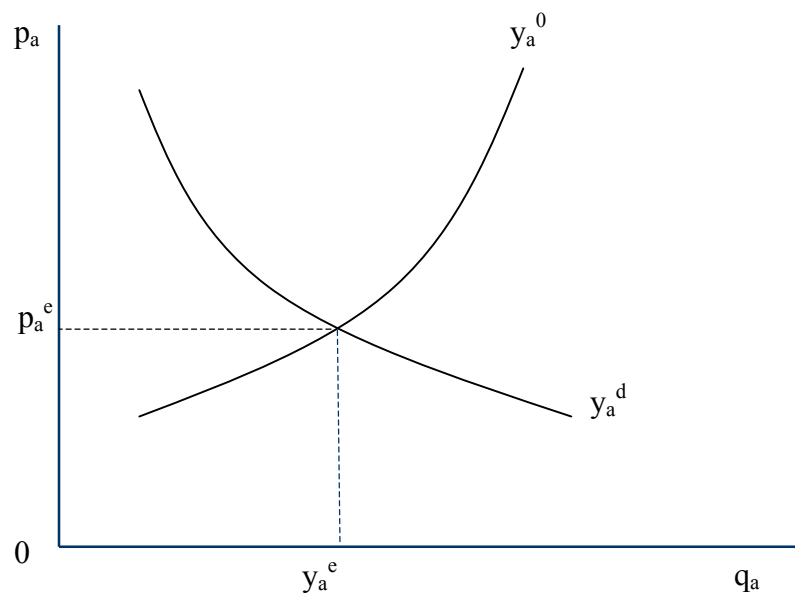
Dealing with market A and assuming $p_a p_b = 1$, we have the following

$\partial y_a^d/\partial p_a = \partial f_b(p_a, 1/p_a, y_b^T)/\partial p_a < 0$ the demand curve for good A declines because of diminishing marginal utility; and

$\partial y_a^0/\partial p_a = \partial[f_a(p_a, 1/p_a, y_b^T)p_a^2/\partial p_a > 0$ the offer (or supply curve) for good A slopes upward because of diminishing marginal utility to trader A.

Therefore we have the following diagram:

Figure 17.6



So given the two equations they can be solved to produce and y_a^0 and y_a^d they can be solved to produce y_a^e and y_b^e. In this type of analysis once equilibrium in market A is arrived at then market B will also be equilibrium - therefore it will not be dealt with.

Now we are in a position to make the following points. Because marginal utility represents the notion of scarcity in that a scarce good is both useful and limited in quantity, the price ratio p_a/p_b represents the relative scarcity of the two goods. Thus, assuming good B as the numeraire, p_a fulfills the notion that prices are a relative scarcity index. From the first order conditions, we clearly see that prices allocate goods A and B between the two traders in a manner that will maximize their total utility. Finally we see that the demand curve for good A is the supply curve for good B from the standpoint of

each trader, As a result, demand and supply are both identical to each other, as the reverse functions expressing the same process and at the same time radically separate one from the other since they are functions of different individuals. Supply and demand are, therefore, wholly disjoint and independent so long as individual preference is itself independently determined. At the same time, and by the same fact, both supply and demand are determined by the same force – individual preference – thus implying that the supply curve is naturally determined.[26]

Now let us go from a pure exchange model to a model in which scarce goods are used to produce intermediate and final goods. With the introduction of production three new questions need to be considered: first is the organization of production qualitatively different from the organization of exchange? secondly, what is the nature of the supply curve? and lastly can the equilibrium price be seen as a scarcity index? Once production is introduced, the supply curve ceases to be directly equivalent to the demand curve. That is, the supply curve ceases to be directly based on preferences; rather its construction is based on how production is undertaken. In the short period, we have argued that the supply curve is based on diminishing returns; while in the long period it is based on decreasing returns to scale. In either case, the supply curve deceitfully appears as a "reverse function" of the demand curve. Moreover, production under perfect competition consists of an individual – qua producer buying factor inputs on the open market at constant prices, and then transforming the factors into useful goods (that is, into utilities) which can then be sold on the market. Thus the individual – qua producer is simply an intermediary between traders and holds this position because of the technical base of the transformation of factors into outputs. Hence it can be concluded that the firm in perfect competition is a technical entity which is indistinguishable from the individual – qua producer. So, the firm as an independent unit of capital in a world of interdependent firms does not exist in perfect competition. Therefore, if a firm is

[26] This section needs to be worked on.

said to exist in perfect competition, it must be manner that is wholly arbitrary (such as being based on uncertainty and transaction costs—see Coase, 1937—more here). Finally, because the supply curve is based on diminishing returns or on decreasing returns to scale, the supply price is in effect a scarcity index since it is correlated with the amount of utilities available for consumption.

That is, as in the case of pure exchange, the supply price increases with the amount of utilities offered for consumption; thus diminishing returns or decreasing returns to scale becomes the exact corollary within production of diminishing marginal utility (and strictly quasi-concave utility function) within demand theory.

To conclude the above analysis, we find that the firm as oppose to individual qua producer does not exist in perfect competition. The reason for this is quite plain, the notions of the supply curve as a "reverse function" of the demand curve and the equilibrium price as a scarcity index are most adequately served if the unit of production is no more than a technical unit situated between factors and consumers and simply transform the factors into utilities that are demanded at large and indifferently by the consumers in the market.

Perfectly Competitive Theory of Prices: A Summary

TO BE COMPLETED

Appendix

Let us consider the Walrasian approach to firm equilibrium and the supply curve. Starting with the profit maximizing equation π = total revenue – total costs, it can be written as

$$\pi = p_y\, f(x_1 \ldots x_n) - [p_1x_1 + \ldots + p_nx_n]$$

where π is economic profits, and

$$f(x_1 \ldots x_n) = y.$$

The first order conditions are

$$p_y \underline{\partial f(\mathbf{x})}/\partial x_1 - p_1 = 0$$

……

$$\underline{p_y \partial f(\mathbf{x})}/\partial x_n - p_n = 0.$$

Solving for the *(output price) factor input demand functions*, we have

$$x_1^p = \psi_1^p(p_1, \ldots, p_n, p_y)$$

…….

$$x_n^p = \psi_n^p(p_1, \ldots, p_n).$$

Substituting the factor input demand functions back into the profit maximizing equation we get

$$\pi = p_y\, f(x_1^p \ldots x_n^p) - [p_1 x_1^p + \ldots + p_n x_n^p] = \pi^*(\mathbf{p}, p_y)$$

which is called the *indirect profit function* or simply the *profit function*. The properties of the profit function are the following:

(a) nonincreasing in **p** and nondecreasing in p_y – if $p_y' \geq p_y$ and $\mathbf{p'} \leq \mathbf{p}$, then $\pi^*(\mathbf{p}, p_y') \geq \pi^*(\mathbf{p}, p_y)$;

(b) homogeneous of degree 1 in p_y and **p**;

(c) convex in p_y and **p**; and

(d) continuous in p_y and **p**.

Now if we differentiate the profit function with respect to p_y, we get

$$\frac{\partial \pi^*(\mathbf{p}, p_y)}{\partial p_y} = f(\mathbf{x^p}) + p_y \frac{\partial f(\mathbf{x^p})}{\partial x_1} \frac{\partial x_1^p}{\partial p_y} + \ldots + p_y \frac{\partial f(\mathbf{x^p})}{\partial x_n} \frac{\partial x_n^p}{\partial p_y} - p_1 \frac{\partial x_1^p}{\partial p_y} - \ldots - p_n \frac{\partial x_n^p}{\partial p_y}$$

$$= f(\mathbf{x^p}) = y = \lambda^*(p_1, \ldots, p_n, p_y)$$

That is differentiating the profit function with respect to p_y produces the firm's supply curve.[27] Now if we differentiate the profit function with respect to p_i, we get

[27] This result is an example of the envelope theorem—see Silberberg and Suen (2001), pp. 152 – 156.

$$\frac{\partial \pi^*(\mathbf{p}, p_y)}{\partial p_i} = f(\mathbf{x^p}) + p_y \frac{\partial f(\mathbf{x^p})\partial x_1^p}{\partial x_1 \partial p_i} + \ldots + p_y \frac{\partial f(\mathbf{x^p})\partial x_n^p}{\partial x_n \partial p_i} - p_1 \frac{\partial x_1^p}{\partial p_i} - \ldots - x_i^p \ldots - p_n \frac{\partial x_n^p}{\partial p_i}$$

$$= -x_i^p$$

$$- \frac{\partial \pi^*(\mathbf{p}, p_y)}{\partial p_y} = x_i^p$$

That is differentiating the profit function with respect to p_i produces the firm's factor demand function for the ith input. And the second derivative of the profit function with respect to p_i is negative showing that the factor demand curve for the ith input slopes downward.

Let us now apply the profit function to the equilibrium of the firm in the short period. Since the firm is a price taker under perfect competition, its only course is to adjust its output so as to maximize its profits. Working with the profit function, we can show this in the following manner:

$$\pi = p_y f(x_1^p, \ldots, x_h^p, x_{h+1}^F, \ldots, x_n^F) - [p_1 x_1^p + \ldots + p_n x_n^F] = \pi^*(\mathbf{p}_{1 \text{ to } h}, p_y).$$

Differentiating with respect to the p_y, we get:

$$\partial \pi^*(\mathbf{p}_{1 \text{ to } h}, p_y)/\partial p_y = f(\mathbf{p}_{1 \text{ to } h}, p_y) \text{ or the firm's supply function.}$$

Since $y = f(\mathbf{p}_{1 \text{ to } h}, p_y) = \lambda^*(\mathbf{p}_{1 \text{ to } h}, p_y)$ we can say that given a market price p_y, the firm will supply output to the amount of $f(\mathbf{p}_{1 \text{ to } h}, p_y) = y$; moreover since $f(\mathbf{p}_{1 \text{ to } h}, p_y) = y$ it is the inverse function of $p_y = \lambda^e(\mathbf{p}_{1 \text{ to } h}, y)$, the amount of output supplied occurs where marginal costs equals the price.

For example, using a Cobb-Douglas production in the context of the short period where the quantity of x_2 is fixed at x_2^o we get

$$p_y (x_1^{1-a} x_2^a) - p_1 x_1 - p_2 x_{2^o}$$

with the first order condition

$$p_y (1 - a) x_1^{-a} x_2^{oa}) - p_1 = 0$$

rearranging we get

$$x_1^P = [(p_y/p_1)(1-a)]^{1/a} x_{2^o} \text{ which is the factor input demand for labor.}$$

Now substituting L^P back into the profit maximizing function we get

$$p_y x_1^{P(1-a)} x_2^{oa} - p_1 x_1^P - p_2 x_{2^o}$$

which is the profit function. Differentiating the profit function with respect to p_y we get:

$$\frac{\partial[p_y x_1^{P(1-a)} x_2^a - p_1 x_1^P - p_2 x_2]}{\partial p_y} = L^{P(1-a)} x_2^a = [[(p_y/p_1)(1\text{-}a)]^{1/a} x_2]^{(1-a)} x_2^a$$

or

$$y = [(p_y/p_1)(1\text{-}a)]^{(1\text{-}a)/a} x_2$$

or differentiating the profit function with respect to p_y produces the firm's supply curve.

CHAPTER 18

CRITICISMS

There are numerous shortcomings of the perfect competition model. However, we are going to restrict our attention to its coherence in terms of its analytical tools and its use of partial equilibrium methodology. Starting with the demand side, as argued in the first section, there is no basis for the existence of a market demand curve of the conventional sort; and hence by implication a firm demand curve.[28] With the absence of both demand curves there can be no firm or market supply and demand analysis. However, for the sake of continuing the analysis, we shall assume for the moment that the firm faces an exogenously given market price (in place of the horizontal firm demand curve). At this point it is generally assumed that the firm is a profit maximizer and proceeds by making production decisions that equate its marginal costs to the given market price. The general drawback to the argument is that, as noted above, the firm's choice algorithm for technology and for producing output (at given input prices) would not necessarily produce maximum profits even if its marginal cost is equated to the market price. Moreover these same influences may also inhibit a profit maximizing output choice from being made by the firm at all. Because the firm's mechanism for making choices and the choices it can chose among are socially constructed without constraints, the imposition of profit maximizing is an ad hoc and illegitimate restriction of the firm's choice decisions.[29] A more specific drawback concerns the shape of the firm's marginal cost curve. That is, profit maximization that is consistent with perfect competition requires that the firm marginal cost curve be increasing. But as noted above, there is no reason for the

---

[28] The usual rendition in textbooks is that the firm demand curve is perfectly horizontal at the market price, but no attempt is made to relate it to the market or consumer demand curve. Hence it is a theoretically groundless concept. [work on]

[29] For example, business histories and studies of business culture make it clear that the firm's decision-makers have non-profit maximizing objectives—see Godley and Westall (1996).

firm's production function should generate declining marginal products or decreasing returns to scale to produce the upward sloping curves; and without them, the profit maximizing firm will increase its production and size so as to be incompatible with perfect competition. These results imply that the firm marginal cost curve need not be transformable into the firm supply curve where for each supply price the quantity supplied will maximize the firm's profits; and since the neoclassical firm supply curve exists only as an inverse transformation for the firm marginal cost curve, this implies that it need not exist.[30]

Market Supply Curve

The usual argument for the derivation of the short or long run market supply curve is that it consists of the horizontal aggregation of the individual firm supply curves. While virtually all textbooks assume that the conditions for consistent and representational aggregation are generally fulfilled for supply curves, this in fact may not be the case if the production functions underlying the various firms supply curve are different (non-homothetic) and the input prices for the same factor input are different. Even if a market supply curve is derived, it may yield perverse results (that is non-increasing in quantity supplied as the price increased) if the output is among its own factor inputs. More significantly, however, is that the upward sloping market supply curve generates non-negligible collateral effects by affecting the prices of factor inputs used in its own production as well as in closely related industries whose output and output prices can affect its market demand. This collateral impact is more generalized when production is carried out by produced means of production and circular production. Hence, these collateral effects violated the *ceteris paribus*, partial equilibrium methodology underpinning the

[30] This implies that the *profit function* and its derivative relationships with the firm supply curve and factor input demand functions has no content. In any case, the concept of profit is so ill-defined by neoclassical economists that it is meaningless and devoid of coherent content. Hence the concept of a profit function or profit anything in NCMT is meaningless. [Salvadori and Steedman, 1985; Gram, 1985; and Naples and Aslanbeigui, 1996]

derivation of both the short and long run market supply.[31] The same collateral effects also invalidate the *ceteris paribus*, partial equilibrium methodology underpinning the factor input demand functions that are necessary for the construction of the marginal cost curves that are the foundations of the market supply curves. Possible problems with consistent and representational aggregation, perverse outcomes, and violation of the partial equilibrium methodology clearly suggest that the market supply curve (both short and long run) is a unsustainable theoretical concept. [Katzner, 1991; Ozanne, 1996; Panico, 1991; Sraffa, 1925; and Aslanbeigui and Naples, 1997]

[NEED TO DEVELOP—BUT ALSO AWARE THAT MUCH OF THE CRITICISMS ALREADY IN PREVIOUS CHAPTERS—NEED TO TALK ABOUT EQUILIBRIUM A BIT MORE]

[31] It is sometimes argued that a long run market supply curve can be derived without violating the partial equilibrium methodology. However, such a supply curve consists of firms with production functions that generate the same minimum average total costs (which implies in this case the same technique of production) which produces a horizontal supply curve at the market price which is equal to the same minimum average total costs of each firm. A supply curve that cannot shift without altering its underlying production, that by itself "determines" the market price, and that does not have a role in determining market output, can hardly be called a supply curve at all.