10 Circular and cumulative causation in the classics

Anticipations, family resemblances, and the influence on Post Keynesian economics

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The origins of the theory of circular and cumulative causation are complex and diffuse, but are to be found mainly in the classical tradition of political economy.

(Toner 1999)

Introduction

The theory of circular and cumulative causation is receiving renewed attention (see, e.g., Berger 2008; Forstater 2004). Early proponents of the principle were Veblen (1898) and Allyn Young (1928), with later elaborations by Myrdal (1957) and Kaldor (1967). Another early, and underappreciated, expositor of the concept was Adolph Lowe (Lowe [1935] 2003; Forstater 2004). In addition, it is not clear that the other writers directly influenced Lowe in this regard. Like Young and Kaldor, Lowe found inspiration for the notion in Adam Smith, but for Lowe it was rather the work of the classical economists and Marx generally that exhibited the basic vision of cumulative processes.

For Lowe, a key difference between the classical and neoclassical approaches regards “the entire possible range of deductive reasoning”:

Let us be quite clear about the disputed region. It concerns the entire natural, social, and technical environment of the economic system ... the changes in these elements through time ... [For the classical economists and Marx] the explanation of the order and changes of these data formed part of the theoretical work of economists.

(Lowe 1954: 109; emphasis added)

To put it into contemporary terms, for the classics and Marx many more components of the economic system – and even its natural and social environment – are treated as endogenous, that is, determined by forces internal to the system itself. Lowe even went so far as to argue that “upon this issue of endogeneity versus exogeneity, rather than conflicting theories of value, hinges the main difference between genuine classical theory and post-Millian economic reasoning, including all versions of neoclassical analysis” (Lowe 1954: 108).

Thus, three of the characteristics we will be looking for when mining the writings of the classics and Marx for anticipations of and family resemblances to the notion of circular and cumulative causation will be endogenous growth, endogenous technical change, and so-called “non-economic” factors as part of the analytical subject matter. Other factors – what we might call characteristics of circular and cumulative causation – are: increasing returns (especially in the manufacturing sector); external economies (in particular, pecuniary ones); positive feedbacks; backward and forward intersectoral linkages; structural change; learning-by-doing; and historical (rather than logical or notional) time. This list is not exhaustive, and not all of these factors need to be present in order for the links to be made with circular and cumulative causation.

The remainder of this chapter will proceed as follows. Next, an examination will be made of some examples of the theories of Smith, Ricardo and Marx with anticipations of and family resemblances to the principle of circular and cumulative causation. Following that, an investigation will be made of the ideas of two Post Keynesian economists, Luigi Pasinetti and Edward Nell, whose works have been influenced by the classics and Marx, and that exhibit some of these same characteristics of circular and cumulative causation.

Circular and cumulative causation in the classics and Marx

Adam Smith

Of all the classical economists, Smith is the one most associated with contributing to the development of the notion of circular and cumulative causation. These ideas are primarily found in the first three chapters of Book I of An Inquiry into the Nature and Causes of the Wealth of Nations (Kaldor famously remarked that economics went wrong in the fourth chapter of Book I of The Wealth of Nations!). As is well known, it is in these initial chapters of Smith’s most famous work that he discusses how the division of labor increases productivity, the most important factor in determining a nation’s per capita output. But there is much, much more, both in these chapters and in subsequent ones, insights that comprise Smith’s dynamic view of capitalism’s growth and development.

After outlining his famous example of how the division of labor in a pin factory permits a fantastic increase in output per worker (i.e., increasing returns), Smith notes that “The nature of agriculture, indeed, does not admit of so many subdivisions of labour, nor of so complete a separation of one business from another, as manufactures”:

This impossibility of making so complete and entire a separation of all the different branches of labour employed in agriculture, is perhaps the reason why the improvement of the productive powers of labour in this art, does not always keep pace with their improvement in manufactures. The most opulent nations, indeed, generally excel all their neighbours in agriculture as
well as in manufactures; but they are commonly more distinguished by their superiority in the latter than in the former.

(Smith 1986: 163)

This emphasis on dynamic potential of the manufacturing sector, in particular, would later be taken up by Young, Kaldor, and others (see, e.g., Ricoy 1987).

Development of a nation’s manufacturing sector as a whole leads to increasing productivity through external economies and increasing returns, in turn leading to a competitive advantage in global markets. A positive cycle of cumulative causation is engendered as competitive success increases aggregate demand, which leads to another round of growth and productivity increases. Such success is reflected on a nation’s balance-of-payments position. On the other hand, sluggish growth in a nation’s manufacturing sector means slow rates of productivity increases and weakness in global markets, reflected in the balance of payments. This latter scenario is typical of those nations assigned the role of primary-product producers in the international division of labor. Specialization in primary production means low income elasticities of demand and leaves the scope for technical change in agriculture dependent on importing capital. Industrialized countries benefit from the internal dynamics of the manufacturing sector with high income elasticities of demand for dynamic industries, harkening back to Lowe’s emphasis on the machine tools sector (Lowe 1976; Argyrous 1996). The splitting up of the world into competitively successful manufacturing economies and sluggish primary economies was dubbed by Kaldor (1981) the “polarization process” and has important points of contact with the Prebisch-Singer thesis regarding the declining net barter terms of trade for developing economies and the structuralist interpretation of the world economic system.

Following the discussion of the three ways in which the division of labor increases productivity, Smith notes the great amount of other workers’ labor embodied even in one cheap coat, and therefore the great amount of cooperation required by a social economy based on a system of general specialization. It is worthwhile to examine this passage at length:

Observe the accommodation of the most common artificer or day-labourer in a civilized and thriving country, and you will perceive that the number of people of whose industry a part, though but a small part, has been employed in procuring him this accommodation, exceeds all computation. The woollen coat, for example, which covers the day-labourer, as coarse and rough as it may appear, is the produce of the joint labour of a great multitude of workmen. The shepherd, the sorter of the wool, the wool-comber or carder, the dyer, the scribbler, the spinner, the weaver, the fuller, the dresser, with many others, must all join their different arts in order to complete even this homely production. How many merchants and carriers, besides, must have been employed in transporting the materials from some of those workmen to others who often live in a very distant part of the country! How much commerce and navigation in particular, how many ship-builders, sailors, sail-makers, rope-makers, must have been employed in order to bring together the different drugs made use of by the dyer, which often come from the remotest corners of the world! What a variety of labour too is necessary in order to produce the tools of the meanest of those workmen! To say nothing of such complicated machines as the ship of the sailor, the mill of the fuller, or even the loom of the weaver, let us consider only what a variety of labour is requisite in order to form that very simple machine, the shears with which the shepherd clips the wool. The miner, the builder of the furnace for smelting the ore, the feller of the timber, the burner of the charcoal to be made use of in the smelting-house, the brick-maker, the brick-layer, the workmen who attend the furnace, the mill-wright, the forger, the smith, must all of them join their different arts in order to produce them. Were we to examine, in the same manner, all the different parts of his dress and household furniture, the coarse linen shirt which he wears next his skin, the shoes which cover his feet, the bed which he lies on, and all the different parts which compose it, the kitchen-grate at which he prepares his victuals, the coals which he makes use of for that purpose, dug from the bowels of the earth, and brought to him perhaps by a long sea and a long land carriage, all the other utensils of his kitchen, all the furniture of his table, the knives and forks, the earthen or pewter plates upon which he serves up and divides his victuals, the different hands employed in preparing his bread and his beer, the glass window which lets in the heat and the light, and keeps out the wind and the rain, with all the knowledge and art requisite for preparing that beautiful and happy invention, without which these northern parts of the world could scarce have afforded a very comfortable habitation, together with the tools of all the different workmen employed in producing those different conveniences; if we examine, I say, all these things, and consider what a variety of labour is employed about each of them, we shall be sensible that without the assistance and co-operation of many thousands, the very meanest person in a civilized country could not be provided, even according to what we very falsely imagine, the easy and simple manner in which he is commonly accommodated.

(Smith 1986: 167–8)

This wonderful description demonstrates the crucial interdependencies emphasized by later theorists of circular and cumulative causation, so related to Young’s insistence that the most powerful cumulative processes are “macro-phenomena.” But what has not been recognized, perhaps, about this important passage is that it is also a terrific description of backward intersectoral linkages (Hirschman 1958)! Interestingly, Darity (1992), following the Williams–Rodney thesis, has employed the notions of backward and forward intersectoral linkages introduced by Hirschman in another version of the polarization process, “the rise of the west and the lag of the rest.” Enslaved Africans laboring on the Native American lands produced otherwise impossibly cheap raw materials and food for Europe. This lessened
agricultural requirements in Europe and supplied the raw materials for incipient European manufactures. The manufactured goods, made with raw materials produced on plantations by a labor force fed on plantation agricultural produce, were then taken to Africa, interrupting traditional crafts, and further financing industry back in Europe and plantations in the Americas. This is the famous Triangular Trade.

What kinds of goods and industries were involved in this process? — sugar, spices, cocoa, coffee, cotton, tea. Sugar, however, means not only sugar cane, but gives birth to refineries producing refined sugar and molasses and rum. This creates demand for all the tools and implements and machines used in growing, harvesting, processing, and transporting these goods. Furthermore, the production of these tools and implements and machines itself requires other tools and implements and machines, as well, of course, as labor. The labor employed in these processes also stimulates consumption demand, feeding into a whole host of consumption goods industries that require tools and implements and machines, and more labor, for their production, and on and on. In addition, there is the role of the shipbuilding industry and gun manufacturing, in the same manner giving rise to industries producing and servicing their component inputs. This frenzy of activity led to what Smith and later Marx called the primary or primitive accumulation necessary for capitalism’s “take-off.” At the same time, it also caused a depopulation of Africa’s youngest and most productive inhabitants, preventing the development of a widespread division of labor and other “salutary effects Adam Smith foresaw for a region anticipating growth in markets” (Darity 1992: 165). In addition, it was not only sugar and cotton in Africa; the fur trade in Canada and Siberia and spices and tea in India must be considered to fathom the scale and impact (the European discovery of the sea-route to Southern Asia around the Cape of Good Hope occurred in the same year as Columbus first arrived in the Americas).

With regards to this primary accumulation, Smith argued that a precondition for the division of labor is that some previous accumulation of capital must have taken place. Further, Smith underscores the fact that not only is the accumulation of capital a necessary precondition for the division of labor, it also leads to the improvement of the division of labor:

As the accumulation of stock must, in the nature of things, be previous to the division of labour, so labour can be more and more subdivided in proportion only as stock is previously more and more accumulated. ... As the accumulation of stock is previously necessary for carrying on this great improvement in the productive powers of labour, so that accumulation naturally leads to this improvement.

(Smith 1986: 228)

Young noted that this might sound like a circular argument, but that it is much more than that; it is the mutually reinforcing relation between economic growth and technical change. This fundamental, powerful dynamic is at the heart of Smith’s theories of endogenous growth and endogenous technical change.

As Lowe (1965), Heilbroner (1973), and others have argued, Smith’s growth model may be envisioned as a spiral, a circular process that continues on an expanding scale until it pushes up against some ultimate constraints. Once the historical institutions are in place and primitive accumulation has occurred, the analysis can be entered at any stage. We begin with capitalist investment, rooted in the desire of “bettering one’s condition,” itself the result of the need to be the object of “sympathy” (i.e., empathy), as Smith argued in The Theory of Moral Sentiments, and which is ultimately a “deception,” since it often does not pay off (Smith 1986: 120–1, 135).

Because accumulation involves capital and labor, and accumulation is the precondition for a greater division of labor, demand for labor increases. Increased labor demand puts an upward pressure on wages and, if this were the end of the story, accumulation might cease since higher wages mean higher costs for capitalists, which cut into profits. This is not what occurs, however, because here Smith introduces what constitutes another important endogenous dynamic of the classical approach: “the demand for men, like that for any other commodity, necessarily regulates the production of men” (Smith 1986: 204–5). Higher wages increase population, increasing labor supply, and causing wages to fall. With higher employment and wages at least as high as they were initially (and perhaps a little higher), the wage bill will be greater. With a workforce with greater purchasing power, consumption demand will be higher; in other words, the market will be bigger. Bigger markets and more demand mean more sales and profits, meaning more accumulation and a more refined division of labor (greater subdivision of tasks, introduction of machinery, higher productivity). Thus growth continues to spiral outward.

Here we have introduced another of the internal dynamics, one at least as important as those regarding labor supply and productivity. The famous title of Chapter III of Book I of the Wealth of Nations, “That the division of labour is limited by the extent of the market,” was called by Young “one of the most illuminating and fruitful generalizations which can be found anywhere in the whole literature of economics” (Young 1928: 529):

As it is the power of exchanging that gives occasion to the division of labour, so the extent of this division must always be limited by the extent of that power, or, in other words, by the extent of the market. When the market is very small, no person can have any encouragement to dedicate himself entirely to one employment, for want of the power to exchange all that surplus part of the produce of his own labour, which is over and above his own consumption, for such parts of the produce of other men’s labour as he has occasion for. There are some sorts of industry, even of the lowest kind, which can be carried on nowhere but in a great town. A porter, for example, can find employment and subsistence in no other place. A village is by much too narrow a sphere for him; even an ordinary market town is scarce large enough to afford him constant occupation.

(Smith 1986: 171)
The flip-side of this, of course, is that bigger markets permit greater specialization. Interestingly, Smith notes much later on, in Book IV, Chapter I, that the main economic benefit to Europe of the discovery of the Americas was not the gold and silver obtained there, but the dynamic set in place by the opening up of new and bigger markets:

By opening a new and inexhaustible market to all the commodities of Europe, it gave occasion to new divisions of labour and improvements of art, which, in the narrow circle of ancient commerce, could never have taken place for want of a market to take off the greater part of that produce. The productive powers of labour were improved, and its produce increased in all the different countries of Europe, and together with it the real revenue and wealth of the inhabitants.

(Smith 1937: 415–16)

The sentence that follows this passage is most interesting, given the tendency of some authors to claim that Smith recognized process innovations, but not product innovations (see, e.g., Heilbroner 1973): “The commodities of Europe were almost all new to America, and many of those of America were new to Europe” (Smith 1937: 416). Of course, improved product quality and design and not only lower costs are an outgrowth of advancing productivity.

Given that Kaldor (1972: 1240–1) has stated not only that economics went wrong beginning in Chapter IV of Book I of The Wealth of Nations, but specifically refers to Smith’s notion of natural price (introduced in Book I, Chapter VII), it seems relevant to briefly note how, perhaps contra Kaldor, this and related ideas might also be seen as part of the classical dynamics. In addition, the distinction between natural and market prices (and their relation) is made not only by Smith, but by Ricardo and Marx as well. The market price of a commodity can deviate from its natural price when there are imbalances between quantity supplied and effective demand. These imbalances set a process in motion such that market price will tend to the natural price. The classical notion of competition states that capital seeking the highest rate of return will tend to establish a uniform rate of profits between industries. This dynamic process has in modern versions of classical analysis been termed cross-dual dynamics, which Flaschel and Semmler have expressed as:

(i) the output of a commodity is expanded or reduced (through entry or exit of firms) whenever the excess of price over cost (including normal profits) is positive or negative (“Law of excess profitability”); and, (ii) the price of a commodity is raised or lowered whenever there is an excess demand or supply on the market (“Law of excess demand”).

(Flaschel and Semmler 1988: 3)

Recent discussions and formalizations demonstrate that far from some simple, static framework, such an adjustment process represents a dynamic and nonlinear relationship between supply and demand imbalances, relative price changes, profit rate differentials, and changes in sectoral growth rates, and “must surely be regarded as one of the richest legacies of [Smith’s] thought, and of the Classical tradition” (Walsh 1992: 14).

David Ricardo

Ricardo is not often mentioned in the context of the principle of circular and cumulative causation, but not only do you find in his work such cross-dual dynamics as we have just discussed, but endogenous growth and structural change as well. While Smith, as we have seen, emphasized increasing returns in manufacturing, Ricardo focused on diminishing returns in agriculture. In both his Essay on Profits and his On the Principles of Political Economy and Taxation, Ricardo considers what will happen in an advancing capitalist economy depending on natural resources such as land in the course of its development. He begins with the following basic vision: “This accumulation would lead to an increased demand for labour, to higher wages, to an increased population, to a further demand for raw produce, and to an increased cultivation” (Ricardo 1951: 790). Here, we see that Ricardo accepts the classical theory of population, already introduced in the discussion of Smith above. Ricardo, however, then takes this in another direction, as he raises the issue of how the larger population leads to an increase in the demand for food and other primary commodities. This prompts Ricardo to introduce a distinctly classical notion of diminishing returns.

Ricardo’s famous Chapter II of his Principles, “On Rent,” contains his theory of differential rent, first introduced by him in his Essay on Profits, and also by some of his contemporaries, such as Malthus and Torrens.

On the first settling of a country, in which there is an abundance of rich and fertile land, a very small proportion of which is required to be cultivated for the support of the actual population, or indeed can be cultivated with the capital which the population can command, there will be no rent; for no one would pay for the use of land, when there was an abundant quantity not yet appropriated, and, therefore, at the disposal of whosoever might choose to cultivate it.

(Ricardo 1951: 69)

However, land is not available in infinite supply nor is all land of equal fertility:

It is only, then, because land is not unlimited in quantity and uniform in quality, and because in the progress of population, land of an inferior quality, or less advantageously situated, is called into cultivation, that rent is ever paid for the use of it. When in the progress of society, land of the second degree of fertility is taken into cultivation, rent immediately commences on that of the first quality, and the amount of that rent will depend on the difference in the quality of these two portions of land.

(Ricardo 1951: 70)
Here it is worthwhile to note how Ricardo’s distinctly classical notion of diminishing returns differs from the neoclassical notion. Whereas in the classics, as we have seen, there is an asymmetric analysis of diminishing returns in agriculture and mining only, neoclassical models portray all factors of production symmetrically, experiencing increasing returns as production begins and diminishing returns as production continues (as in the U-shaped average cost curve). Neoclassical economics also abandoned the qualitative aspects of returns, limiting the causes to quantitative differences only. In neoclassical economics all factors of production are homogeneous, and so there are only diminishing returns of the intensive variety, in the classics diminishing returns may be extensive or intensive. Ricardo (1951: 70) even remarked on the possibilities of diminishing returns due to “peculiar advantages of situation,” such as proximity to the central market outlets, resulting in differential transportation costs (an idea first introduced by William Petty, who Marx considered the originator of classical political economy). These asymmetrical and qualitative aspects of the classical approach bear family resemblances to the notion of circular and cumulative causation rather than the purely quantitative equilibrium approach of neoclassical economics.

Continuing with Ricardo’s scenario, as accumulation takes place, population grows and the demand for food increases, cultivation will have to be extended on to less fertile land, where the productivity of labor is therefore less. If it is assumed, as a first approximation, that wages are still the same, profits must be less on the less fertile land. But profits cannot be less – competition enforces a tendency toward uniformity in the rate of profit. Therefore, the surplus on the least productive land determines the rate of profit throughout agriculture. Landlords with more productive land charge rent for its utilization. So the “superprofit” on the more productive land becomes rent. Meanwhile, though, as cultivation continues to be extended, profits are shrinking.

Following Ricardo’s approach in his Essay on Profits, we now relax the assumption that wages remain constant. In his Chapter V of the Principles, “On Wages,” Ricardo remarks that “with every improvement of society, with every increase in its capital, the market wages of labour will rise” (1951: 96). Just as in the case of commodities, the market wage will tend toward the natural wage, but even though the natural wage is determined by subsistence, in the classical theory wages are historically and socially – not biologically – determined by subsistence. Ricardo writes:

> It is not to be understood that the natural price of labour, estimated even in food and necessaries, is absolutely fixed and constant. It varies at different times in the same country, and very materially differs in different countries. It essentially depends on the habits and customs of the people. An English labourer would consider his wages under their natural rate, and too scanty to support a family, if they enabled him to purchase no other food than potatoes, and to live in no better habitation than a mud cabin; yet these moderate demands of nature are often deemed sufficient in countries where “man’s life is cheap,” and his wants easily satisfied. Many of the conveniences now enjoyed in an English cottage, would have been thought luxuries at an earlier period of our history.

(Ricardo 1951: 96–7)

Since the “market rate of wages” may, in an improving society, for an indefinite period, be constantly above” their natural rate, rather than the market rate tending back down to the natural rate, the natural rate may in these circumstances end up rising to the market rate (1951: 94–5). In any case, the rising unit cost or cost per bushel of corn due to deteriorating production conditions (less fertile land) leads to a rise in the price of corn and thus increases the value of the means of subsistence. Profits get squeezed from below by wages as well as from above by rent. When profits fall, accumulation is choked off, investment is not taking place, and stagnation sets in.

There are two factors emphasized by Ricardo that can fend off the stationary or declining state: technological progress or foreign trade. While growth is endogenous in Ricardo, technological change is not. Yet, Ricardo in the third edition of the Principles, did add a chapter, “On Machinery,” in which he reversed an earlier position and put forward an analysis that recognized technological unemployment. In other words, Ricardo conceded the possibility that labor displaced by technical progress might not be employed elsewhere, which was the prevalent view up until that time. Ricardo’s analysis in Chapter XXXI has been called an “early and rude type of traverse analysis” (Kurz 1984). The traverse describes an economic system shunted off a steady-state growth path by structural change.

While macro-economics regards changes in the levels and rates of growth of aggregate economic activity, structural change deals with variations in the composition of economic activity and the effect such variation has on the operation of the economic system. Structural analysis thus often focuses on such factors as organizational and institutional evolution, changes in labor supply and the supply of natural resources, capital- and labor-displacing technological progress, and the composition of final demand. The importance of these factors for sector proportionality and balance means that structural analysis is often conducted at a slightly lower level of aggregation than most macro-economic models, highlighting (for example) inter-industry relations. Structural change may also be seen as changes in the data of economic theory and is therefore important for understanding the long-term development of the economic system. A nation’s structural position in the global economy often has important implications for such development, as well as for human, social, and environmental well-being generally. Structural change was an important part of the work of the classical political economists and Marx, and is at the heart of the principle of circular and cumulative causation.

**Karl Marx**

Ricardo’s conclusion that workers displaced by technical progress might not be re-employed elsewhere in the economy was a point picked up and developed by Marx and incorporated into his analysis of growth and cycles. In Marx, however,
labor-displacing technological change is endogenous. Marx also outlined the requirements for proportionality and balance in his schemes of reproduction, with output in the capital goods sector replacing the fixed capital in both the capital and consumption goods sectors, and output in the consumption goods sector providing the means for subsistence for workers in both sectors. Expanded reproduction thus requires not only aggregate but also inter-sectoral proportionality and balance.

In Chapter 25 of Volume 1 of Capital, "The General Law of Capitalist Accumulation," Marx lays out the dynamic relationship between unemployment, wages, profitability, and technical change. This is Marx's theory of the trade cycle, but it also concerns the longer term rhythms of accumulation. Unlike many monetary theories of the business cycle, in Marx's structural theory the same forces that determine the long-run trajectory of the system also explain the business cycle. Slumps may be exacerbated by monetary disturbances, but at bottom are regulated by the structural and technological features of capitalist accumulation.

Marx's analysis in Chapter 25 commences in a manner reminiscent of both Smith and Ricardo, as outlined above: accumulation increases the demand for labor, causing wages to rise:

Growth of capital implies growth of its variable constituent, in other words, the part invested in labour-power. A part of the surplus-value which has been transformed into additional capital must always be re-transformed into variable capital, or additional labour-fund. If we assume that, while all other circumstances remain the same, the composition of capital also remains constant (i.e. that a definite mass of the means of production continues to need the same mass of labour-power to set it in motion), then the demand for labour, and the fund for the subsistence of the workers, both clearly increase in the same proportion as the capital, and with the same rapidity. Since the capital produces a surplus-value every year, of which one part is added every year to the original capital; since this increment itself grows every year along with the augmentation of the capital already functioning; and since, lastly, under conditions especially liable to stimulate the drive for self-enrichment, such as the opening of new markets, or of new spheres for the outlay of capital resulting from newly developed social requirements, the scale of accumulation may be suddenly extended merely by a change in the proportion in which the surplus-value or surplus product is divided into capital and revenue – for all these reasons the requirements of accumulating capital may exceed the growth in labour-power or in the number of workers; the demand for labourers may outstrip the supply, and thus wages may rise. This must indeed ultimately be the case if the conditions above continue to prevail. For since in each year more workers are employed than in the preceding year, sooner or later a point must be reached at which the requirements of accumulation begin to outstrip the customary supply of labour, and a rise of wages therefore takes place.

(Marx 1990: 763)

Here, however, Marx departs from the earlier discussions in the classics in some important ways. Recall that in both Smith and Ricardo, the increasing demands for labor and rising wages result in increased labor supply via the classical or Malthusian law of population. Marx harshly criticizes and roundly rejects any notion of "natural" or universal laws of population growth. Instead, he views "laws" of population as only tendencies of a particular mode of production. In capitalism, this takes the form of what Marx terms the relative surplus population, or reserve army of labor:

This is a law of population peculiar to the capitalist mode of production; and in fact every particular historical mode of production has its own special laws of population, which are historically valid within that particular sphere. An abstract law of population exists only for plants and animals, and even then only in the absence of any historical intervention by man.

(Marx 1990: 783–4)

For both Marx and Keynes, unemployment is a normal feature of capitalism, but whereas for Keynes unemployment is irrational, for Marx it is functional. Unemployment is not an irrational by-product; it serves several important purposes in the system. First, unemployment provides a pool of labor standing ready to work when the demand for labor rises in response to expansion. Second, unemployment helps to hold down wages by decreasing the bargaining power of labor. Third, unemployment disciplines workers, who will be fearful of dismissal when there are many potential replacements needing employment.

Another distinctive feature of Marx's theory of endogenous growth is that it is driven by endogenous labor-displacing technical change. In Smith, there is endogenous technical change, but it is not labor-displacing; in Ricardo, there is labor-displacing technical change, but it is not endogenous. In Marx, competitive pressures require capitalists to seek to raise productivity and cut costs. Both productivity and costs are partially determined by technology.

We now have the pieces required to put together Marx's theory. As capitalist expansion takes place, firms increase their demand for labor, wages get bid up, which are costs for business that cut into profits. Firms respond by instituting cost-cutting technical change. This technical change is labor-displacing, so unemployment rises and the reserve army expands, dampening wages, and at the same time increasing productivity and profits. As profits expand, growth expands, the demand for labor rises, and this puts upward pressure on wages, cutting into profits, and growth slackens, leading to another round of cost-cutting, labor-displacing technical change. This is the expansion and contraction of the aggregate reserve army.

However, over time, the capital–labor ratio is rising; in other words, firms don't go back to the old, more labor-intensive methods of production when they increase their demand for labor, they are increasing their demand for labor with the new technical organization. So less labor is being used per machine as a secular trend. So, technical change alters the capital structure; more labor is
being used, but with the new production methods. While individual capitalists benefit from lower costs, the higher capital intensity of production results in a falling average rate of profit for the economy as a whole.

Not only does Marx have a theory of endogenous growth and a theory of endogenous technical change, he has a theory of endogenous structural change. In addition, there are a number of other features of Marx's system that have family resemblances with the principle of circular and cumulative causation.

Modern developers of the principle of circular and cumulative causation have often looked to Adam Smith for anticipations of the notion, but the theories of Ricardo and Marx also contain the basic vision of cumulative processes. Some contemporary Post Keynesian economists who have been strongly influenced by the classics and Marx have put forward frameworks that include, explicitly or implicitly, circular and cumulative causation. In the final section we will briefly examine two examples.

**Transformational growth and structural economic dynamics**

Two Post Keynesian economists who take much of their inspiration from classical political economy (and Marx), and whose works contain important points of contact with the principle of circular and cumulative causation, are Edward J. Nell and Luigi L. Pasinetti. Both authors regard capitalism as a dynamic economic system exhibiting endogenous structural and technical change, and operating in historical time. This section briefly examines their ideas.

Nell's theory of transformational growth bears significant family resemblances to the notion of circular and cumulative causation. Contemporary capitalism exhibits ongoing structural and technological change, and so is not well depicted by instantaneous adjustments leading to equilibrium solutions.

Equilibrium theory is largely useless for practical purposes. It is unable to explain the ordinary behavior of business and the working of markets, let alone speculate on the economic forces that helped to create the modern world.

(Nell 1998: 3)

Transformational growth is the "interlocking emergence of new products and new processes, creating new markets, and new industries" (Nell 1992: 106). As in the classics and Marx, competition drives these changes.

Competitive market pressures especially breed innovation. Innovation leads to the expansion of existing markets, and to the creation of new markets, which in turn give rise to further competitive pressures, leading to a bigger push to innovate, furthering the expansion and the creation of markets, and so on. Transformational growth rejects the notion of steady-state growth, instead viewing growth as disproportional, qualitative, and disruptive. These kinds of transformative processes result in, and are further caused by, changes in socioeconomic relationships, such as the "distribution of income, and the urban–rural relationship, together with the nature of work, of household life, and so on" (Nell 1988: 162). The process of transformational growth is an interdependent and cumulative process.

Nell employs transformational growth to examine the transition from a craft-based economy of family firms and family farms into a modern industrial mass production economy, the key features of which are not only production on a large scale, but production that is by its nature in continuous endogenous flux, and where economic processes are wholly interdependent. In a dynamic framework, economic data such as socioeconomic relationships, or parameters such as technical coefficients of production, are bound to change through time. As Lowe, a colleague and mentor of Nell at the New School for Social Research, has put it, once analysis moves beyond the short period into a dynamic framework, it is improper to treat economic data as given:

It is a fundamental theorem of realistic theory that under the particular social conditions of the industrial system, data and process are involved in a regular and continuous interaction which makes any concrete constellation, and therefore the system as a whole, essentially unstable and liable to transformation.

For this reason in any long period analysis concerning the industrial system, on principle the data are to be handled as dependent variables.

(Lowe 1935 2003: 146–7)

Pasinetti has also been influenced by Lowe's ideas, and was a student of Leontief, who was in residence at Kiel University in the 1920s while he wrote his doctoral dissertation on input–output analysis, and where Lowe was research director.

It should be noted that there are magnitudes, such as technology, or the attitudes and preference of consumers, that an economic analysis may consider as exogenously given; and yet they are extremely, if not crucially, variable over time.

(Pasinetti 1993: 11)

Structural analysis is indispensable for understanding the process of transformational growth. A structural model of production and distribution describes completely the: (1) industrial/sectoral relationships; (2) socio-technical relationships as expressed by final demand; and (3) conditions required for the system as a whole to reproduce itself. For the practical purposes of planning and policy, conventional input–output analysis may be the most appropriate to describe the interdependence of industries in a mass production economy. Models that are not as disaggregated as input–output models may be more useful for theoretical analysis, however. Horizontal models (such as Lowe's three-sector framework) emphasize sectoral interdependence, inter-industry linkages, and their associated implications (Lowe 1976). The horizontal models are advantageous, as they are parsimonious, and they highlight time lags, bottlenecks, and other rigidities which make up the physical and technical nature of the system. Growth of industries within a given sector create backward and forward linkages, as capital
goods are highly specific and are not shiftable between different lines of production. Industrial growth in non-primary sectors requires the formation of real capital goods, creating backward linkages, to be used as inputs into the expanding sector. Growth in primary sectors creates forward linkages, as increases in output are used both as inputs into the production of other goods, and a portion of the output is purchased by consumers, contributing to final demand.

The interdependencies of a mass production economy have circular and cumulative effects. The growth in sector i causes an increase in the demand for the output of sector j, which in turn increases income and employment in sector j, causing an increase in final demand, which creates positive feedbacks to sector i, generating further demand for output in sector i. Thus, any change in the final demand for goods and services in any given industry is bound to have a cumulative effect, since these changes happen in the same direction increasing the amplitude of the result, such as in the multiplier processes of Keynes, central for both Nell and Pasinetti.

Inter-industry models such as input-output models or horizontally integrated models, with a given set of technical coefficients, are simply snapshots of the economic process at a given point in time. Horizontal models are useful for describing the physical, technical nature of the production system at a given point in time, and have been fruitfully employed to investigate the traverse from one growth path to another.

Pasinetti’s structural economic dynamics replaces inter-industry relationships to a framework in terms of vertically integrated sectors. Pasinetti’s framework recognizes that the economy is a multi-sectoral industrial system with ongoing technical change, and ongoing changes in the level and composition of final demand. Pasinetti’s model, unlike the horizontally integrated models of Leontief and Lowe, is not linked by inter-industry coefficients, but rather each of the sectors is linked by the overall impacts of effective demand (see Pasinetti 1981, 1993, 2007). The nature of employment in Pasinetti’s model is due to the division of labor among the sectors, which enables each individual laborer to contribute to only a small portion of the production process, but contributing to the demand of all the goods and services produced in the economy. Pasinetti’s model, while not as parsimonious as the Lowe model, nor as descriptive as the Leontief input–output model, may be preferable for the investigation of certain problems, as the model has elements of effective demand (which affects the coefficient) and technical progress (affecting the l coefficient).

The Pasinetti model describes the interdependencies of production and distribution, and the structural and technological requirements for the conditions for full employment.

PASINETTI’S MODEL

1. Movement of labor coefficients: \( l_i(t) = l_i(0) e^{pt} \), \( i = 1, 2, \ldots, m \)

2. Movement of per capita consumption: \( c_i(t) = c_i(0) e^{pt} \)

3. Population growth: \( N(t) = N(0) e^{pt} \)

4. Structural dynamics: \( \rho_i \neq \rho_j \); \( r_i \neq r_j \); \( r_i \neq r_j \) — where: \( \rho_i \); \( r_i \); \( g \) = \( 0 \)

\( N(t) = \text{total population at time } t \)

\( l_i(t) = \text{labor coefficients (labor required per unit of output at time } t) \)

\( c_i(t) = \text{rate of growth of the labor productivity in sector } i \)

\( c_i(t) = \text{per capita consumption} \)

\( r_i = \text{rate of change of the per capita consumption of commodity } i \)

\( g = \text{rate of growth of the population} \)

\( \mu = \text{proportion of active to total population} \)

\( v = \text{proportion of working time to total time} \)

From equations (1) and (2) above it can be seen that the condition for full employment is given by:

\[
\frac{1}{\mu(t)v(t)} \sum_{i=1}^{m} c_i(0) l_i(0) e^{pt} - \rho_i \mu - 1 = 0
\]

which states that the proportion of labor employed in each sector must add to one, and is dependent upon demand for output within each sector, as well as upon structural and technological change. The full employment condition is rarely if ever fulfilled and is certainly not a self-equilibrating process. The reason is due to the nature of the parameters \( r_i \), which is essentially the effective demand condition, and \( \rho_i \), labor productivity, which serves as a proxy for technical change. The overall effect is on sectoral employment, \( 1 \), which can be positive (absorbing labor into sector i) or negative (driving labor from sector i). If, as is most often the case, labor productivity is increasing in sector i, causing \( \rho_i \) to be positive, per capita consumption in sector j, k ... m must be

Pasinetti’s Pure Labor Model: physical quantity system

\[
\begin{bmatrix}
1 & 0 & \ldots & 0 & 0 & -c_i(t) & Q_i(t) \\
0 & 1 & \ldots & 0 & 0 & -c_j(t) & Q_j(t) \\
\vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \vdots \\
0 & 0 & \ldots & 1 & 0 & -c_i(t) & Q_i(t) \\
\vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \vdots \\
0 & 0 & \ldots & 0 & 1 & -c_m(t) & Q_m(t) \\
-l_i(t) & -l_j(t) & \ldots & -l_k(t) & -l_m(t) & \mu(t)v(t) & N(t)
\end{bmatrix} = 0
\]

Pasinetti’s Pure Labor Model: price system

\[
\begin{bmatrix}
1 & 0 & \ldots & 0 & 0 & -l_i(t) & p_i(t) \\
0 & 1 & \ldots & 0 & 0 & -l_j(t) & p_j(t) \\
\vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \vdots \\
0 & 0 & \ldots & 1 & 0 & -l_i(t) & p_i(t) \\
\vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \vdots \\
0 & 0 & \ldots & 0 & 1 & -l_m(t) & p_m(t) \\
-c_i(t) & -c_j(t) & \ldots & -c_m(t) & -c_m(t) & \mu(t)v(t) & w(t)
\end{bmatrix} = 0
\]

Figure 10.1 Pasinetti’s pure labor model.
growing in order for labor to be reabsorbed and return the system to full employment. Pasinetti’s result is that the economy, owing to its interdependence, is inherently unstable. Non-proportional sectoral growth has an effect on the entire economic system (Pasinetti 2007). Full employment is rarely if ever achieved, let alone maintained, due to the perpetual movement of per capita consumption and technical progress. The two are moving in opposite directions, and so will cancel each other out to some extent, “but never completely, in any systematic way” (2007: 286). Pasinetti shows quite clearly the complexity of the economic system. Industrial capitalism suffers from two types of unemployment: technological or Marxian unemployment and Keynesian unemployment, as described by Pasinetti’s model. This leads Pasinetti to the following conclusion:

Keynes intuition is proved right and the implications are far reaching…. [The condition for full employment] is not a once and for all condition, except in the extreme trivial case of a perfectly stationary economic system. (Pasinetti 2007: 286)

In a dynamic system, every component of equation (5) is moving, corresponding changes in demand by consumers of given output in given sectors, which further has an effect on all other sectors of the economy. Structural models demonstrate that modern mass production economics are never at rest. They are in continuous flux, with the expansion of industries within sectors, the introduction of new product and process innovations, leading to the addition of new industries and the demise of obsolete, non-competitive industries. The role of the market in a mass production economy is to foster innovation. Markets reward winners through an increase in demand, and punish losers whose innovations do not succeed. Production is an interdependent process, and is by its nature unbalanced. Structural models are useful to illuminate the connection of industry to industry and sector to sector, and the connection of society to production, and production to society. Transformational growth, depicting structural and technological change, is an inherently dynamic, social, interdependent process, and dovetails nicely with the principle of circular and cumulative causation.

References


