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LAW OF INCREASING RETURNS IN THE NEO-CLASSICAL THEORY

by Izumi HISHIYAMA*

PREFACE

The problem of the law of returns has been known as the theory of diminishing returns, and has been one of the vital points of the classical system. However, in the neo-classical school originating with Marshall, it was again taken up from a new stand-point and adopted into the system, enkindling passionate disputes among the economists of this school. It is a well-known fact that this did not end in a scholastic much-ado-about-nothing, but made an unforgettable contribution toward the formation of the theory of imperfect competition of Cambridge of today. In this article, the subject of the law of returns will be reconsidered rather in general terms along with the development of the theory by the successors of Marshall, not in connection with the theory of imperfect competition or the theory of monopolistic competition, but in connection with the equilibrium theory of supply and demand which is the theoretical backbone of this school. There, a particular attention will be given to the issue of increasing returns which is deemed, before anything else, characteristic of the neo-classical school.

I

What relations had the problem of increasing returns to the neo-classical system? One of its relations was to the doctrine of marginal productivity. The famous maxim that "when the value of the marginal product of each factor is equal to the price of respective factor, the products of the firm in question will be distributed among the factors without excess or deficiency," rests on the assumption of 'constant returns to scale' with respect to the said firm. In the case of *diminishing* returns, the introduction of the conception of rent or surplus profits may help us to avoid logical failures. But what about the *increasing* returns under competitive conditions? In this case, it is quite obvious that of logical necessity the firm under discussion will suffer from constant loss, and therefore, if many firms operating compe-

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tively should normally show the evidence of increasing returns, a deep gulf will be formed between this competitive reality and the logical consequence of this doctrine (as to the increasing returns). However, Marshall, the founder of the neo-classical school, cannot be called a victim suffering directly from this difficulty, because the exact formulation of the doctrine of marginal productivity is based upon the idea of static equilibrium of the firm whereas Marshall's idea of the equilibrium of the industry (which is important for the problem of returns) cannot be concluded to rest upon the same cornerstone.¹⁾ It is a matter of course that those successors who tried to revive Marshall by adopting something from this idea into their own system could hardly pass over the problems we have already discussed, but the theory of returns proper to the neo-classical school was formulated primarily in relation to the industry and not to individual firms. That is, it concerned the rates of change between the productive factors to be thrown into the production of a certain commodity and the output. To put in another way, it concerned the rates of change between the cost of production of that commodity and

1) Although it was pointed out in the past that Marshall's long-term equilibrium-which is very important for the problem of the law of returns, and above all, for the problem of increasing returns-was not based upon the idea of static equilibrium of individual firms, I should like to make it clear again because even his successors are divided in opinion on this matter and because we cannot close our eyes to this point which marks the starting-point of this article. Marshall's long-term equilibrium only concerns the determinateness of the output (and the price) of an industry under consideration, in which case we can think of a case where the constituent firms are not all in the conditions of equilibrium. (Marshall, *Principles*, 8th ed., pp. 342-43). On the other side, Marshall's idea of representative firm vindicates on the contrary that he was well aware of the difficulty of constituting the equilibrium of an industry on the basis of the equilibrium of individual firms in the case of increasing returns. It may well be considered that as a result of his overcoming this difficulty in his own way, he hit on the idea of representative firm, or to interpret by contraries it might be concluded that he gave up the static firm equilibrium thereby. As Marshall himself stated and Robertson expound very rightly, the representative firm makes a small-scale replica of the supply conditions of the industry concerned on the other hand. (Marshall, *Principles*, p. 459 and note 1; Robertson, *The Trees of the Forest*, *Economic Journal*, Vol. 40, 1930, p. 89). Therefore, the following view in a valuable essay on Marshall by his another disciple (Shove, *The Place of Marshall's Principles in the development of economic theory*, *E. J.* Vol. 52, 1942, p. 321) is not acceptable. "The two leading propositions that in equilibrium (1) the scale of the firm is determined by the equation of the final increment of its receipts with the final increment of its outlay, and (2) the number of firms in an industry by the rule that the total receipts of the firm on the margin of entry must be equal to its total costs.....are essentially his (Marshall's)." In short, according to Shove it is the proposition of Marshall to determine the equilibrium of the industry by the equilibrium of the firm (on the margin). From such a point of view, the following statement of Kaldor (in his article which conveys somewhat destructive meaning to the orthodox interpretation) may rather have more for us to listen to. "Instead of analysing at first the conditions of equilibrium for individual 'firm' and then deriving from them, as far as possible, the conditions of equilibrium for an 'industry,' Marshall first postulated the latter and then created a *Hilfskonstruktion* which answered its requirements." (Kaldor, *the Equilibrium of the Firm*, *Economic Journal*, Vol. 44, 1934, p. 62).

the output. Now that the so-called supply price of a commodity can be related to the cost of production per unit, diminishing or increasing returns meant nothing but the increasing or diminishing cost of a certain commodity or the increasing or diminishing supply price.¹⁾ In short, the problem of the law of returns was primarily connected with the analysis of supply made from the industry-first stand-point in the neo-classical school.

Thus, secondly the problem of the law of returns has some connection with the doctrine of the optimum allocation of resources of production from the point of view of society which has been loaded with an exceedingly practical meaning from old. Perhaps nobody can deny that since the classical school this doctrine has lied concealed in the theoretical ground of *laissez-faire* policy.²⁾ The dogma that leaving competition to itself, the profit-making activities of capitalists motivated by selfinterest lead to the optimum allocation of resources between different employments was a secular implication of that famous 'invisible hand' of Adam Smith. Not that Marshall stuck to this time-honored maxim, but in a chapter³⁾ devoted the qualification of its theoretical validity, he presented a proposition that excepting the case of constant returns, the production scale of competitive industry with variable returns did not coincide with the optimum scale from the point of view of society, (which would guarantee the maximum advantage of the individuals of the society). In Pigou who inherited this idea, too, it was developed in a more elaborate form and was placed at the basis of the financial policy as a remedy.⁴⁾ In Marshall the case of constant returns was regarded as

1) From now on, please take the terms diminishing or increasing returns (increasing or diminishing costs) as related to the industry (commodity) under consideration. When we need to discuss about constituent firms distinctively, we shall use the adjectives either individual or firm such as individual increasing returns (diminishing costs) or increasing returns (diminishing costs) of a firm. The problems of what is commodity or how is an industry defined have been argued from both sides of the theory and the practical application. But at this moment we have no immediate need of pushing ourselves into the jungle of these problems.

2) As an example, let us refer to the statement of an English economist who is well versed in the classical school. According to him, the drive to accumulate is the mainspring of the mechanism of the economic process of Smith. As one of the three main ways in which it operates, he states that "it (the drive to accumulate) leads to the optimum allocation of capital (from the point of view of society) between different employments." R. L. Meek, *Studies in the Labour Theory of Value*, 1956, London, p. 58.

3) Marshall, *Principles*, Book V, Chap. XIII (Theory of Changes of Normal Demand and Supply in Relation to the Doctrine of Maximum Satisfaction), pp. 462-76.

4) Pigou modified his original formulation many times at this point. But as to the definite form of today, refer to the following work. Pigou, *The Economics of Welfare*, 4th ed., Part II, Chap., XI (Increasing and Decreasing Supply Price) and Appendix II, pp. 213-28, 789 sq. (Japanese translation: Supervised by Kiyoshi Nagata, "KOSEI KEIZAI GAKU" II, pp. 106-124, 371 sq.)

exception,¹⁾ and so it appears to lead to the conclusion that (under normal circumstances every industry indicates variable returns, and) the doctrine of the optimum allocation from the point of view of society does not work in general. In this sense, we cannot but accept the view of Shove who contends that "one of the outstanding features of the Principles was a logical refutation of *laissez-faire* theory."²⁾—They must have thought that the classical doctrine should undergo a modification.

Lastly and what has something to do with the foregoing discussion, it is related more fundamentally with the equilibrium theory of supply and demand of the neo-classical school. In composing the theory of distribution, the classical school considered the law of diminishing returns of agricultural produce in general, but it threw no doubt on accepting constant returns (costs) as normal for individual competitive commodities.³⁾ However, the neo-classical school regarded constant returns as exceptional and considered that normally returns were to change. On such a supposition regarding returns could they arrive at the general validity of the equilibrium theory of supply and demand for the determination of value of a single commodity as the basic theory of the first degree. The reason is this: the law of returns is the basic law that determines the supply of a commodity, but if the cost of production per unit remains constant in spite of the changes in the output of that commodity (the case of constant returns), it is obvious that the demand may affect the determination of output but does not produce any direct effect upon the price.⁴⁾ It is obvious as well that we can conceive the theory of balance between the force of demand and that of supply working in the determin-

1) It appears that this idea was maintained consistently before and after the publication of the Principles. Ten years before the Principles was published, it had been formulated clearly in his first systematic work written on economics in collaboration with Mrs. Marshall. A. & M. P. Marshall, *The Economics of Industry*, 2d ed., 1881, London, p. 57, 92-93 (By courtesy of Prof. Hideo Aoyama, I could ascertain this fact in the book possessed by him.) Also see the following works of Mr. Sraffa. Sraffa, *Sulle relazioni fra costo e quantità prodotta*, *Annali di Economia*, II, 1925, pp. 317-18 and the Laws of returns under competitive conditions, *Economic Journal*, Vol. 36, 1926, *Readings in Price Theory*, p. 186 note 4. (Japanese translation by Hishiyama and Taguchi, "KEIZAIGAKU NI OKERU KOTEN TO KINDAI," pp. 69-70, 99-100)

2) Shove, op. cit., *Economic Journal*, Vol. 52, 1942, p. 312.

3) The idea in Chapter IV (*Natural Price and Market Price*) in which Ricardo dealt with the mechanism of normal profit and competitive price was inherited from Smith, but without the supposition of constant returns it could never be conceived. Cf., Ricardo's Works (Sraffa's edition) Vol. 1, pp. 88 sq. Japanese Translation (IWANAMI BUNKO) Pt. 1, pp. 80 sq. Also refer to the argument of Sraffa which clarified this point for the first time (Sraffa, *Relazioni fra costo e quantità prodotta*, p. 316. Japanese translation, p. 68). J. S. Mill classed the case of constant returns (constant costs) under the second category "embracing the majority of all things that are bought and sold." (J. S. Mill, *Principles of Political Economy*, Vol. 1, p. 547).

4) Cf. Marshall, *Principles*, p. 349.

ation of price, only in those cases where the cost of production per unit does either increase or decrease (the case of diminishing or increasing returns).¹⁾ Now, as is universally known, the partial equilibrium analysis (that isolates an industry producing a specific commodity from all other industries) is a characteristic of the methodology of the neo-classical school. However, it was the fundamental scepticism thrown by Sraffa at the root of the neo-classical system that the laws of increasing and diminishing returns could not co-exist with the conditions of partial equilibrium without contradiction.²⁾ And it was the point of his criticism that as long as we stood on that standpoint the thesis of constant returns of the classical school would remain valid.³⁾ If such a scepticism of Sraffa is well-grounded, the general validity of the equilibrium theory of supply and demand as a competitive value theory could not but become unsettled. Because as we have seen already, the role of demand in the determination of value is extremely lessened, and it is not too much to say in brief that value is determined solely by the factors on the supply side. The shock given by this criticism to the system of the neo-classical school was great. Because to them the theory of distribution is in essence an application of the theory of competitive value as the theory of

1) The equilibrium theory of supply and demand of the neo-classical school is composed of the two conditional equations; an equation regulating the relation between the expenses of production and the amount produced (supply schedule) and the other equation regulating the relation between the selling price and the amount produced (demand schedule), having two unknowns (the price and the amount produced) as the answers. The ground of the general validity of the theory which regarded the case of constant returns (together with the case of a commodity which is fixed in amount, as for instance Raphael's pictures) as "the opposite extreme" (Marshall, *Principles*, p. 349) depends upon the generality of variable returns. The following remarks of Sraffa is worthy of note: "la teoria basata sulla simmetria tra le forze dell'offerta e quelle della domanda regge solo a condizione che la variabilità del costo di produzione col variare della quantità prodotta abbia lo stesso grado di generalità che ha la variabilità del prezzo di domanda. Quanto maggiore è l'importanza dei casi di produzione nel determinare il prezzo, e quindi tanto più viene turbata quella simmetria." (Sraffa, op. cit., p. 317. Japanese translation, p. 68). The following statement of Marshall himself seems to endorse his view: "in the case of most commodity it is not true either that the amount produced is fixed, or that the Expense of production are fixed; and therefore as a rule, Demand is one, but only one of the causes that determine value. An increase of Demand increases the amount produced, and this alters the Expenses of production; so that value depends partly on Demand, because Normal value is equal to Normal Expenses of production, and Demand is one of the determining causes of these Expenses.....The Normal price of a commodity is therefore not fixed, but may rise or fall slowly." (A. & M. P. Marshall, *Economics of Industry*, p. 93). *That the laws of increasing and diminishing returns of individual commodities were not detected as a result of the study of empirical facts, but were induced hypothetically as the requisites of the equilibrium theory of supply and demand for being general in application*, is the point to be emphasized here.

2) Cf. Sraffa, op. cit., (Italian Papers), pp. 319 sq. (V.-Coordinazione e critica delle tre tendenze), particularly, p. 322. Japanese translation, pp. 71 sq. (V.-Coordination and Criticism of Three Tendencies), particularly, p. 76.

3) Cf. Sraffa, op. cit., pp. 316-18 (IV.-Costi costanti), p. 88 and ditto, *Econ. Jnl.*, 1926. Japanese translation, pp. 67-70 (IV.-Constant Costs), p. 88, p. 99.

determination of price of productive factors, and according to Marshall "distribution and exchange are fundamentally the same problem, looked at from different points of view."¹⁾ It appears that the rearrangement of the classical system of value and distribution from a new point of view marks Marshall's proper starting-point of economics, and we can see some of the typical manifestation of his analysis made from that new stand-point in the equilibrium theory of supply and demand.²⁾

As we have seen in the foregoing discussion, the law of returns can be considered in relation to the doctrine of marginal productivity, to the doctrine of the optimum allocation from the point of view of society, and to the equilibrium theory of supply and demand. In Marshall and his successor Pigou, the relations of the law of returns to the second and the third problems are important, and above all, the last relation to the equilibrium theory of supply and demand is decisive because the equilibrium theory of supply and demand forms the basis of their proposition regarding the second doctrine. In this sense, we can recognize an essential contribution toward sounding the nature of the neo-classical system in Sraffa who presented the problem of the law of returns in relation to the equilibrium theory of supply and demand.³⁾ But how did the successors of Marshall conquer the problem

1) Marshall, Distribution and Exchange, *Economic Journal*, 1898, p. 47.

2) In his first systematic work quoted already, Marshall viewed the fundamental subject of economics as follows; J. S. Mill never worked out fully the problem of Distribution. In this volume an attempt is made to supply the solution to it and to show that there is a unity underlying all the different parts of the theory of prices, wages and profits. The remuneration of every kind of work, the interest on capital, and the prices of commodities, are determined in the long run by competition according to what is fundamentally the same law. This law of Normal Value has many varieties of detail, and takes many different forms. But in every form it exhibits value as determined by certain relations of demand and supply. (A. & M. P. Marshall, *Economics of Industry*, Preface to the second edition). As to this point, the following statement of Shove spoken in a decisive manner is worthy of attention: "the analytical backbone of Marshall's *Principles* is nothing more or less than a completion and generalisation, by means of a mathematical apparatus, of Ricardo's theory of value and distribution as expounded by J. S. Mill.....True, the process of completion and generalisation involved a transformation more thoroughgoing than Marshall himself was disposed to admit. Nevertheless, so far as its strictly analytical content is concerned, the *Principles* is in the direct line of descent through Mill from Ricardo, and through Ricardo from Adam Smith. It is of the true Ricardian stock, neither a cross-bred nor a sport." (Shove, op. cit., *Economic Journal*, 1942, pp. 294-95).

3) Of those three problems referred to in the text as related to the law of returns, the first two problems (the doctrine of marginal productivity and the doctrine of the optimum allocation from the point of view of society) were pointed out in 1952 by Harrod in one of his works (Cf. Harrod, *Economic Essays*, 1952, pp. 175-76). But he is open to the charge of confusing the view-point of a firm with that of an industry in his discussion of the law of increasing returns (Cf. *ibid.* pp. 177 sq. particularly, p. 179). The law of increasing returns of Marshall and Pigou discussed in connection with the social optimum doctrine is viewed from the stand-point of industry in the best sense of the word, and therefore does not stand on the homogeneous level with the problem of individual increasing returns of firms (as Harrod treats). The problem of the relation of law of returns to the equilibrium theory of

presented by Sraffa? Could they solve the problem thoroughly? If Sraffa's problem strikes at the heart of the neoclassical system, the settling of the problem may give us at the same time a key to clear up the multifarious development up to the present of the system inherited from Marshall, and we may be dealing with the limit of their theory in itself as the solution. Before going into this subject, we should like to look at the position of Sraffa, with the help of somewhat exterior materials, who was the center of the disturbance that urged a sudden turn of the neo-classical school in the twenties and the thirties of this century.

II

The English neo-classical school is considered to have reformed the economic theory handed down from Marshall after World War I, exactly speaking, from the latter part of the twenties down to the thirties. Now, how can we appraise the role of Sraffa played in this sudden change of economics which started wave-rings in the placid stream? To this question, we will try to make an approach through the window of this school; that is, through the materials presented by the leading economists of this school, particularly the views of E. A. G. Robinson.¹⁾ What kind of ideas did the leading economists of this school have about the economics in general before and after the death of Marshall (he died in 1924), that is, in early twenties? In other words, what sort of atmosphere was prevailing around the economics at that time? It is cleverly symbolized by the recollection of Mrs. Robinson. "(When I came up to Cambridge, in 1922, and started reading economics), Marshall's *Principles* was the Bible, and we knew little beyond it..... Marshall was economics."²⁾ The prevailing ideas of that time may be summarized as follows: the theoretical and analytical study of economics reached to its highest potential, and the principles of economics developed since Adam Smith attained nearly perfection in the time of Marshall. The remaining task to be done by later economists in this respect was to make good the minor deficiencies of the system to integrate into a perfect gem. The major work demanding their earnest application was rather to apply the established principles to actual policies, namely, the applied economics and positive studies.

supply and demand which comes in the third place was presented in a clear form for the first time in the Italian Papers of Sraffa concerning the cost of production. This paper regards this problem as one of the points of fundamental importance for the critical examination of the development of the neo-classical economics since Marshall.

1) E. A. G. Robinson, *L'Université de Cambridge, Cinquantenaire de la Revue d'économie politique*, Paris, 1937, pp. 94-95.

2) J. Robinson, *Collected Economic Papers*, Oxford, 1951, p. vii.

The introduction to the series contributed by Keynes, the general editor, to the first volume published in 1922¹⁾ of the Cambridge Economic Handbooks is a fine example manifesting this idea. However, the introduction contributed by the same Keynes to another volume of the series²⁾ in 1928 has a completely different tone from it. It reads, "Even on matters of principles there is not yet a complete unanimity of opinion amongst professional students of the subject. Immediately after the war daily economic events were of such a slashing character as to divert attention from theoretical complexities. But today, economic science has recovered its wind. Traditional treatments and traditional solutions are being questioned, improved, and revised."³⁾

Then, Austin Robinson asks this question: what has happened in such a short space of time as six years (1922-28), acting as the motivating power of such a sudden turn? He says there are two answers to this question for the Cambridge school. The one is Robertson's *Banking Policy and the Price Level*, published in 1926. In this work, Robertson opened up a new road for the subject of money under constant exchanging of views with Keynes. Another epicentre of this sudden disturbance was Sraffa, "taon socratique," who came to Cambridge in 1927. The needle of scepticism he threw upon the system of Marshall pricked the disciples of Marshall and directed them to investigate further the theory of value or distribution and other subjects of the kind.⁴⁾ In the following ten years, the traditional doctrine of Cambridge changed remarkably. "L'ère de la foi ayant cédé le pas à l'ère de la raison critique, la science économique à Cambridge a entièrement changé de caractère."⁵⁾

Since we have confirmed in the foregoing section, through the materials presented by leading economists of this school, the external meaning of Sraffa who acted as a sort of epicentre, shaking Marshall's Principle off the Bible like position, and gave birth to a new era of criticism and theoretical development, we can sum up our remaining task (as pointed out already)⁶⁾ as follows: our task is, after all, to examine internally and critically the after-effect originating from the said epicentre along the development of the neo-

1) D. H. Henderson, *Supply and Demand*, 1st ed. 1922, pp. v-vi (Introduction by Keynes).

2) Dobb, *Wages*, 1st ed. 1928, pp. v-vi (Introduction by Keynes).

3) *ibid.*, p. vi.

4) Also see the following statement of J. Robinson: "When I returned to Cambridge in 1929 and began teaching, Mr. Sraffa's lectures were penetrating our insularity. He was calmly committing the sacrilege of pointing out inconsistencies in Marshall and at the same time revealing that other schools existed. The elders reacted by defending Marshall as best they could, but the younger generation were not convinced by them. The profound inconsistency between the static base and the dynamic superstructure had become too obvious." (J. Robinson, *ibid.*, p. vii).

5) E. A. G. Robinson, *ibid.*, p. 95.

6) See p. 22 of this article.

classical school from the time of Marshall up to the present. In this case, we naturally will not try to make our way into the analysis of money which is another important subject opened up by Robertson (in cooperation with Keynes) because it lies beyond the limits of this article. The scepticism thrown by Sraffa upon the system of Marshall can be, as we have seen, reduced to the problem of the laws of returns, particularly the law of increasing returns. Thus, assuming the position of Sraffa as such, the thoroughgoing examination of those problems pertaining to this law will be nothing less than to open up a window to look into the root of the theoretical backbone of the to-day's neo-classical school.

To-day, some thirty years after Keynes' saying "In the end this activity of research should clear up controversy,"¹⁾ was the scepticism thrust by Sraffa at the neo-classical system cleared up, and is there a complete unanimity of opinion amongst scholars on the theoretical foundation? Fortunately, the present state of economics looks a little bit too immature to nullify tiny studies as mine. "So those of you who enjoy controversy need not fear the horrors of perpetual peace." (Robertson).²⁾

III

What had the traditional Marshallian doctrine on increasing returns looked like before it invited Sraffa's criticism? Or, we can put this question this way; what was the successor Pigou's version of Marshall on this subject? It is most necessary to clarify this point in order to grasp the right meaning of Sraffa's criticism, and therefore, we ought to confirm the early doctrine of Pigou which was developed in the first edition (1920) of *The Economics of Welfare*, always comparing with the original view of Marshall, in the following sections (Sections III and IV).

In the system of Pigou's *The Economics of Welfare*, the theory of increasing returns (together with the theory of diminishing returns) constituted a corner stone of his theory of production in relation to the doctrine of the optimum allocation of resources from the point of view of society between different employments, which we have discussed already, and it provided him with one of the theoretical grounds for the government intervention policy to be adopted for the promotion of the welfare of all the members of the society. As is known to all, the original proposition of Pigou concerning with this may be summarized as follows: under competitive conditions, the production of those industry showing 'diminishing returns' exceeds the limit that the

1) Keynes, Introduction to the Series (in Dobb, *Wages*, 1928, p. vi).

2) D. H. Robertson, Some Recent (1950-5) Writings on the Theory of Pricing, *Economic Commentaries*, London, 1956, p. 41.

real common good of the society calls for, while the production of those industry showing 'increasing returns' does not reach that limit. Therefore, supposing that other circumstances remain constant, there is a possibility of squaring the production of industries with the requirement of the public good, by limiting the production of the former by taxation and encouraging the production of the latter by subsidy.¹⁾

Against such a view, there is a well-known refutation of Clapham entitled "Empty Economic Boxes."²⁾ The core of his thesis may be described as follows: admitting that the theoretical soundness of the laws of returns and their formulation leave no room for doubt, it will be impossible to put these laws to a practical use and therefore, the laws will be of no value, because nobody can confirm in practice the process of returns of industries.³⁾ However, it may be said that the real difficulty involving the laws of returns does not lie in the possibility of practical application, but rather in the theoretical soundness itself under a given condition. In other words, whether the laws of increasing and diminishing returns rest on a solid theoretical ground or not, whether the basic classification concerning such laws (increasing, diminishing, and constant returns) is built up in accordance with the objective facts peculiar to respective industries or is unmistakably a hypothetical structure,⁴⁾ these are the problems to be solved at first. As long as these problems remain unsettled, we can hardly escape the charge that our discussion of usefulness of practical application of the said laws is no more useful than building a castle on the sand.

Seeing that the foregoing discussion has confirmed the position of the laws of returns in the system of Pigou's *The Economics of Welfare*, and at the same time, has brought to light that the shafts of Clapham's criticism on this did not sink to the core of the problem concerning the laws of returns, we will center our attention on the problem of the law of *increasing* returns in the following section, and examine somewhat in detail what premises was this discussion based upon. This will certainly help us to clarify the grounds of Sraffa's critical demonstration as well as to confirm the starting-point of the theoretical development (made after Sraffa's criticism) by the neo-classical economists including Pigou. So, we, the research travellers, will stop for a minute and throw light at our feet.

1) Cf. Pigou, *Economics of Welfare*, 1st edition, 1920, pp. 191-93. Unless specified otherwise, all the quotations in Sections III and IV are made from the 1st edition.

2) Clapham, Of Empty Economic Boxes, *Economic Journal*, Vol. 32, 1922, pp. 305 seq. (Now reprinted in *Readings in Price Theory*, 1952, pp. 119. sq.)

3) Cf. Clapham, *ibid.*, pp. 126 sq.; Pigou, Empty Economic Boxes: A Reply, pp. 131. and O. Morgenstern, Offene Probleme der Kosten- u. Ertragstheorie, *Zeitschrift für Nationalökonomie*, II, 1931, s. 490.

4) Cf. Sraffa, op. cit., *Annali di Economia*, p. 278 (Japanese translation, p. 3).

IV

The law of increasing returns was based on the following premises.

(i) It was based on the premise of simple competition from the point of a fairly long period (*ibid.*, p. 931). It was the condition of simple competition that "it is to the interest of each seller to produce as much as he can at the ruling market price, and not to restrict his output in the hope of causing that price to rise" (*ibid.*, pp. 180-90), and that condition of things "implies that each individual seller is only responsible for a very small share of the aggregate output." (*ibid.*, p. 191) Thus, avoiding the traditional term 'free competition' (that Marshall postulated in his general formulation of the equilibrium theory of demand and supply in Book V of the *Principles*), Pigou defined the competitive condition by *the supposition of a given price to the exchange party*,¹⁾ which we can find its original model in Cournot's 'unlimited competition,'²⁾ and its definite formulation in Pareto.³⁾ It is open to question whether this idea (which is not contradictory to 'perfect competition' of the imperfect competition theorists) inherits some of the fundamental ideas contained by Marshall's 'free competition' or not⁴⁾ but at any rate, it is quite

1) We can confirm more positively in his later work that Pigou's definition of competitive (hence monopolistic) condition inherits the idea of Pareto. Cf. Pigou, *The Economics of Stationary States*, 1935, p. 87.

2) Cf. Cournot, *Researches into the Mathematical Principles of the Theory of Wealth* (1738), Bacon's edit., 1929, p. 90. Japanese translation (by Nakayama), COURNOT NO SURIKEIZA-IGAKU, 1949, p. 144.

3) Cf. Pareto, *Cours d'économie politique*, tome 1, 1896, p. 20, § 46; *Manuel d'économie politique*, p. 163, § 41; *Economie mathématique*, p. 623, § 27.

4) It would seem that Marshall's hypothetical condition of free competition was composed of the multiplicity of the exchange parties of the commodity under consideration, free entry of new firms (and free secession of the existing firms), and the law of one price for one commodity (Cf. *Principles*, pp. 341-42). We cannot say that the supposition of a given price to each exchange party will generally be reduced if the above condition is given. That is because the law of one price for one commodity (that is the law of perfect market) and the above supposition of a given price are two different things, and granting that the former is given, it cannot be ascertained whether the price is a constant or a variable unless the qualifying condition for the multiplicity of the exchange parties is given. Besides, such hypothetical definition of competitive condition would not be speaking fully for the essential idea of Marshall's *free competition*. On that point, the statement devoted to the definition of free competition in his early work should rather be referred. "A man competes freely when he is pursuing a course, which without entering into any combination with others, he has deliberately selected as that which is likely to be of the greatest material advantage to himself and his family.....But in this world, as it is, the chief *active* principle in business is the desire of each man to promote the material interests of himself and his family. Normal results in Economics are therefore those which would be brought about in the long run by this active principle, if it has time to overcome-as it necessarily would in sufficient time-custom, inertness, ignorance, and all the other *passive* elements which make up economic friction..... Human nature is never absolutely rigid; and custom never holds its own in opposition to a strong active economic force working for many generations persistently in the same direction." (A. & M. P. Marshall, *The Economics of Industry*, 2nd ed. 1881, Preface to the second

certain that such definition of competitive condition was proposed in an effort to improve Marshall in formal unity and strictness, and represented the orthodox idea of the neo-classical school of about 1925.

(ii) Such definition of competitive condition based on the supposition of given price is applicable not only to the price of commodity to each *firm*, but also to the price of factors of production to be employed by each *industry*. The ground of the soundness of such supposition can be sought in the following assumption of industrial structure.

My analysis is not designed for application to the output of the whole body of a country's resources lumped together into a single industry. Its purpose, on the contrary, is to provide machinery for studying the distribution of resources among a great number of different industries and occupations, each one of which is supposed to make use of only a small part of the aggregate resources of the country. *Because every occupation is thus relatively small, the price per unit of the several factors of production in each occupation is determined by general market condition and is not affected to any appreciable extent by variations in the quantity of them that is employed in that occupation.*¹⁾ (Pigou, *ibid.*, p. 935. Underlined by this writer.)

Thus, the industrial structure assumed in the foregoing analysis is neither of a macro-sopic idea of industry (agriculture in general) (which absorbs a considerable part of a country's aggregate resources) that the classical school adopted in presenting the theory of distribution, particularly rent, nor an industrial structure implied by Keynes' aggregate analysis which serves the purpose of tracing the movements of general prices when the volume of

edition, pp. vi-vii).—In short, *the process that the desire of each man to promote the material interest, that is the chief active principle in business, is overcoming in the long run economic friction working as the passive element of resistance in itself in the world of atomistic competition*—this is, I think, the main stream of the fundamental idea conveyed by Marshall's free competition. Therefore, I can feel a brief, but sharp insight of Robertson in the following statement in his recent work: "What exactly do we mean by it ('under free competition')? Marshall, I think, meant primarily that the *processes* of competition were actively at work." (D. H. Robertson, *Lectures on Economic Principles*, London, 1957, Vol. 1, p. 96).

- 1) Strictly speaking, this proposition is not correct, because such assumption should be conditioned by a certain qualification concerning the efficiency of factors of production. That is, admitting that individual industries (each one of which is supposed to make use of only a small part of the aggregate resources of a country) are small, the supply price per unit of the several factors of production is not necessarily constant. *Excepting those cases where the efficiency of units of a certain factor employed by each industry is all equal, or from the point of view of each industry (employing it), the differences in efficiency of units of the said factor are of equal degree*, it may be considered that the supply price of the said factor varies (with the changes in the output of the industry under consideration). Cf. Robertson, *Lectures*, Vol. 1, pp. 114-116. For details, see Shove, *Varying Costs and Marginal Net Products*, *Economic Journal*, Vol. 38, 1928, pp. 258-66; J. Robinson, *Economics of Imperfect Competition*, 1933, pp. 102 sq. Ch. 8.

employment varies freely with variations in effective demand (from the point of view of short run).¹⁾ In either case, such analysis does not deal with changes in supply prices of commodities produced by *individual industries*, but is fit for dealing with the movement of the whole produce, and it is neither logical nor general to assume that the price per unit of the several factors of production employed in such a case remains constant (regardless of variations in the quantity of the production).

(iii) Since the doctrine of increasing returns is, as we have discussed²⁾, one phase of the problem of supply price (the supply schedule), it must necessarily satisfy the requisites for partial equilibrium analysis. Such analysis is characterized by that in order to focus our attention on the conditions of a specific industry and to isolate that industry completely from others, we regard all other factors as constant except those which will directly affect the supply and demand conditions for this specific industry. Such (isolation) method is, according to Marshall, nothing more than a temporary procedure of primary approximation as an introductory approach to the entire process of the general development of industries.³⁾ If so, then, what will be the requisites, compatible with this procedure, to be satisfied by the supply schedule of an industry?The supply schedule (expressing a conditional relation of the cost per unit of production, namely, supply price, and the amount produced) of that industry schedule, so should be independent not only from the corresponding demand far as insignificant variations in the amount produced are concerned, but also from the supply and demand conditions of all other industries.⁴⁾

(iv) Of course, this can be reduced naturally from the definition of competitive conditions of (i) which we have discussed already, but it is assumed that each industry must be composed of a great number of firms (such a great number as the variations in the amount produced by a single firm does not affect the price established at the market)⁵⁾ (*ibid.*, p. 939). In addition to the assumption of the multiplicity of firms, it is also assumed that all constituent firms are precisely similar (in demand or supply conditions). "We

1) Cf. Sraffa, op. cit., *Annali di Economia*, p. 279 (Japanese translation, pp. 4-5); J. Robinson, Rising Supply Price, *Economica*, Vol. 8, 1941, p. 1 (*Readings in Price Theory*, p. 233), and Kaldor, Alternative Theories of Distribution, *Review of Economic Studies*, 1955-56, No. 61, p. 84.

2) See p. 19 of this article.

3) Cf. Marshall, *Principles*, p. xiv and p. 461.

4) Sraffa, op. cit., *Annali di Economia*, p. 322 (Japanese translation, p. 76) ditto, op. cit., *Economic Journal*, 1926 (*Readings in Price Theory*) p. 184 (Japanese translation, p. 95).

5) If the number of constituent firms is not sufficient to satisfy such condition (it meant oligopoly or polypoly in fact), that will be the case of 'the monopolistic competition' as he called, and is not consistent with the supposition of a given price to a firm described in (i). Consequently, this case will naturally be excluded.

suppose that all the various sources or regions of supply, from which the aggregate supply is contributed, are precisely similar" (*ibid.*, p. 192). It is very questionable whether the latter assumption is faithful the Marshall who showed a particular interest in the prosperity (and the decline) of the constituent firms in the growing process of an industry, and accepted as a rule the logic of "to wax and wane in prosperity like trees of the forest,"¹⁾ or to the same Marshall who regarded as natural the disparities in the conditions of cost of individual constituent firms in his concept of the equilibrium for an industry, and yet alluded to the ever-shifting order of such disparities. To be brief, it is doubtful whether this assumption is consistent with the keynote of the back-bone idea running through the concept of the Representative Firm.²⁾ To speak straightforwardly, we *can never think* that in Marshall, individual firms making up a competitive industry are the very counterparts of one another in the long-term equilibrium of that industry. Nevertheless, if we neglect this doubt, it may not be denied that the above assumption is more flexible from the point of view of analytical operation of the static equilibrium analysis.

(v) The theory of increasing returns was dealt with under the premise of static perfect market. Perfect market means an exchange system which is perfectly organized, and sees its formal condition in the law of one price for one commodity. The law of one price for one commodity (according to which there are no two prices to be paid for the homogeneous identical commodity in a perfectly organized open market) is the thing which was originally taken as a matter of course in Ricardo's classical system,³⁾ and

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- 1) The practical applicability of this famous Marshall logic of economic process was given some qualification in the later edition of the *Principles* (6th ed. 1910). The reason for the revision was "the great recent development of vast joint-stock companies" (*Principles*, p. 316). Thus, this logic was banished from the position of a universal rule which it had occupied, but he still thought "now that rule is far from universal, but it still holds in many industries and trades." For further details, see Shove's papers on Marshall (*Economic Journal*, 1942, p. 321).
 - 2) It was stated positively by Robertson already that the concept of the representative firm of Marshall was devised to meet the difficulties occurring in the analysis of supply when there is a disparity of efficiency as between different producers. (Robertson, The Colwyn Committee, the Income Tax and the Price Level, *Economic Journal*, Vol 37, 1927, pp. 570-71. ditto, *Economic Fragments*, London, 1931, pp. 28-29). On that point, see the famous refutation of the above article of Robertson by L. Robbins, particularly, p. 391. (Robbins, The Representative Firm, *Economic Journal*, Vol. 38, 1928, pp. 387 sq). I have pointed out already (p. 18 of this article, note (1)) that there was another reason for Marshall to elaborate the concept of Representative Firm (that is, to overcome the difficulties involved by increasing returns under competitive conditions).
 - 3) It is evident that Ricardo's theory of rent was based on the two assumptions of the law of one price for one commodity in the same industry (agriculture), and the general rate of profit in industries. See also the following work of J. S. Mill. J. S. Mill, *Principles*, Vol. 1, pp. 579-80.

developed by Jevons later,¹⁾ and it is the very assumption of this traditional market that the neo-classical school depended upon.²⁾ In Marshall, a careful consideration was given to the imperfection of market,³⁾ but the concept of Pigou (for the discussion of increasing returns) was arrived at after the purification from this impurity.⁴⁾

Moreover, the theory of increasing returns is subject to the static conditions. That is to say, for the period under consideration (a long period), the factors fundamentally regulating supply and demand (such as technical knowledge, desire, or the condition of taste) must be assumed to be constant. In other words, it must be considered that through that period the general circumstances of the market remain constant (Cf. Marshall, *Principles*, p. 342). I don't think we need to dwell upon this, but just one thing in so far as we may clarify the declining supply schedule of the neo-classical school, we will look back the way Marshall and Pigou treated invention or technical changes in general.

When making lists of supply prices (supply schedules) for long periods in these industries, we exclude from view any economies that may result from substantive new inventions; but we include those which may be expected to arise naturally out of adaptations of existing ideas.

(Marshall, *Principles*, p. 460)

Thus, when a normal supply schedule of an industry is made, the adaptations of new methods of production or new accommodations *to be induced* by changes in the quantity of production (hence, changes in the cost of

1) Cf. Jevons, *The Theory of Political Economy*, 3d ed. p. 87. However, Jevons seems to be open to the criticism of having confused the law of one price for one commodity with the assumption of a given price to the exchange party under the name of the law of indifference. On that point, see the following book. Hideo AOYAMA, "DOKUSEN NO KEIZAI RIRON (*Economic Theory of Monopoly*)," pp. 16-21.

2) Cf. Marshall, *Principles*, p. 325. "The more nearly perfect a market is, the stronger is the tendency for the same price to be paid for the same thing at the same time in all parts of the market." See also the following remarks: "We assume that there is only one price in the market at one and same time." (*ibid.*, pp. 341-2). Pigou took over the above assumption of Marshall. On that point, see the following book by him. Pigou, *The Economics of Stationary States*, 1935, p. 76.

3) Cf. Marshall, *principles*, pp. 286-87, 396, 457-58, 501, 809. Marshall is often reckoned among pioneers of the theory of imperfect competition. He suggested in many places building materials of the theory of imperfect competition such as the importance of good-will, the existence of special market or particular market, and the declining particular demand curve. But the theory of imperfect competition can hardly be regarded as a natural Marshallian solution, because Marshall offered separately his own answer to the difficulties of increasing returns under competitive conditions.

4) As is known to all, Pigou devoted one chapter to the full discussion of *imperfect knowledge* impeding the process of maximization of welfare. Cf. Pigou, *Economics of Welfare*, pp. 131 sq. Ch. IV. But, such consideration has no essential relation to the problem of increasing returns (which primarily concerns the discrepancy between the marginal individual net product and the marginal trade net product).

production) of the commodity under consideration are taken into consideration, but the autonomous technical changes or inventions arising irrespective of changes in the quantity of production (hence, changes in the cost of production of the said commodity) must be disregarded.¹⁾ That amounts to say in short that through the long period considered, only those changes of the cost of production deriving from expansion of the scale of production of the industry will be given attention, and such changes of the cost of production that may arise even if the scale of production remains the same (that may add a new factor to the existing technical knowledge) will be disregarded.²⁾

Those things which we have seen above construct the stage for treating the problem of increasing returns—some of the building materials outlived years of trial, and others were modified in the course of time—, but the law of increasing returns (to be staged there) should not be expected, as a matter of course, to show the historical relations of the real quantities of production and the real supply prices of individual industries, but instead, we ought to confirm that it is such a hypothetical structure as may satisfy the requisites of partial equilibrium analysis before everything else.³⁾ As we have

1) The works of Pigou published after the criticism of Sraffa would rather serve as better references to see the Pigouvian version of Marshall on the treatment of such inventions or technical changes. Cf. Pigou, *Laws of Diminishing and Increasing Cost*, *Economic Journal*, 1927, p. 189; *Economics of Welfare*, 4th edition, 1932, p. 217.

2) There is a scathing criticism of Schumpeter on such basic attitudes of Marshall and Pigou. It is quite obvious that the famous Schumpeter's idea of innovation can hardly be incorporated into the scheme of the static declining supply schedule of the neo-classical school, and Schumpeter saw the cardinal elements of economic process in those factors which were, as it were, rubbed out from this scheme. (Cf. Schumpeter, *The Instability of Capitalism*, *Economic Journal*, 1928, pp. 361 sq., particularly, pp. 367 note 2, 375-80.) That is because to Schumpeter, "innovation," as it is called, "does not follow, but creates" expansion of industry. (*ibid.*, p. 377).

3) Cf. Pigou, *Economics of Welfare*, 4th ed. 1932, p. 217. Japanese translation, Vol. II, pp. 110-11. See also pp. 21 of this article, note (1). Although Schumpeter affirmed the law of increasing cost, he denied the existence of theoretic law of diminishing cost, and admitted that we might, if we so choose, fit a series of changing positions (occurring through breaking off the old, and starting the new (increasing) cost functions due to the changes of the given conditions invited by innovations) only to historical declining curves. The ground of his denial of theoretic law of diminishing returns is to be found in his views that generally there is no such decreasing cost of production (of the said industry) as arising only from the increase in the quantity of production of the industry, that is, the external economies peculiar to the same industry. Further, according to Schumpeter, economies, before becoming "external," must generally be "internal ones" in some firm or firms of the same or some other industry, and (as we have seen in the above note 2) he sought the internal economies incidental to the running of economic life in the innovations of heterogeneous nature. Therefore, he thought that it could not be handled by static analysis (presupposed by the supply schedules). Cf. Schumpeter, *op. cit.*, *Economic Journal*, 1928, pp. 367-68, and 368 note 2. It is only right and proper that we should accept the latter view (that the ideas of innovation characteristic of him cannot be handled by static supply schedule), but on the other hand it seems for us that the ground of his denial of theoretic declining supply schedule discussed in the first half needs further examination.

seen already, the foregoing premises represent the views of the neo-classical school represented by Pigou, or to speak fully, the Pigounian version of Marshall in regard to those premises upon which the problems of the laws of returns (the problems of competitive value at large) depend. So far as we can clarify the nature of the premises, we should like to confirm the following point. The point is what were the factors gotten rid of by Pigou from the original ideas of Marshall when he inherited and developed Marshall? The answer to this question can easily be reduced if we summarize what the foregoing discussion suggested, but speaking in the abstract, it may well be said that Pigou made a step forward in static equilibrium analysis and removed those factors in the ideas of Marshall which he could not incorporate successfully into this static apparatus. The factors could be no other than the very ideas that lay behind the concept of Representative Firm of Marshall; namely the alternation of prosperity and decline of various firms (which was already named as the logic of "to wax and wane in prosperity")¹⁾ taking place in the process of growth of various industries, the conflict between active economic forces and economic frictions appearing in the process of competition through a long period²⁾; in a word, "those obstructions due to the time element (to which Dr. Marshall has called attention)" (Pigou, *Economics of Welfare*, p. 940). The factors cannot be dealt with by simply adopting the supposition of a long period as a substitute for the supposition of a short period. That is because the basic classification in Marshall's time-analysis³⁾ does depend upon the differences of the conditions on the supply side (namely, whether the amount of supply is given or variable, whether the plants of producers are given or variable, or whether the number and the sizes of constituent firms are given or variable), rather than *on the differences in the length of period required for process of adjustment*. Accordingly, the respective supply curves (in temporary market equilibrium, short-period equilibrium, and long-period equilibrium) are made up one after another by increasing the number of the conditions (variables) as above, and the differences of these conditions are merely expressed in the feature of supply curves. Thus (since the time element does not appear as a variable in this model), the supply schedules will be expressed on the rectangular coordinates of the second dimension (which express nothing but the relation between the quantity of production and the supply price) *no matter how long will be the period under*

1) See p. 30 of this article.

2) See the note 4 in pp. 27-8 of this article.

3) Cf. Marshall, *Principles*, pp. 378-79.

*consideration.*¹⁾ At any rate, seeing that the time element (that the pouch of the supply schedule of a long period could not hold) was one of the cardinal ideas of Marshall, it may safely be said that Pigou missed an important thread running through the ideas of Marshall because of his attempt to attain formal unity and logical strictness. But such treatment of Pigou was apparently based on his conviction that the difficulties involved in increasing returns under competitive conditions could be solved logically "without reference to the time element" (Pigou, *ibid.*, p. 941), and that was obviously the positive reason that made him to choose the way he treated.

Now, the next problem that we are to take up is related to how much logical appropriateness does such conviction has after all. To put in the concrete, the problem is how much correctness have the solutions offered by Marshall and Pigou to "the difficulties which beset the theory of equilibrium in regard to commodities which obey the law of increasing return" which was proposed by Marshall (Marshall, *Principles*, p. 805.) or to put it in another way, the difficulties that beset *competitive equilibrium under increasing returns*. —What on earth are those difficulties originating from Marshall, what was the solution given by himself, how did Pigou approach the difficulties and how did he try to overcome them, what theoretical ground was his solution based on? To examine a series of these questions will be indispensable as the ground work for our inquiry into the root of the controversy opened by Sraffa.

1) Cf. Guillebaud, Marshall's Principles of Economics in the Light of Contemporary Economic Thought, *Economica*, Vol. 119, 1952, pp. 122 sq.; Robertson, *Economic Commentaries*, 1956, pp. 15-16; Machlup, Equilibrium and Disequilibrium: Misplaced Concreteness and Disguised Politics, *Economic Journal*, 1958, p. 8. But Marshall himself was well aware of the defects of such analytical apparatus. (Cf. Marshall, *Principles*, pp. 460-61 and 809).