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OF EMPTY ECONOMIC BOXES

PICTURE an economist, well-educated in the dominant British school, going over a hat-factory. On the shelves of the store, the first room he enters, are boxes containing hats. On the shelves of his mind are also boxes. There is a row labelled Diminishing Return Industries, Constant Return Industries, Increasing Return Industries. Above that a dustier row labelled Monopolies (with discrimination of three degrees) in Diminishing Return Industries, Constant Return Industries, Increasing Return Industries. On top again he can just read the docket, Taxes on Monopolies in Diminishing Return Industries—and so on. He is aware that these boxes are not very prominent on the shelves of some economists of whose mental furniture he generally approves; but he received them from his masters and he has seen them handled with beautiful ingenuity by his friends. Yet from all his reading and conversations he cannot recall a scene in which anyone opened the boxes and said, with authority and convincing evidence, “Constant Return Industry, hosen; Increasing Return Industry, hats,” or used any like words. Nor can he think of an industrial monograph in which profitable use was made of the Laws of Returns in commenting on the things of life. Perhaps he has himself tried to write a little monograph and remembers how, doubtless for lack of wit, he made of them no use; but how for this no one ever blamed him.

He takes down, in memory and when he gets home from his shelves, *Industry and Trade: A Study of Industrial Technique and Business Organisation*, with its nearly nine hundred pages packed full of the things of life. Two references to Constant Returns—one in a footnote—and a handful of references to Diminishing and Increasing Returns *im Allgemeinen*, not so far as he can find in close relation to the facts of those British, French, German and American Industries of which the great book has taught him so much: these seem to be all. He tries *The Economics of Welfare* to find that, in nearly a thousand pages, there is not even one illustration of what industries are in which boxes, though many an argument begins—“when conditions of diminishing returns prevail” or “when conditions of increasing returns prevail”, as if everyone knew when that was.

The difficulty of supplying illustrations had been brought home to him that day in the hat factory. Whilst wandering among hollow copper cones to which hat-stuff miraculously adhered, shaping and pressing appliances, and dye vats, he had wondered—recalling the words with difficulty—whether “the increment of product due to the increase by a unit in the quantity of resources occupied in producing” hats is smaller (diminishing returns), or greater (increasing returns), “the greater is the quantity of resources so employed.”¹ How should he conceive his unit of resources? How his increment of product? No one had given him any help here. Must he fix on a standard hat or a standard quantity of standard hat-stuff? It is physical output, the Great Analytics repeat, with which these Laws deal; so something of the sort seems necessary. He appreciates the wisdom of talking not of hats but of commodities.

Or how is he to conceive of “an industry”? Is it a national industry? The Great Analytics seem to assume this; though they are not perfectly explicit. But are they entitled to assume it? Ought he not somehow to take into account conditions in that place—now in Czecho-Slovakia—whence came the “Austrian velours hats” of which he hears so much among the hat factories of Denton? Discouraged, he falls back, most reluctantly, on generalities. As the world’s population is still growing, presumably more units of resources, however conceived, are in fact being turned to hat-making. But only the most searching and difficult realistic inquiry could, he feels sure, even suggest the conclusion that, in this industry at this time, each “dose” of manufacturing resources means more standard hats.

Can the diminishing returns side help? Hats; chief raw materials, coal, rabbits’ fur, shellac, leather for the inside band and pulp for the box. Coal seems easy; and an approximate solution there will help in so many other industries, in some of which the value of the product is thirty per cent. fuel cost, or more. To assert that the produce of mines conforms to the Law of Diminishing Returns is, he knows, “misleading.”² But if the one raw material common to all industries is not to be brought within the scope of the Laws, all hope of dragging them out of the realm of the categories must be abandoned *in limine*. So the risk of misleading must be shouldered.

Nature’s response to the miner is notoriously reluctant. A time must come in the history of the planet, as a time comes in the history of every pit, when equal successive “doses” of

¹ *The Economics of Welfare*, p. 120.

² Marshall, *Principles*, p. 168.

resources will yield smaller physical returns. Economics, however, is not concerned with geological time; nor the Laws of Returns, if he has rightly apprehended them, with individual pits. The industry is the unit. For the moment he will think of a national industry, an old national industry, that of Britain. Have the new large-scale applications of resources, those great pit-sinkings on the Doncaster extension of the Yorkshire coalfield which the war interrupted, have they the effect of increasing or of only keeping constant the yield of coal "per unit of resources" in Britain? Or, in spite of their undoubted efficiency, is the return per unit for the whole industry actually diminishing, because elsewhere the working out of pits is rendering the successive "doses" applied to them less efficient? He does not know; but it seems not impossible that an approximate answer might be worked out—with a gigantic reservation which he sets aside for further thought.

That coal in Britain is being produced under conditions of diminishing returns is quite possible; but this is one of the cases in which we are least entitled to adopt a narrow national standpoint. One could hardly err in assuming that in Upper Silesia, or in the Transvaal, or in many parts of the United States the reverse is true; and as the world is fast becoming a single market for coal, and coal-mining a single world-industry like wheat-growing, any thorough inquiry would have not only to balance the virgin coal of Doncaster against the well-worked Lancashire field, but Britain against America or even against that wonderful coal-field through which, they say, the upper Yangtse-Kiang cuts its gorges. So far as our economist knows the work is not yet begun.

After coal, rabbits' fur: an awkward case: a joint-product too. Nature shows no reluctance to supply mankind with rabbits; but as a crop they compete with others. The rabbit-skin industry is distributed between Hampshire warrens, Belgian hutches, and Australian back-blocks. There is system in it, at least in the hutches and on the back-blocks; but its organisation, its internal and external economies, are elusive. The puzzled economist has no idea, and no notion how he shall begin to form an idea, whether it is or is not carried on under conditions of diminishing returns. Of the leather for the hat-bands he is more disposed to hazard a guess that diminishing returns prevail; but it is a guess, and there are all the problems of the joint-product and the sources of supply (some in old countries and some in new) which faced him when considering the rabbits.

Shellac and pulp for the boxes are more hopeful. From what he has read of the shellac "industry" and the lac insect he suspects diminishing returns. Things picked up in forests are apt to elude with greater and greater success intensive efforts to pick them up. But stay—is there any "cultured" shellac? That is a thing to be looked into; for, in the slightly similar case of wild and plantation rubber, he suspects that the transition from the wild to the cultured product marked a transition from diminishing to increasing returns upon each "unit of resources" devoted to rubber production. It looks almost as if a proof of increasing returns in rubber planting might be established statistically for the period 1905–22: it is, of course, the simple case of an organised large-scale industry on virgin soil, a Ricardian, or perhaps we should say a Careyite, rudiment. Shellac is not so easy. With a confession of ignorance, coupled with a strong guess of diminishing returns, he passes to pulp, the most hopeful of all his raw materials.

Common knowledge of the wastage of the world's timber—which was being treated rather as a stock, like coal, than as a crop, like rubber—supported by some study of timber price movements as compared with other price movements before 1914, did suggest definitely that "units of resources" applied to forest exploitation were yielding smaller physical returns. Whether this is true of wood-pulp is less certain. There the economies of an organised industry, the increasing returns tendency, have to be set against Nature's very obvious reluctance to supply mankind with timber indefinitely on the stock system. But it is likely that the pulp industry also, thanks more to human carelessness than to the niggardliness of Nature, is working under conditions of diminishing returns. Provisionally, and with hesitation, our economist was just about to conclude that the cardboard of his hat-boxes shows clear signs of Nature's reluctance to meet man half-way, when someone reminded him that this particular cardboard was made not of wood-pulp but of straw, ropes' ends, and the worn-out covers of railway wagons. Vegetable materials, no doubt, and against all such a suspicion of diminishing returns lies; but may not the improving organisation of the marine-store dealers and other handlers of "junk" come in on the other side? New processes have got between him and Nature: a new, long and none too hopeful inquiry into fact lies before him. He must, if honest, admit ignorance of the class of "returns" under which this cardboard is made. Finally he must balance all these uncertainties and ignorances on the

“diminishing” side against the equally stubborn ignorances—all of which there has not been space here to tabulate—on the “increasing” side. He leaves the factory with no formed opinion about the proper economic box for hats.

It may be said that the industry is not typical of industries generally. Certainly there is a special lack of decent organisation for the production of some of its raw materials and great difficulty in hitting on a representative finished product. But the same is true of many other trades; and incidentally it has been shown, or suggested, that coal itself cannot be boxed confidently. No doubt it is easy to take extreme cases on the “increasing” side and box them. Meccano Ltd., no doubt, are working under conditions of increasing returns. So, one supposes, are the Ford establishments and probably the car industry generally; but whether or not well-established industries, say textile machinery or locomotives, are working under decided conditions of increasing returns would be very difficult to determine. True, it seems most unlikely that mechanical industries with mineral raw materials, in the present state of the world's mineral resources, are producing under “diminishing” conditions; but no more can be said with any confidence. Wherever animal or vegetable materials are involved the element of uncertainty is greatly increased. And it was for these cases in particular that the conception of the balance of forces, man's organisation *versus* Nature's reluctance, was worked out. A strict interpretation of diminishing returns, as we know, excludes the mineral stocks. Then consider wool.

It is no use discussing “woollen cloth”; for there is no such thing. You might as well discuss a commodity. But there are standard products of the industry, reasonably uniform and regularly quoted. Take combed wool, “tops.” If any problem in “returns” involving organic matter is soluble, that of 64's Botany tops should be. The wool is, by definition, all Australian; and if perhaps now and then some River Plate or New Zealand wool gets into the tops, that too is new country wool. “In the production of wheat and wool” (the tendency towards diminishing returns) “has almost exclusive sway in an old country.”¹ The converse is no doubt true of a new one. But is Australia still “new”? There is keen competition between agricultural and pastoral interests and, in some districts, between sheep and cattle. The districts in which the fine merino wool used for 64's can be produced to perfection are limited; and as the supply

¹ Marshall, *Principles*, p. 319.

has grown but little, in spite of steady demand, it is likely enough that "conditions of diminishing returns" prevail. But just how the situation is now to be described, I do not know. A monograph, as yet unwritten, would be illuminating but might not be decisive. At present we are not justified in stating that Botany (*i. e.* fine merino) wool is being produced under the sway of either of the returns tendencies. On the other hand we are, I think, justified in stating that the tendency to increasing returns is not working strongly on the manufacturing side. The combing industry is highly organised and localised to an astonishing degree. Apart from combs run by some spinners, the combing plants are mostly large. Fresh ones are seldom set up, and it is unlikely that the building of new mills or the extension of those now existing would increase the efficiency of the industry disproportionately to the effort expended. This is almost a verbal repetition of what Dr. Marshall wrote long ago about the production of blankets. Supposing that Botany wool is, in fact, produced to-day under conditions of slightly diminishing returns, it is conceivable that 64's Botany tops are being turned out very near the mathematical point of constant returns. But we do not know.

Constant returns, it may be observed in passing, must always remain a mathematical point, their box an empty one. It is inconceivable that a method can ever be devised for so measuring these real but infinitely subtle and imponderable tendencies towards diminishing and increasing returns that someone will be able to say, Lo, here a perfect balance. If this is so, constant returns industries may be relegated finally to the limbo of the categories, in company for the present with such still disembodied phantoms as the "commodity whose elasticity of demand is unity."

In the passage where Dr. Marshall discusses blankets occurs the reservation referred to above as gigantic and set aside for further thought. The improvements in efficiency arising from the increasing size of an industry, to which Dr. Marshall attributes increasing returns, are, as I read him, not to include notable inventions, perhaps not inventions at all. They are improvements in organisation only. Referring to the blanket trade he writes, "an increase in the aggregate volume of production brings some new economics, but not many," because the trade is "already on so great a scale that any new economics that (it) may attain are more likely to be the result of new inventions than of improved organisation." I think Professor Pigou endorses this distinction between invention and organisation, but I am

not quite sure; he is less concrete in his treatment than Dr. Marshall, further from the clod and much further from machinery. The distinction, important as it is and clarifying of pure thought, discourages the student not of categories but of things. For, when trying to box an industry with the increasing docket, he must strive to think away that part of any additional output, coinciding with a fresh "dose of resources," which is due to invention, and concentrate on the part due to size and organisation only. Suppose he has just found out—it would be hard enough, perhaps not possible, but conceivable—that the returns to the expenditure of resources in sinking of coal-pits near Doncaster are such as to show that even the British coal industry is still in the "increasing" stage; and that then someone tells him (I fancy it is true) that these pits would never have been sunk at the price in "resources" but for the modern invention by which loose and water-logged strata above the coal-measures are frozen artificially to facilitate sinking. Can he, like a schoolman, put this aside as an *accidens* and concentrate on the pure *substantia* of the growing industry apart from the invention? He is not tempted to try. If he were, quite certainly the boxes would always remain empty. Should the laws ever be rescued from the limbo of the categories, it could only be by treating industries as they are and lumping in inventions. Professor Pigou's definition quoted above would, I think, permit of this. You can pack much into the phrase, "a unit in the quantity of resources." It may prove difficult to suggest a concrete measure for the "unit of inventiveness," but it should not be much more difficult than measurement of the "unit of normal managerial capacity," which is obviously included in Professor Pigou's composite unit.

Perhaps some analytic, great or small, having read so far with impatience will be muttering quite loud, *connu, farceur!* Was it not obvious to you that we did not pretend to have set up measured units of managerial capacity, units of capital, and units of labour, compounded into a joint-unit of resources? Of course there are endless practical difficulties in fixing on standard units of product for particular industries and correlating them with the application of units of resources. Did not the rarity of illustrations in our discussion of "returns" indicate what we were doing? A standard hat is not a mathematical concept. We are generalising the bewildering detail of industry. Do you admit the logic of the conception of the laws of returns? Yes?

Well, we are building a framework into which we hope facts may in time be fitted. If those who know the facts cannot do the fitting, we shall regret it. But our doctrine will retain its logical—and, may we add, its pedagogic—value. And then you know it goes so prettily into graphs and equations. Besides, in the history of thought analysis has often outrun verification.

The answer to such a statement of the case depends, *first*, upon the measure of hopefulness or despondency with which one contemplates the task of translating the theory into the facts of those industries which one knows best; *secondly*, upon one's estimate of the final utility of such a translation if it could be made; and *thirdly*, upon one's personal opinion of the consequences of the outrunning of verification by analysis in Economics. Taking the last point first and speaking in the first person, as in such a case one must, I think a good deal of harm has been done through omission to make it quite clear that the Laws of Returns have never been attached to specific industries; that the boxes are, in fact, empty; that we do not, for instance, at this moment *know* under what conditions of returns coal or boots are being produced. If unwary, one might read *The Economics of Welfare*, a book which from its title would not appear to be an essay in "pure economics," without apprehending this; and I suspect that many students do so. I myself did not appreciate how completely empty the boxes were until I had given a number of public demonstrations with them. And if more acute minds are not likely so to be misled, the rank and file surely are. Unless we have a good prospect in the near future of filling the boxes reasonably full, there is, I hold, grave danger to an essentially practical science such as Economics in the elaboration of hypothetical conclusions about, say, human welfare and taxes in relation to industries which cannot be specified.

Next, supposing we did, after much labour, ascertain definitely that coal in England was being produced under conditions of slightly diminishing and 64's Botany tops under conditions of slightly increasing returns—what would be the utility of the knowledge, apart from the satisfaction of a legitimate scientific curiosity? Professor Marshall has stated that "*other things being equal*, the Finance Minister should press on products of Decreasing Return industries rather than on products of Increasing Return industries,"¹ and there is a considerable literature, with few illustrations, on the working of taxes upon commodities under different assumptions as to returns. But I think we may take it that the italicising of the "*other things being*

¹ *Industry and Trade*, p. 405 n.

equal" is a scholarly reminder that this is not a bit of political advice; for it is hard to think of cases in which other things would be equal, since Diminishing Return industries, if we can lay them by the heels, are likely to prove nearer the raw material, so to speak, and so less eligible for taxation, than Increasing Return industries. If not a safe guide to taxation, would the knowledge affect social, industrial or commercial policy? At the moment I can think of no advice which I should give to a working wool-comber, top-maker, spinner, merchant or reformer of social conditions in the worsted trade, as a result of the decision that 64's Botany tops were being produced under conditions of slightly increasing returns. Long before scholars had established that British coal was being produced under conditions of slightly diminishing returns, the resultant price rise relative to the price in increasing return areas would have stimulated organisation and invention to restore at least a state of constant returns, were that in any way possible. In all these matters the economist is, willy-nilly, an historian. The world has moved on before his conclusions are ripe.

And with how much hope does one face the establishing of these conclusions? The instances referred to so far have not been very encouraging. Looking backwards over long periods the task can be approached with some hope, provided one does not seek too great precision, does not, for instance, try to separate the effects of organisation from those of invention. The fact that the iron-work required to build a church cost about as much in sterling in 1913 as when Sir Christopher Wren was estimating for City churches, after the great fire of London,¹ alone indicates an enormously increased return to invention and organisation combined during the intervening two centuries and a half. But to prove that any standard grade of iron—No. 3 Cleveland pig or crown bars, let us say—has been turned out since the war under any particular condition of returns is a different matter. I can at present see no way of giving reality to the "unit of resources": though that by no means proves that there is no way. If it were given reality, some appreciable period of time would be necessary during which successive "units" would have to be applied to the industry, and the physical outputs measured. The allowance of time might have to be so long as to "make history" of the inquiry: its results might be true only of yesterday. Again the experimental difficulties appear, though they may not prove to be, insurmountable. No one, so far as I know, has begun to attempt to surmount them.

¹ W. G. Bell, *The Great Fire of London*, p. 282.

If it is judged worth while to make a serious and concerted effort to fill the boxes—of which I am doubtful—a beginning might be made with some of the simple industries which it is customary to assume are working under conditions of diminishing returns. Do we really know that wheat, world wheat, is produced under those conditions? Or wool, or cotton? Some rough suggestions have been thrown out above as to timber, rubber and coal: the two first are the most hopeful. Before we know how much reluctance on the part of Nature we have to overcome, it is rather vain to speculate on the extent of our achievement in overcoming it and establishing conditions of increasing returns. Nature's reluctance varies presumably with the proportions of virgin and non-virgin soil, forests, coal measures and so forth to the total quantity of each being exploited at a given time for the production of a given raw material or food-stuff. In special cases, of which rubber may be one, she may for the time being be not reluctant at all. Easy generalisations about the Law of Diminishing Returns being necessarily true, because if it is not you might feed the world from a square yard, will help little in the discussion of these world-problems.

As to Increasing Returns: if we are to restrict the conception as, I believe, Dr. Marshall does, to the increased efficiency resulting from the improved organisation which generally accompanies an increase of capital and labour in any industry, or in industries in general,¹ to the exclusion of the efficiency flowing from invention—and a very good case can be made out for such restriction—then, I think, we should on principle avoid even the suggestion that we know that particular industries come into the “increasing” category, because we never can know what proportion of their efficiency is due to organisation resulting from mere size and what to invention. This is not a denial of the reality of increasing returns in this sense, only a denial of their measurability. If, on the other hand, we widen the conception as suggested above so as to cover all inventions, we can arrive at certain tolerable historical results; but, as I think, we shall be permanently held up by “experimental” difficulties in dealing with the present and, *a fortiori*, with that near future which is so particularly interesting to the working economist. If I am wrong, and there are ways over any or all of the difficulties, which someone can point out, these mainly destructive notes may have constructive uses.

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¹ See the definition in *Principles*, p. 319.