The Elgar Companion to Classical Economics A–K

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Increasing Returns

Increasing returns occur when a rise in production levels leads to reduced input requirements per unit of output. Adam Smith's analysis represents the basis of the classical conception of increasing returns. Smith maintains that a permanent increase in the extent of the market – due to numerous factors including better transport and the growth of the urban population – allows a reorganization of production which involves *dynamic increasing returns to scale*. When 'effectual demand' for a commodity expands, he writes, its 'market price' tends to rise 'a good deal above its natural price' which corresponds to the 'ordinary or average' cost of production. This difference, between the market price and the cost of production, will determine high profits, which in turn will favour the existing firms' investment and the entry in the market of new ones. The increase in 'current supply' of industry tends to reduce the excess of demand for this commodity and to make market price 'gravitate' towards the natural price. However, if the expansion of supply is permanent, the natural price will be affected by the presence of increasing returns which entail a reduction in the unit cost of the commodity under consideration (*WN*, I.vii; cf. Young, 1928).

It is interesting to examine Smith's celebrated example of the pin factory because it clearly demonstrates the strong connection of increasing returns with (1) the extent of the market, (2) accumulation, (3) division of

labour, and (4) technical change. Considering 'the eighteen distinct operations' into which the 'business of making a pin is ... divided' (*WN*, I.i.3), we can suppose that initially two workers share these 18 operations in such a way that each worker carries out nine of them. For the sake of simplicity, let us assume that each operation takes the same amount of time. Then an increase in production, due to an expansion of the market, opens a wide range of possible organizational outcomes from these two extreme situations: (a) to keep the same type of organization, producing in parallel with each worker continuing to perform the original nine operations; or (b) to reshape the organization of production, establishing a linear sequence in which each worker performs the minimum number of operations. When demand increases to the point of making it possible to hire 18 workers, in the first case, these workers will perform nine processes in parallel, while in the second case, each worker will execute a single distinct operation in linear sequence following the maximum technical division of labour achievable with that particular process and the technical conditions.

In the first case of artisan production with little division of labour, it is reasonable to expect constant returns because the increase in demand causes a simple reproduction (in parallel) of the original process. In this example, all quantities (inputs and output) are multiplied by nine and increase in proportion. In the second case, by contrast, a better division of labour determines increasing returns owing to a rise in the 'productive power of workers' which entails an output growth larger than the increase in the number of workers. As Smith points out, division of labour leads to increasing returns because it allows greater dexterity of the workers in performing 'one simple operation' and the saving of 'time commonly lost in passing from one sort of work to another' (*WN*, I.5–7). The change from craft to factory production may be initially characterized by a more efficient distribution and organization of workers within the process *using the same old tools*. However, this reorganization allows 'the invention of a great number of machines' which makes the task easier and shorter (*WN*, I.8 and II.3). Hence higher division of labour requires a new organizational framework to link workers together and it favours a change, not only in the quality of equipment, but also in the qualification and specialization of workers. In conclusion, this example shows that the relations of complementarity among inputs tend to change in response to a different dimension of scale. Increasing returns do not derive from a proportional increment of inputs, that is from a simple multiplication by n of quantities utilized, but from the reorganization of production, which determines an increase of *all inputs* in different proportions and the change in the quality of inputs by favouring the introduction of new sorts of workers and tools.

Charles Babbage (1832: 169) and John Rae (1834: 165) underline a further important link between efficiency and organization: the opportunity of reducing periods during which production tools are idle as the production levels grow. In Smith's day, this aspect had not yet become prominent because of the relatively small involvement of fixed capital, but in the following years it took on more and more importance. Obviously, the greater the cost of the equipment used, the more desirable it is to reduce idle time. With craft production, when an artisan performs one particular operation, the tools of all other operations remain idle. Only an increase in production and a reorganization of work will permit full utilization of production tools. When the volume of production increases, the possibility of matching (at each given instant of the process) the different productive capacities of various indivisible and specialized machines improves. Following Babbage's Factory Principle, once a scale is established that reduces equipment idle time to a minimum, 'any expansion in the scale of production' has to occur in '*discrete jumps*' of the multiples of the scale achieved (Landesmann, 1986: 308; cf. Babbage 1832: 308; Pagano, 1985: 12ff; Leijonhufvud, 1986: 206ff; Rosenberg, 1992: 44; Scazzieri, 1993: 36–46). Hence the need to combine the productive capacities of single machines, according to specific relations of complementarity, plays a very important role in determining the size of the production unit.

Karl Marx's treatment of increasing returns develops Smith's and Babbage's arguments and includes an extremely detailed analysis of the actual conditions of the manufacturing industry of his day. Marx highlights in particular the importance of *dynamic* increasing returns, obtained by improving equipment and by augmenting, at the same time, the dimension of scale. In fact, in Marx's opinion, without a qualitative change in processes, production shows constant returns because, 'all other things being equal', the increased production of a single commodity involves a proportional increase in the amount of labour (Marx, 1867–94, vol. 3: 288). In Marx (as in Smith), returns do not vary with small and occasional changes in the quantity produced, since in such a context the proportion between labour and tools is assumed to be constant.

However, Marx maintains that, in the capitalist system, 'the technical and social conditions' of the labour process are continually revolutionized in order to acquire higher profit by raising 'the productivity of labour' (Marx, 1867–94, vol. 1: 431–2). Dynamic increasing returns are obtained by improving equipment, augmenting their size, inducing learning processes and achieving economies of cooperation among a larger number of workers. The economies of cooperation 'in the application of the means of production arise entirely out of their joint consumption in

the labour process by many workers'. The increase in the size of machines reduces construction and operating costs. Moreover, in 'large-scale industry ... the concentration of means of production' reduces the cost of recycling waste, heating, lighting and storing (Marx, 1867–94, vol. 1: 442; vol. 3: 172, *passim*). The entrepreneurs' attempt to reduce costs, by augmenting the scale, involves a continuous increase of production that would therefore require a constant expansion of the market. In such a situation, overproduction of commodities may occur, if the market does not expand in parallel with the increase of production (Marx, 1867–94, vol. 1: 434–5; vol. 2: 156; vol. 3: 353, 364–6). Consequently, in Marx's analysis the capitalistic system is characterized by two opposite tendencies, both linked to the phenomenon of increasing returns: the tendency towards accumulation and, at the same time, towards recurrent overproduction crises.

Piero Sraffa (1925; 1926) shows that the law of *increasing returns to scale*, as formulated by the classical economists, is incompatible with the static theory of competitive prices based on the construction of the individual and collective long-period supply curves. In the 1925 article, he distinguishes between increasing returns with a constant input and increasing returns to scale. *Increasing returns with a constant input* arise only if the constant input is indivisible. If the constant input can neither be augmented nor left partially idle, an increase in variable inputs initially brings about more and more efficient proportions between the constant input and the variable inputs. This determines increasing returns as long as the optimal proportion is reached. Of course, if the constant input is divisible, as for instance agricultural land, increasing returns of this kind do not arise because the constant factor may be continually employed in optimal proportion to the point of its complete utilization. By contrast, *increasing returns to scale* are linked to the increase of *all inputs* and therefore they may occur only when there are no constant factors. With divisible inputs, increasing returns are always related to change in the scale of production (Sraffa, 1925: 20,40, cf. Maneschi, 1986: 2–4; Kurz and Salvadori, 1995: 418).

In Sraffa's opinion, 'everyday experience shows' that the majority of undertakings which produce manufactured consumers' goods 'work under conditions of individual diminishing [unit] costs', but in the static theory of competitive prices, increasing returns – due to variations in the size of *a single firm* – must be neglected, as they are not consistent with competitive conditions. With increasing returns to scale internal to the firm, the development of a firm implies that it is able to dominate the entire market, driving all others out of a given sector. This obviously entails a movement towards monopoly conditions (Sraffa, 1925: 41–2;

1926: 543). Therefore, the part played by the law of increasing returns is necessarily 'limited to the case of independent ... factories coming into existence as the production of an industry increases'. On the other hand, increasing returns which are due to external economies resulting from general progress must be ignored, as they are clearly incompatible with the *ceteris paribus* assumption of 'the particular equilibrium of a commodity' (Sraffa, 1926: 537–8,540; 1925: 44–5,59–60; cf. Panico and Salvadori, 1994: 334–5). The logical conclusion is that in perfect competition the only increasing returns 'which could be taken into consideration would be such as occupy an intermediate position between these two extremes': they must be external to the firm but internal to the industry under consideration. However, Sraffa maintains that midway between these two extremes 'nothing, or almost nothing, is to be found'. As Marshall himself recognized, increasing returns 'can seldom be allocated exactly to any one industry: they are in great measure attached to groups, often large groups, of correlated industries' (Marshall, 1919: 188, quoted by Sraffa, 1926: 540). In any case, Sraffa acutely points out that 'in-so-far as external economies of the kind in question exist, they are not likely to be called forth by small increases in production' (ibid.). In conclusion, even if the presence of external–internal economies may be an important element which contributes to an explanation of local industrial development, in the partial equilibrium theory of price, external–internal economies cannot play an important role because such a theory is based on marginal changes in quantities produced.

From the late 1920s, Sraffa abandons the analysis of price based on partial equilibrium hypothesis and on the functional connection between returns and quantity. Sraffa (1960: v–vi) determines relative prices assuming 'no changes in output ... so that no question arises as to the variation or constancy of returns'.

In his more recent works, Nicholas Georgescu–Roegen (1966: 206ff; 1994: 241ff) has pointed out the importance of organizational and qualitative aspects of production organization. He utilizes the concepts of flows and funds, which derive – as he himself recognizes – from the classics. The distinction between funds and flows is based upon the different time utilization of production elements. A fund–flow model of production offers a fruitful analytical tool in treating increasing returns to scale following Smith's and Babbage's line of reasoning. In short, the representation of process time profile allows the analysis of the way an increase in scale dimension determines a rise in productivity by reducing idle times of indivisible funds and process (Georgescu–Roegen, 1986: 256; cf. Morroni, 1992: 60–67,142ff; and Scazzieri, 1993: 102ff).

Nicholas Kaldor (1966, 1972) discusses the macroeconomic implications of the Smithian relationship between the extension of the market

and increases in productivity. He considers (1966: 16–32; 1972: 1242ff) economic growth as the result of the interaction between increases in demand, induced by increases in supply, and increases in supply, generated in response to increases in demand. Irreversible dynamic increasing returns of scale, which he believes are obtainable mainly in the manufacturing sector, enter and amplify this cumulative process. The greater is the tendency to use additional income to acquire industrial goods (whose production benefits from dynamic increasing returns), the more rapid will be the process of growth.

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See also:
Decreasing Returns; Division of Labour; Given Quantities; Natural and Market Price; Technological Change.

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