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Marshall on Pigou's *Wealth and Welfare*¹

By KRISHNA BHARADWAJ

As Marshall's favourite pupil and successor, Pigou is considered to have confirmed and extended Marshall's conclusions on the question of maximum satisfaction under free competition. In the words of Keynes:² "Marshall's proof that *laissez faire* breaks down in certain conditions, *theoretically* and not merely practically, regarded as a principle of maximum social advantage, was of great philosophical importance." But, as Keynes adds, Marshall did not pursue this argument in all its ramifications, and it was Pigou who worked out fully its consequences for social policy.

While Pigou looked upon his early work as being "merely supplementary"³ to that of Marshall, there has been no direct evidence as to how Marshall viewed the extension of his method by Pigou. Marshall's manuscript notes in his own copy of Pigou's *Wealth and Welfare*,⁴ published here for the first time, reveal that Marshall had strong reservations concerning Pigou's conclusions in that book which, however, he did not intend to disclose "for the present", even to Pigou himself.⁵

It is notable that Marshall's comments, dated October 10, 1914, were made more than two years after the publication of Pigou's book. It is probable that the comments were occasioned by the attack on marginalism made by J. A. Hobson in his *Work and Wealth: A Human Valuation*, published in 1914. Hobson noted that Pigou, by showing that the supply price and the "marginal supply price" of an industry diverge excepting under constant returns, had virtually admitted the failure of marginalism to establish that competition ensures *maximum satisfaction*.⁶ Marshall refers twice to this passage of Hobson in his

¹ I am grateful to Piero Sraffa for suggesting this topic to me and for all the invaluable discussions we have had during the course of preparing this article. Thanks are also due to M. Dobb, P. Garegnani, L. Pasinetti and Joan Robinson for their helpful comments.

² J. M. Keynes, "Alfred Marshall, 1842-1924", *Economic Journal*, vol. XXXIV (1924).

³ A. C. Pigou, "Producers' and Consumers' Surplus", *Economic Journal*, vol. XX (1910), p. 366.

⁴ A. C. Pigou, *Wealth and Welfare*, 1912.

⁵ Marshall's library (including the Pigou volume) was given to the University of Cambridge after his death. The volume was withdrawn by Mrs. Marshall when the Librarian of the Marshall Library, Mr. P. Sraffa (incautiously, as he realized too late) drew her attention to the notes. After her death the volume was returned to the Library, but was kept in reserve during Pigou's lifetime.

⁶ "Professor Pigou (*Wealth and Welfare*, p. 176) though adopting the general position of marginalism, makes a concession, as to its applicability, which is a virtual admission of its futility. For, by showing that only in 'industries of con-

comments (see §§1 and 11 below). He agrees with Hobson if only to the extent that he himself considers Pigou as overrating "the possibilities of the statical method".

Marshall's manuscript notes are presented in Section I in the form of 16 numbered comments.¹ Where appropriate, the relevant passage from *Wealth and Welfare* or a summary of the relevant portion of the text is presented (in smaller print) before the comment itself. Abbreviations used by Marshall are expanded in square brackets. Asterisks are reproduced as placed in the text by Marshall. Underscorings by Marshall are noted in the footnotes. The page reference at the beginning of each comment is to the appropriate page in *Wealth and Welfare*. Explanatory notes are provided in the footnotes.

In Section II of the article we discuss differences between Marshall and Pigou in the light of the Comments in section I; we have also drawn upon other unpublished supporting evidence in the Marshall Papers.

I. MARSHALL'S COMMENTS ON PIGOU

§1

On the front end-paper of *Wealth and Welfare*, Marshall makes the following general comment.

10.10.1914.

I incline to think that the marginal supply curve Part II Ch. VIII has no reality; I think he overrates the possibilities of the statical method, and so far I agree with Hobson's criticism of marginalism, *Work and Wealth* p. 174,² though most of what J. A. H[obson] says on the subject seems to me invalid.

In this I may be wrong. For I can't follow all that A. C. P[igou] says: and it is possible that he has some recondite meaning. Anyhow I incline not to controvert him, even under 4 eyes, for the present. When he translates his W[ealth] & W[elfare] into realism, then I may perhaps raise a question, if I still cannot follow him. But on the whole I incline

stant returns' are 'supply price' and 'marginal supply price' equal, and that in industries of 'decreasing' or of 'increasing returns' there exists a tendency to exceed or fall short of the 'marginal net product yielded in industries in general' he virtually endorses the criticism that 'marginalism' assumes a statical condition of industry. For only in a statical condition would all industries be found conforming to constant returns: the operation of increasing or diminishing returns means nothing else than that changes in volume or methods of production are raising or lowering productivity and remuneration above or below the equal level which 'marginalism' desiderates." (Hobson, *Work and Wealth*, p. 175, n.)

In Marshall's copy of Hobson's *Work and Wealth*, which is now in the Marshall Library, the passage quoted here is marked with an asterisk. He writes in the margin: "See my pencil note on this passage", which presumably refers to the pencil annotation on Pigou's *Wealth and Welfare* (§11 below; see also §1).

¹ Some incidental comments of Marshall on transportation, economies of large scale and joint costs, etc. have been omitted on the suggestion of the Editors.

² See p. 32, n. 6, above.

to keep my[self] close to Pr[inciples] (especially in regard to the limitations of the statical method) in [Book] IV.¹

§2

(p. 17)

Pigou contrasts Marshall's definition of national dividend, as comprising the whole of the gross dividend minus such part as would suffice to maintain the country's capital intact, with that of Irving Fisher. "Professor Fisher, on the other hand, placing in the forefront of his argument the proposition that the savings are in no circumstance income, claims unequivocally to identify the national dividend with those services, and those only, that enter directly into consumption."

This is a definite unit; but I do not think "income" is the right name for it.

§3

(p. 18)

"When . . . we are concerned, not with an imaginary stationary state, but with the condition of affairs that actually exists, the mere maintenance of the physical efficiency of our plant is no longer obviously equivalent to the maintenance of our capital intact. Machinery that has become obsolete because of the development of improved forms is not really left intact, however excellent its physical condition; and the same thing is true of machinery for whose products popular taste has declined. If, however, in deference to these considerations, we decide to make an allowance for cases of obsolescence, we are exposed to the retort that this concession logically implies the recognition of the value, and not the physical efficiency, of instrumental goods as the object which is to be maintained intact."*

* I do not follow this. I regard an obsolescent machine as I do a horse that is "ageing" perhaps prematurely. On the other hand, in so far as invention etc. cause the efficiency of plants to increase relatively to its cost I take the addition to be included in my main statement. I am however aware that I have made no attempts to supply suggestions for avoiding double entry in so far as (i) an improved machine and (ii) its (improved) product are both entered. I do not think such subtleties are appropriate in a broad statement.

§4

(p. 149)

"By the 'social net product'² is meant the aggregate contribution made to the national dividend; by the 'private net product'* the contribution made to the earnings of those responsible for the industry under review".

¹ The sixth edition of Marshall's *Principles* was the latest in print when Marshall wrote this comment. Chapter XIII of Book IV of that edition included the section, "Correlation of the tendencies to increasing and to diminishing return".

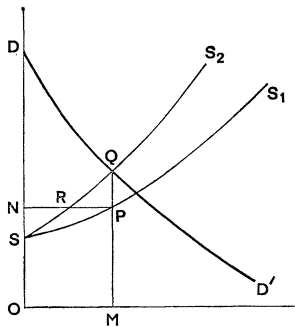
² The word "net" is underscored and the words "i.e. Net product" written in the margin by Marshall.

* i.e. private net product is the "remuneration" of the worker whether it comes in the form of wages or in the price of the product or service wh[ic]h he makes and markets on his own account.

§5

(pp. 172-173)

"In respect of any industry, construct a demand curve $DD \dots$ Construct, secondly, a supply curve SS_1 of the ordinary type, a curve namely, such that, if a perpendicular PM be drawn from any point P upon it to cut the base line in M , PM represents the price which, in the long run, tends to maintain an annual output OM . Finally, construct a curve of marginal supply prices SS_2 , such that, if a perpendicular QM be drawn from any point Q upon it to cut the base line in M , QM represents the difference made to the aggregate expenses of the industry*¹ concerned by the production of the OM th unit of output. Let the curve of marginal supply prices cut the demand curve in Q . Then in order that equality may be established between the marginal net product of resources in our selected industry and in other industries, it is necessary that the output of our industry be OM units".



I rather think that QP is (neglecting influences on the technical economies of farming caused by increased production) not a real expense but an extra charge wh[ic]h landlords will be able to put on producers, in consequence of the increased value of land. I understand this to be implied by F. Y. E[dgeworth]'s statement, *Ec[onomic] J[ournal]* 1913, p. 210² (*mag[azine]s*³ *Transport* 1914, No. 10) that area $OMQS = OMPN$, i.e. $SPQ = SPN$.

* I do not understand "the aggregate expenses of the industry". If all economies appertaining to an increased scale of prod[uctio]n were

¹ Marshall underscores "aggregate expenses of the industry".

² In "Contribution to Theory of Railway Rates—IV". The statement is: "If the ordinate of any point of the abscissa, M , intersects SS_1 at P and SS_2 at Q , the area $OMQS$ is equal to the area $OMPN$. But the area $OMPN$ represents the total expenses incident to the production of quantity OM ; inclusive of rent (the area PSN) and of entrepreneur's remuneration . . .".

³ "Magazines" are volumes of articles from periodicals bound together, for Marshall, according to subjects. These are now in the Marshall Library.

“internal” to particular firms, then I think one should look to the expenses of an increased production (not hurried) of a “representative” firm. But as in fact increased economies in shipbuilding depend in part on correlated economies in the manufacture of plates there seems to me to be no one point at which the “aggregate expenses” act as a specific motive force.

§6

(p. 173, footnote)

“It must be carefully observed that ‘the difference made to aggregate expenses’ by the production of the OM th unit of output, means the difference between the aggregate expenses of an industry when it is producing and is fully adjusted to producing x units and when it is producing and is *fully adjusted* to producing $(x + \Delta x)$ units. . . . This . . . may be illustrated from the facts of railway transportation. . . . The loading of all trucks will be different according to the total quantity to be carried. The next step after 40 overloaded trucks would not be 40 overloaded trucks *plus* one truck containing one parcel but 41 lightly loaded trucks”.¹

I think he means that if the demand for such trainloads had been anticipated as permanent the trucks would have been made a little smaller so that 41 could just have been filled.

§7

(p. 176)

“It is objected that, since, under diminishing returns, our argument makes the supply price of any quantity of output less than the marginal supply price, it implies that the marginal unit is continuously produced at a loss to the producer of it; and that this is impossible and absurd. This reasoning derives its plausibility from an implicit assumption that the *curve of marginal supply prices* employed here is equivalent to Dr. Marshall’s *particular expenses curve*. That assumption, however, under conditions of simple competition is not correct”.

Certainly the two seem to have nothing in common.

§8

(p. 176)

“When x units are being produced . . . the particular expenses to the representative producer of producing any one unit, *all costs, including the hire of the necessary land being reckoned in*, is equal to the particular expense of producing any other unit. That is to say, if p is the average full cost per unit of producing x units, the particular expenses curve, corresponding to the production of x units, is a horizontal line drawn parallel to the base line at a height representative of p .”

No, my curve represents avowedly *no* actual conditions.

¹ The last two sentences in this passage are sidescored by Marshall and the words “lightly loaded” underscored.

§9

(p. 176)

"The general result is that, in industries of constant returns, the supply price and the marginal supply price of all quantities of output are equal; in industries of increasing returns the supply price is greater than the marginal supply price."

This, I think is better treated in my App[endix] H of Pr[inciples].

§10

(p. 176)

"In industries of diminishing returns the supply price is less than the marginal price . . ."

This seems invalid if rent be taken as a charge.

§11

(Top margin of p. 176)

Hobson, *Work and Wealth*, p. 174 says¹ that this page is "a virtual confession of the futility" of the doctrine of marginalism. Is it not the fact that the contrast between the supply price and marginal supply price is inconsistent with A. C. Pigou's own definition at top of §3 (p. 174);² and that the important facts on which he insists can be set out without suggesting any such contradiction [?].

§12

(p. 216)

Pigou argues against the proposition that the transport of copper and that of coal are joint products on the ground that "a very large fixed plant *for varied* purposes is essential to the operation of joint costs. . . . A sufficient answer . . . is to observe that the carriage of tons of different things from A to B *is*³ a single homogeneous commodity, on precisely the same footing as plain cotton cloth."

No, it is not. The whole doctrine of costs of manufacturing in the higher technical, as well as academic developments, turns largely on the difficulty of assigning to different products their several shares of the common costs of such things as powerful shears, hand saws, turret lathes, etc.; which spend part of their time idly, but when at work perform almost identical operations for these various products. Like the supply of transport by the locomotive, the supply of every such machine of similar operations for different things is an instance of

¹ See p. 32, n. 6, above.

² Pigou's definition of the supply price of any quantity of output is: "the price which tends to call out the production of that quantity annually". The "marginal supply price" was defined by him as "the difference made to aggregate expenses of production of all producers, by an increase in production from x to $(x + \Delta x)$ units". "Producers' and Consumers' Surplus", *op. cit.* p. 363.

³ This is underscored by Marshall as well.

common supply (not "joint" in the sense in which sirloin and shin of beef are joint, but joint in the ordinary use of the term). Similarly the cost of an expensive frontage for selling a hundred different products has to be shared out among them, and raises difficulties of joint supply of the same service to different things on all fours with the railway problem. This is not inconsistent with the position that monopoly plays an exceptionally large part in the vagaries of monopoly charges.

§13

(top margin of chapter on the Variability of Errors in Business Forecasts, p. 453)

This chapter puts many points in new settings; but on the whole it seems to repeat the old explanation of crises, without taking account of the new causes chiefly since 1857 (1866 was exceptional) which have checked the rise, mitigated the fall and blunted the sharpness of the apex.

§14

(p. 457, referring to Hull's *Industrial Depression*)

"Mr. Hull has rightly observed that the effect of forward buying, in expanding the range of variability of business expectations, would be mitigated, if the state were to publish monthly 'all pertinent information in relation to the existing volume of construction under contract for further months'."

But it is already done by trade journals better than it could be by government.

§15

(p. 464, footnote)

"It is, thus, a true saying which Mr. Burton quotes from John Mills: 'As a rule, panics do not destroy capital;* they merely reveal the extent to which it has been previously destroyed by its betrayal into hopelessly unproductive works . . .'"

* This use of "capital" is unsatisfactory. In effect it refers mainly to material capital, to the exclusion of business reputation, adjustment of means to ends. The collapse of a part of a printing press may destroy much capital invested in type tho' the lead can all be recovered.

§16

(p. 485, footnote, referring to the Minority Report in the Report of the Royal Commission on the Poor Laws, p. 1196.)

"The Minority's argument . . . is associated with the suggestion that an addition of £10,000,000 to the wage fund of the worst year would suffice to reduce unemployment in that year to the normal amount. This result, which is based upon statistical evidence by Mr. Bowley, assumes that the whole of the extra ten millions would go in employing

new hands, and none of it in raising wages . . . To . . . equate the total wage fund of bad years to that of good would require a sum nearer to 100 millions than to 10 millions."

Both of these arithmetics seem hazardous. £m.10+ adjustment *might* do all. The question is w[ould] adjustment improve much? If it did employment w[ould] make employment.

II. DISCUSSION

In his *Principles* Marshall suggested that a community's satisfaction could be increased by levying a tax on an industry subject to decreasing returns to finance a bounty to an industry in which the law of increasing returns "acts sharply". This "tentative" conclusion was arrived at by considering the effects, mainly on consumers' surplus, of a tax or a bounty. Marshall found the effects of a tax to be the least injurious to consumers when levied on an industry under decreasing returns, and that a bounty to an industry subject to increasing returns would add to the community's satisfaction.¹

In *Wealth and Welfare*, Pigou, adopting the national dividend as a measure of a community's welfare, stipulated the equality of marginal net product of resources in all uses as the condition for maximum welfare. To show that, under certain conditions, the competitive output fails to satisfy this criterion, he introduced the notion of "the marginal supply price" of an industry, defined as "the difference made to aggregate expenses of production (in terms of money) of all producers by an increase in total production from x to $(x + \Delta x)$ units".² He argued that, while in the case of increasing returns, the marginal supply price curve lies *below* the supply curve, in the case of decreasing returns it lies *above* it, so that the "ideal output", given by the intersection of the marginal supply price curve and the demand curve, exceeds competitive output under increasing returns and falls short of it under decreasing returns. Only under constant returns do the "ideal" and the competitive outputs coincide. These results led Pigou to advocate a tax on *every* industry subject to decreasing returns *and* a bounty to *every* industry subject to increasing returns.³

This unconventional result, that competition, in general, failed to achieve maximum satisfaction, provided the ground for Hobson to observe that Pigou's findings amounted to an admission of the futility of marginalism. And it was Hobson's remark which stimulated Marshall to criticize Pigou's method. Marshall's criticism is mainly directed against the notion of the "marginal supply price" which, he says, "has no reality" (§1). He objects to its use in the case of decreasing returns as well as that of increasing returns, but for different reasons. In the

¹ *Principles*, p. 462-76. Unless otherwise stated, all references are to the sixth edition, 1910 (see p. 34, n. 1, above); and those to Pigou are to his *Wealth and Welfare*.

² This notion was first defined by Pigou in his article, "Producers' and Consumers' Surplus", *op. cit.*, p. 363. ³ *Wealth and Welfare*, p. 178-9.

former case, he finds the contrast between marginal supply price and the supply price to be inconsistent with Pigou's own definition of the supply price (§11). More important and interesting is the objection Marshall raises with regard to increasing returns: that, in applying the marginal method in a cut-and-dried fashion Pigou "overrates the possibilities of the statical method". Marshall had written in his *Principles* (already in the fourth edition of 1898): "The statical theory of equilibrium . . . is barely even an introduction to the study of the progress and development of industries which show a tendency to increasing return. Its limitations are so constantly overlooked, especially by those who approach it from an abstract point of view, that there is a danger in throwing it in definite form at all."

It may be noted at the outset that Pigou's use of the term marginal supply price is misleading, and indeed he himself appears initially to have been misled by it. In constructing the curve of marginal supply prices, Pigou appears to have assumed that the average cost curve of the industry is its supply curve under *both* decreasing and increasing returns. However, it is so only under increasing returns, and can hold for decreasing returns only if such returns are wholly due to external diseconomies. When decreasing returns are due to a fixed factor, as is generally supposed, the supply curve is itself the marginal cost curve, and the curve of marginal supply prices is then merely a derivative curve of this marginal cost curve.¹

Marshall's comment that the marginal supply price has no reality can be understood, with regard to decreasing returns, from the preceding: a derivative curve of a marginal cost curve can be said to have no "real" significance. Marshall's §5 brings this out explicitly. He observes that "neglecting the influence of technical economies" the difference between the marginal supply price and the supply price "is not a real expense but an extra charge which landlords will be able to put on producers, in consequence of the increased value of land". It can be seen that the ordinate on the marginal supply curve at a given output measures the cost of producing the marginal unit which pays no rent (indicated on the supply curve) *plus* the additional rent payments on all the rest of the units, due to the marginal increase in output. These additional payments are not for the use of additional real resources but are increased costs of a fixed factor already in use. (This argument underlies §10 also.)

We may recall here that Allyn Young in his review of *Wealth and Welfare*² published in August 1913 had already pointed out that the

¹ In fact, Pigou himself wrote in his earlier article, "Producers' and Consumers' Surplus", *op. cit.*: "The supply curve for all values in respect of which it is inclined positively coincides with the curve of collective marginal supply prices and for all values in respect of which it is inclined negatively, with the curve of average full expenses of production." In *Wealth and Welfare*, however, he takes the supply curve to be *below* the curve of marginal supply prices for decreasing returns, while it continues to be *above* for increasing returns.

² *Quarterly Journal of Economics*, vol. XXVII (August 1913), p. 672-86.

difference between the marginal supply price and the supply price in the case of decreasing returns was to be interpreted as "transferences of purchasing power" to owners of the fixed factor rather than as additional cost in terms of real resources. Although this criticism of Young was thus before Marshall's (dated October 1914), there is nothing to suggest that Marshall was aware of it at the time of writing his own comment. Pigou, in response to Young's criticism, corrected this anomaly with regard to the case of decreasing returns in the second edition of *Economics of Welfare*, 1924. In the third edition of that book, 1928, he replaced the marginal supply price by "the supply price from the standpoint of the community" and defined it in such a way as to eliminate transfer elements (p. 222).

The more interesting comments of Marshall relate to the case of increasing returns.¹ He displays strong misgivings about Pigou's unqualified use of the statical method in relation to increasing returns. He himself had, in the *Principles*, appended cautionary remarks to the results arrived at in this case, drawing the readers' attention—as he does also in §§1 and 11—to Appendix H where he discussed at some length "the limitation of the statical method".

Before considering Marshall's own treatment of increasing returns in Appendix H, we adduce here an additional piece of evidence which helps one to formulate a little more pointedly Marshall's objection to Pigou's use of the long-period supply curve. This evidence is a pencilled comment by Marshall on Pigou's article "Producers' and Consumers' Surplus",² where Pigou gives the following definition: "Let the supply price, in any market, be defined as the price which is able, and any lesser price than which is not able, to evoke in the market the production of exactly $(x + \Delta x)$ units". Marshall adds to this: "in a given period of time"; and objects to Pigou's phraseology ("a price is able to evoke"): "Nor does the change of phrase obviate the necessity for the conditioning clause as to time. He excludes short periods but treats all long periods, say 10 to 50 years, as having the same effect. *That is, he commits, in silence, violence similar to and greater than that which I confess to in regard to consumption.*" (Italics added.) The implication of this

¹ Marshall raises here an objection against Pigou's use of the *aggregate expenses of the industry* (see §5). His objection that it lacks "specific motive force" could be interpreted to mean that, unlike the "supply price" which is defined in relation to producers' motivation (a price at which producers would be willing to supply the specified output), the marginal supply price in terms of *aggregate expenses of the industry* has no such motivational basis. It is somewhat puzzling, however, to find that Marshall rests a part of his objection on the ground that economies in one industry (say, shipbuilding) depend upon correlated economies in another (say, manufacture of plates). This recoils on the method of partial equilibrium itself since it challenges the notion that economies would be *internal to the industry* even if they are external to the firm, required to validate Pigou's partial equilibrium method. Moreover, Marshall's criticism strengthens further Pigou's argument that the welfare-maximizing output and the competitive output diverge under increasing returns.

² This copy of the *Economic Journal*, 1910, is in the Marshall Library, Cambridge.

becomes clear when we note that Marshall was greatly perturbed by the problem of ensuring the stability of demand and supply curves in the face of difficulties arising from what he called "the element of time". The comment reveals that, while he was more troubled over the hypothesis of the stability of the long-period supply curve, he was far from happy even about his long-period demand curve. Even the possibility that the conditions impounded in the *ceteris paribus* clause used in defining the demand curve would alter over time had led him to state that "our list of demand prices is highly conjectural except in the neighbourhood of the customary price".¹ However, Marshall relied upon the stability of the demand curve as, for example, in the present problem, when calculating changes in consumers' surplus. As for the supply curve, he appears to have had stronger doubts whether the theory coped satisfactorily with "the elements of time", especially in the presence of increasing returns. For he saw the difficulties as arising mainly from the irreversibility of changes in production conditions;² and it was to these that he mainly devoted Appendix H.³

In Appendix H Marshall focuses on the fact that increasing returns are due to "extensive improvements in organization, creation of skills" etc., which bring about changes through time that are not reversible: economies once created can scarcely be withdrawn. He also recognizes that irreversibilities violate the assumption, central to the equilibrium approach, that "if the normal production of a commodity increases and afterwards diminishes to its old amount the demand and supply price will return to their old positions" (p. 807). He argues that, if the supply is diminished, once having been expanded, "the supply price would not move back by the course by which it had come", and suggests that a method of handling irreversibilities would be to show the backward

¹ See *Principles*, pp. 109–13 and 129–35.

² It is of interest to find that in his early work, *Pure Theory of Foreign Trade and Domestic Value*, Marshall stressed the difficulties that custom and habits raised for the demand curve by introducing irreversibilities in consumption. He recognized that "consequently, every movement of the exchange index entails some alteration in the shape of the curves and therefore the forces which determine succeeding movements" (p. 32). In *Principles*, irreversibilities in consumption are not given the same importance, although they are alluded to in Appendix H.

³ Marshall was so concerned about the difficulties created for his theory by irreversibilities that he appears to have devoted much thought as to where he should place their discussion in the text. The following manuscript note was found in the Marshall Papers, written by him on a sheet of paper in which were enclosed some printed pages taken from a copy of his *Pure Theory*:

"General suggestions: 31: VIII: 96.

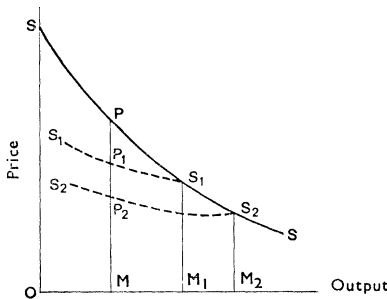
Postpone case II altogether and treat it on different footing.

Decide early what to do about elasticity.

Make much shorter all attempts to bring the curves into reality."

Case II, in *Pure Theory*, it will be recalled, is that of the supply curve under increasing returns. It was as an attempt to bring the curves closer to reality that Marshall discussed irreversibilities at some length. Indeed, he treated irreversibilities on a different footing from the fourth edition of *Principles* (1898) onwards, when they were shifted from the central chapter to a "Note on Pure Theory of Stable and Unstable Equilibria"; and from the fifth edition onwards (1902) they were transferred to Appendix H, where irreversibilities were introduced in an argument against the possibility of multiple equilibrium positions under increasing returns.

movement by a separate curve. This treatment means, however, that there would be no uniquely defined "supply price" for a given output. This can be illustrated with the aid of Marshall's diagram (on p. 806). The supply price of the output OM could be MP , MP_1 or MP_2 , depending upon whether output expands continuously to OM , or whether it decreases to OM after once having reached OM_1 , or does so after having reached OM_2 . In fact, since along SS there are economies operating continuously, there would be a separate curve for backward movement at each point and the supply price of OM would be indeterminate, in the sense that it would vary with every change in the *sequence* of output levels by which it is approached. Or, to put it differently, with every change in output, the supply curve needs to be redrawn. Such an ever-shifting supply curve cannot be used to determine equilibrium price and output, as it is essential for that purpose that the supply curve should remain stable for hypothetical movements along it. Here, *given a sequence of output levels*, we may depict the supply price at each output



level in that sequence, taking into account irreversibilities. But such a curve would be in the nature of an "historical curve", and not the one required by the theory of equilibrium price.

In the same Appendix H, Marshall suggests a way of obtaining a "true long period normal supply curve" in the case of increasing returns, by treating "time" as a third dimension (pp. 809–10):

"We might take a series of curves of which the first allowed for economies to be introduced as a result of each increase in the scale of production during one year; a second curve doing the same for two years . . . and so on . . . Cutting them out of cardboard and standing them up side by side we should obtain a *surface* of which the three dimensions represented amount, price and time respectively. If we had marked on each curve the point corresponding to that amount for which, so far as can be foreseen seems likely to be the normal amount for the year to which the curve related, then these points would form a curve on the surface and that curve would be a fairly true long period normal supply curve."

There are two points to be noted about this suggestion. First, the matter dealt with here is not one of irreversibilities but a different

one, namely, that "a suitable time to allow for the introduction of economies appertaining to one increase in the scale of production is not long enough for another and larger increase"—which is a matter of the time lags in reaping economies of scale. However, the *long-period* supply curve is obtained under the hypothesis that sufficient time is allowed for forces to work out their full effects.¹ Second, the supply curve is needed to *determine*, in conjunction with the demand curve, the equilibrium price and output, whereas what is required here are the foreseeable "likely" normal outputs, in order to obtain the supply curve. There are any number of such curves, each corresponding to a sequence of likely outputs. Indeed, the exercise becomes meaningless for the theory of equilibrium price when we see that, since the forecasts are forecasts of equilibrium outputs, they could also be considered as forecasts of normal quantities demanded; and the curve connecting them could be said to represent the long-period normal demand curve. We are left then with only one blade of the well-known pair of scissors.

Marshall, while he was acutely aware of the difficulties posed by irreversibilities and "the element of time" in the case of increasing returns, nevertheless tried to present them only as "limitations" which qualified the results.² His criticism of Pigou is directed against Pigou's application of the statical method to the case of increasing returns without the qualifications that he himself had laid down. Pigou had thereby cast in a rigid form the results which he himself had put forward in tentative and flexible terms.

These differences in approach are reflected in policy implications as well. A tax on an industry subject to decreasing returns is favoured by Marshall only as the least harmful among the commodity taxes from the standpoint of the consumers. He showed that the tax receipts would exceed the loss of consumers' surplus if the supply curve were sufficiently steeply inclined relatively to the demand curve. However, the decrease in output would also bring about a loss of producers' surplus and the combined reductions of consumers' and producers' surplus would exceed the tax receipts.³ Marshall's recommendation for a bounty to an increasing-returns industry rested on a positive argument—that it would increase the community's satisfaction. Here, too, he recom-

¹ On p. 497 Marshall explains that the long-period normal price relates to periods "... in which those economies that normally result from an increase in the scale of production ... have time to develop themselves".

² For example, in the context of the problem of *maximum satisfaction*, when discussing the shift of the supply curve following a tax, he warns us that the new supply curve in the case of increasing returns "ought properly not to have the same shape as the old one" (p. 469, n. 1). The argument he offers is that, even when the industry shrinks following the tax, it would at least in part preserve the economies already gained. This brings in the question of irreversibilities which jeopardizes the very notion of the supply curve and not only its shift as Marshall suggests.

³ Marshall treated the effects on producers' surplus on a different footing and concerned himself mainly with those on consumers' surplus. He argues, for example, that the tax on an industry subject to decreasing returns is desirable as consumers would be discouraged thereby from incurring expenditure on a commodity which reduces the real purchasing power of income. No mention is made

mended the bounty only where increasing returns acted sharply. This qualification follows upon his treating the entire amount of the bounty as a cost to society which needed to be off-set by the gain in consumers' surplus arising from the bounty. However, the question whether the entire expense of the bounty is to be reckoned as a cost to society depends upon how the bounty is raised, and it cannot be answered without considering effects on the rest of the economy of raising the required revenue.

Pigou, as we have seen in *Wealth and Welfare*, treated decreasing returns and increasing returns symmetrically, the implication being that both are due to externalities. He favoured a tax on an industry subject to decreasing returns for the same reason as he favoured a bounty to an industry subject to increasing returns, namely, in order to correct deviations from "ideal output". Pigou appears to have treated the cost of the bounty as a transfer. This becomes explicit only in his *Economics of Welfare*, in which he added the following qualification for the grant of a bounty: "Provided that the funds for the bounty can be raised by a mere transfer that does not inflict any indirect injury on production" (4th ed., p. 224). The treatment of the amount of the bounty as a transfer had the consequence that *any* degree of increasing returns qualified the industry for the bounty.

Although Pigou continued to speak in terms of taxation, he had cast the net of tax policy very widely indeed, with a tax on *every* industry under decreasing returns *and* a bounty to *every* industry under increasing returns. Such complicated and comprehensive taxation would have brought the state into the economy on a grand scale. The boldness of this policy was in sharp contrast with Marshall's own position. Apart from the fact that his suggestions were limited in scope, he had further tempered them by the recognition of considerations "other than economic". He warned against the "administrative side of state interference" (pp. 712-13) and against evils such as the opportunities for the corruption of public officials opened up by a scheme of bounties; and he feared that bounties could "sap the springs of free initiative and strength of character" (p. 714).¹

of increases in landlords' incomes (p. 474). Also, when discussing the effects of taxes and bounties in terms of diagrams (pp. 464-9), he is concerned with changes in consumers' surplus alone. Only in one case, where he discusses a tax on agricultural produce, does he take explicit account of producers' surplus (p. 473). But even here he adds that the question of the effects on landlords differs "so much as not to be fitly discussed here". Marshall realized that the concept of producers' surplus which had a clear interpretation in agriculture could not be extended to industry. He suggested a parallel in terms of the particular expenses curve in Appendix H, but realized that this curve is not a normal supply curve. (In §§7 and 8, Marshall disclaims any association between the particular expenses curve and the supply curve.) Producers' surplus calculated from such a curve cannot be treated conceptually as a counterpart of consumers' surplus calculated from a demand curve.

¹ Marshall's general reluctance to bring in the state is reflected in §§14 and 16, where he differs from Pigou on specific points of practical policies. In §14, Pigou having agreed that the variability of business expectations would be mitigated if

What appeared in Marshall as aberrations in the working of the competitive system were transformed by Pigou (in generalizing and extending Marshall's results) into the failure of the competitive system to achieve maximum welfare. When Hobson emphasized this failure of the system, Marshall was impelled to record—if only for posterity—his criticism of Pigou's conclusions. In the case of decreasing returns, he notices an error in the argument of Pigou. In the case of increasing returns, however, his criticism raises questions which are not confined to Pigou's application of the statical method to the problem of welfare, but relate more generally to the validity of the statical approach to the theory of equilibrium itself. Marshall, while bringing out the difficulties confronting that approach, nevertheless had characterized them as being no more than "limitations" of the method which qualified the results. They were locked up in that Pandora's box—Appendix H of Marshall's *Principles*.

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the state published monthly statistics of the existing volume of construction, Marshall comments that the trade journals have done it already, better than it could be done by government. §16 relates to Pigou's questioning of the Minority's argument in the *Report on Poor Laws* that an addition of £10 mn. to the wage fund of the worst year would suffice to reduce unemployment in that year to its normal amount. Pigou argues that a sum nearer to £100 mn. would be required, since an allowance has to be made for a possible rise in wages. Marshall comments: "Both these arithmetics seem hazardous". He thinks a small adjustment should suffice, and that if it improves the situation, employment would then create further employment. In the *Principles* he had argued that the chief cause of unemployment was a want of confidence, and that "the greater part of it could be removed almost in an instant if confidence could return, touch all industries with her magic wand, and make them continue their production and their demand for the wares of others" (p. 711). While arguing that increased production itself creates increased demand, Marshall sees the way to the cumulative increases in employment through revival of confidence rather than large-scale public expenditure.

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[Footnotes]

³ **Producers' and Consumers' Surplus**

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² **Review: Pigou's Wealth and Welfare**

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Allyn A. Young

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