

INVESTMENT CHAINS THROUGH HISTORY OR AN HISTORIAN'S OUTLINE OF DEVELOPMENT: "USING GOODS OF EVER HIGHER ORDERS"

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Technology is widely seen as the key to development. But this does not explain how a single innovative machine multiplies itself. An alternative tack: Menger's analysis of investment chains. Begin with first-order (consumer) goods and examine the second, third-, and other successively higher-order goods required. The range of final goods produced in four historical contexts (Upper Palaeolithic Europe, early modern England, DCs in the late 20th century, Mali in the same period) are set out. In each context, for a selected first-order good, the investment chain of successively higher-order goods is detailed. Such investment chains are most complex in DCs.

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We begin with three authoritative views on long-term economic development:- by two leading historical economists; a well respected applied economist; and a foremost, very senior historian. This then leads us into an examination of the range of final outputs, and the production processes through which they are provided, in four historical contexts: Upper Palaeolithic Europe, early modern England, the DCs in the late 20th century, Mali in the late 20th century. We see that 'investment chains' are extremely 'short' (in relative terms) in the first historical context; are complex and geographically far more extensive in the second; are extraordinarily complex and extend across the globe in the third; and, *relative to* the DCs, are much 'shorter' and geographically very restricted, in Mali. The range, quantities and quality of final outputs correspond, in all four historical contexts (see below).

TECHNOLOGY THE PRIME MOVER (?)

As Rondo Cameron and Larry Neal see it, "one of the...most pressing contemporary problems [is] ...uneven economic development." At its heart lies the "seemingly simple question" of why "some nations [are] rich and others poor." And, "although much research has been devoted to the problem, scholars and scientists have not yet produced... an operationally useful and generally applicable" theory. Cameron and Neal set out a

hypothesis: the “upper limits” to a society’s “economic achievements” are set by “the resources available to” it, “with a given technology”. This “ceiling” is raised effectively by “technological change”, which increases productivity and opens up “new resources”. But “diminishing returns” eventually set in. There is “a new ceiling on production”. However, as and when “technological change” recurs, and there is a new “epochal innovation” (Simon Kuznets’ term), this “again increases productivity and opens up still newer resources” [Cameron and Neal (2003) pp. 3, 18]. In other words, it is technology which keeps pushing up the ceiling of scarce resources. A new, productive machine multiplies itself and output grows until returns diminish. Then a newer, even more productive machine is invented, and it, too, grows in numbers, with output expanding even further, until returns again fall off; and so on.

Mokyr points to four sources of economic growth: “increases in the capital stock”; “commercial expansion”; “scale or size effects”; “increases in the stock of human knowledge.” Mokyr concentrates on a branch of this last, technology.

“Technological progress has been one of the most potent forces in history...it has provided society with...a ‘free lunch’...an increase in output” disproportionately greater than the increased “effort and cost” put in to obtain it. “[T]echnological change [...] increases...the productive potential of the economy.” For a given output, “technological progress” reduces costs, or it results in “better or new products.” The “Industrial Revolution [was] unprecedented and accelerating technological change.” “Technologically creative societies...generated innovations whose benefits dwarfed the costs of invention and development and thus created a free lunch.” To give “economic activity” a “relatively low” rank “is inimical to technological progress.” It means “the best educated and most successful” are channeled “into activities that do not increase...productive capacity...” Since it is the “uneducated and inarticulate” who do “productive work”, “the diffusion and adoption of new technology” is thwarted. Compared with other societies, “Europe approached the new knowledge it generated with a more pragmatic attitude...” [Mokyr (1990) pp. 3, 4, 6, 82, 174-5]. In short, the DCs experienced a continuing wave of evermore productive machines; the LDCs didn’t.

Landes defines the ‘Industrial Revolution’ as: (1) “the substitution of machines...for human skill and effort” (2) the invention of engine-power, “opening an almost unlimited supply of energy” (3) “the use of new and far more abundant raw materials”, especially minerals. An “abundance and variety of innovations” in many “branches of industry” mutually reinforced one another, “transformed...cotton manufacture”, and “drove further gains on an ever widening front.” Finally, there came the “invention of machines to build machines”. All this happened because the underlying principles “could take many forms, find many uses.” The result was not just “a rapid rise in productivity and...income per head”, but “self-sustaining” growth: “for the first time in history both the economy and knowledge were growing fast enough to generate a continuing flow of improvements” [Landes (1999) pp. 186, 191, 186-7].

All these occurred in 18th-century Britain because it “was a precociously modern, industrial nation”. By “the early eighteenth century [it] was well ahead, in cottage manufacture...seedbed of growth;” in the use of coal; and “in the technology of...the core of the Industrial Revolution: textiles, iron, energy, and power.” This “early technological superiority...was itself an achievement...the result of work, ingenuity,

imagination, and enterprise.” Some key “technical sequences” went back to the sixteenth century: manufacturers then already used coal (instead of charcoal) in a number of industries, e.g., “glassmaking, brewing, dyeing, brick- and tile-making...” From these foundations, inventors went on to develop steam technology far, far beyond, in a series of interrelated changes and improvements in efficiency through the 18th and 19th centuries. The sequence from the first coke-smelted iron to Bessemer steel went from 1709 to 1856. Power spinning “turned industry upside down.” Rotary engines produced “big gains” in metal-making [Landes (1999) pp. 219, 213, 215, 190, 187-9, 191].

Furthermore, “commercial agriculture” was efficient and productive, “a force for economic change.” Its “contribution...to British industrialisation” can hardly be exaggerated. There were “major gains in land and water transport [...] these improvements [were] widespread and effective.” Britain also had modern “nonmaterial values...and institutions.” These are “familiar” to us, but they are “a big departure from older norms”. Modern values were “accepted and adopted....only in the face of tenacious resistance.” Another “key area of change: the increasing freedom and security of the people.” And the whole was underpinned by “the purchasing power of the lower classes...their ability to buy beyond the necessities” together with “the wealth...of the great English middle class” [Landes (1999) pp. 213, 214, 215, 217, 219, 221].

The regions that failed to progress technologically had choked off scientific (and so technical) inquiry, at some point: e.g., the Islamic world, Spain, Portugal, Italy. In India, both employers and workers saw hard labour as natural and unavoidable. Moreover the caste system locked everyone concerned into existing production techniques and made change extremely difficult. Thus it could not occur to people to invent machines [Landes (1999) pp. 54-5, 179-83, 225-230].

THE QUESTIONS HISTORIANS ASK (THEY ARE NOT SCIENTIFIC ECONOMICS)

Landes summarises well some important features of 18th -century Britain. However, taking together all the observations quoted, from all the above authors, certain questions arise:

(1) The inventor invents but a *single* new machine. To affect production, hundreds, even thousands of such machines are necessary. How does an invention multiply itself on a scale sufficient to have this impact? Can an invention *also* supply the *resources* needed to produce all these thousands of new machines? How so? (2) The various favourable developments mentioned clearly supplied a fertile environment for productive innovation. But how so? How precisely do all these interact?

In short: How did it happen that people produced (and continue to produce) this continuing flow of machines? Such that even economists and historians are not conscious (i) that it occurs and (ii) that they are therefore taking it for granted? Clearly this development could not have emerged overnight, it took very long periods of time indeed, to evolve. And it clearly is an integral, if invisible, aspect of historical contexts. How do we get to see it? Clearly what is needed is an analytical tool suited to historians' investigations.

The historian's task is distinct from the economist's. Neoclassical theorising rests solidly on that of natural scientists, via the philosophers of science. Scientists study

various aspects of the natural world. In doing this, they devise, discuss and develop theories, and investigate the data of the natural world. Philosophers of science then discuss the philosophical features of these theories and of the process of scientific theorising, including the acceptance/rejection of theories, and criteria for declaring theories to be progressive (or not).

In line with this philosophical model, neoclassical scientists too develop and discuss scientific theories. Now, scientific theories ultimately use data; and so neoclassical theorising, too, in due course goes through exercises using empirical data. Because the process is scientific, neoclassicals know that the empirical world is simply a gigantic data warehouse. The theory gives economists a shopping-list of the data required for the exercise; these data are then simply taken off the warehouse shelves. The batches of data so used are identified by the appropriate labels, dates and place-names. Thus theories are put through their paces and their points displayed in such empirical exercises; the theoretical cake receives a bit of empirical enhancement. (Theories are being continually improved, of course, with better ingredients and recipes; empirical exercises then go on top). Neoclassical economists specialise in particular branches of theory; each is tidily self-contained.

Now in neo-classical exercises, the data are worked through; they are then no longer 'raw' data. And so any question *can* relate, of course, only to the *kinds* of *techniques* used to work the data, the sorts of theoretical machinery they have been put through. Alternative techniques will, of course, produce different results from the raw data, so it is vital for the economist to be well-acquainted with a wide array of scientific methods of investigation.

As distinct from the above, historians (and 'pre'-historians) investigate and specialise in, (particular aspects of) specific historical contexts: the woolen industry in 18th century Yorkshire; iron production in England from 1500 to 1700; the European Palaeolithic; cultural development in Tokugawa Japan; international trade in the later 19th century; etc. Each such study contributes to building up a picture of that specific historical (or pre-historical) context.

Now, "the bulk of [historical] evidence...is produced by people doing things". And so it is through studying "the extant deposits of human experience (action and thought)..." [Elton (1983): p. 92] that historians learn about all these various historical contexts. Such residues from what people have done are variously geographical (landscape changes), artefactual, documentary, architectural, textual, etc., according to the context and the aspect studied. Thus historians wrestle directly with the results of people's activities, what people have done. This makes the historical "discipline...more exacting and more technical than often appears to be the case...the techniques involved in the framing of proper questions,...the collection and assessment of historical evidence, above all in the subtle relationship between evidence and the propriety of the question are complex and learnt only through hard experience...The techniques required in the writing of history...are equally complex..." [Loyn (1979): p. 171].

Many of the activities/interconnected structures that historians investigate, are relatively straightforward to analyse: 'towns', 'trade', 'army', etc. Here the interconnections and linkages amongst particular actions and activities are so obvious

that historians virtually never realise that they are in fact using an implicit theory. Just as M. Jourdain was astonished to learn he spoke prose, many historians are unaware that they do use abstract theoretical constructs, as such use is unwitting on their part.

But more complex structures and interconnections do not declare themselves, as we have seen above: whence this continuing flow of ever-improving machines we now take for granted? If historians are to go *beyond* what is immediately and unmistakably obvious, i.e. beyond what can be seen through simple and implicit theoretical lenses, the kind one doesn't even know one is wearing, historians have to select and use appropriate analytical tools. It is only through such suitable lenses that historians can see how numerous activities and developments are *in fact* linked and connected together, in and through what people actually do. Without the proper analytical tools, these complex structures and their operations must remain unknown: key interrelationships continue invisible, key links cannot be seen, and unsuspected confusion reigns. Suitable analytical lenses (or tools) have to *derive from that which is common to all history*, the fact that these are people's actions [Mises (1960): pp. 95-96, 98-102, 107, 122-24 and ch. 1; Hayek (1948): pp. 57-76, esp. 67-68, 126-27].

INVESTMENT CHAINS: THEIR MAIN CHARACTERISTICS (FOR HISTORIANS)

In thinking *systematically* about what people actually do, we comprehend that people have various aims, material, religious, social, cultural, artistic, etc. People (in the early 21st century, in the DCs), feed, clothe, and house their immediate families (and their pets), and provide them (the humans) with various electrical and electronic gadgetry (*inter alia*). People (in this historical context) also ferry their children to school and to various activities; they go to (or participate in) sports events; some visit art galleries, attend concerts; many read books and/or journals, listen to CDs; most give to charities, help their relatives, friends, neighbours in various ways; etc. And to achieve all these several ends, people use material goods and services. That is, the latter are *means to* various ends, not ends in themselves.

To further analyse people's actions, we can *classify* the material outputs, the material means, that people use. People use material resources both directly and indirectly. Those goods and services that people use directly to achieve their several ends, can be termed outputs of the first order (e.g., foodstuffs, clothing, furniture, TV sets, houses, cars, books, journals, CDs, churches, art galleries, etc., etc). But people produce first-order outputs by using *other* goods and services, outputs of the second order (e.g. bricks, tools, building labour, to build houses, churches, factories, art galleries, etc). People produce 'second-order' goods, in turn, by utilising outputs of the third order (brick-kilns, brick-earth, iron for tools, etc.) and so on [categories explicated in Menger (1976) pp. 55-67].

People, then, use second, third, and higher-order outputs *indirectly* to yield *first-order* goods and services. Bricks are of no use in themselves. People use bricks to build houses that people live in, or factories that produce e.g., TV sets. And so on. The *sole* rationale of *any* investment chain (production structure), then, is the range of final products, first-order outputs, that it turns out. Thus the classification of outputs into successive 'orders' cannot refer to some physical features somehow intrinsic to the outputs themselves. The classification is of the *ways in which people use* the goods and services

concerned [Menger (1976) pp. 55-58, 63-67]. As people use goods of successively higher orders, second, third, fourth, fifth,....., they participate in an expanding *vertical division of labour* (see below).

Let us now turn to a specific historical context, to see how this analytical insight helps us to see what is otherwise invisible. This first examination will also bring out certain key aspects of investment chains (the use of outputs of successively higher orders). These aspects are abstract and general, they are the general, abstract characteristics found in all investment chains.

From the entire range of final products available in 1920s Australia, let us pick out one item, bread, and work through the investment chain involved. The 1st order output, then, is: Bread in bins in numerous pantries and kitchens. 2nd order products: Bakery ovens (and fuel or power), flour, water, yeast, salt, baking tins, bakers' labour. These goods form a capital combination: each item is necessary, in the right proportions, to produce bread (and the flour has to be of the right type). Too little (or no) yeast or salt, means no bread, even if the appropriate sort of flour, ovens, labour are all available. No producer makes any returns, rather, they suffer losses. Too much yeast (or salt or flour) means some cannot be used and so is left over (and the relevant manufacturers make lower returns or losses). This capital combination, then, forms one link in the investment chain leading to the final output (in this case, bread) [Menger (1976) pp. 58-63].

Taking the single ingredient, flour, from this particular capital combination: to produce this 2nd-order good, the necessary 3rd-order capital combination includes: flour mills with machinery, wheat (of the appropriate type and grade), power, labour, sacks. Again, all the right investment goods and services have to be present in the right quantities and proportions, the appropriate capital combination must be formed. Continuing with the single ingredient, flour: In the 4th order, the capital combinations that duly contribute to produce this good include agricultural properties with agricultural equipment (and fuel), seeds, fertilisers, pesticides, herbicides, fungicides, labour, storage facilities, good weather, including rain, all in the right proportions and quantities; and so on and on. Thus each and every link in the investment chain leading to the final output (bread), consists of capital combinations. Both 'circulating capital' and the services of 'fixed' investment goods, are combined together throughout. These *general* features are seen in all investment chains.

The specific points picked out above cannot be the complete picture, of course. Machinery for the flour mills (3rd order) comes from Britain; sacking (3rd order) comes from Dundee (in Scotland; the jute is grown in Bengal); fertilisers, pesticides, etc. (4th order) come from Germany. Shipping, insurance, transport, and legal services are all needed as well. This capital structure is, of course, global. Note that the entire global production structure is necessary. *All* capital combinations must be in place in order to turn out this particular final product, bread in 1920s Australia.

But this cannot be its only output. The capital structure turns out an entire range of final goods and services. I discuss this further below. Here, however, flour (for instance) is used to produce a range of foodstuffs, at home as well as in bakeries. Agricultural properties produce (according to circumstance) a range of crops (fodder crops as well as for human consumption); as also cattle, sheep, and horses, that all contribute, in due

course, to various final outputs (including horse-racing and riding for recreation). Steel is used not just for machinery for flour mills. Steel goes into a huge variety of products, final outputs (cars, household equipment) as well as higher-order goods (machinery of all sorts, machine tools). So too for chemicals, from cosmetics to industrial chemicals. Bread (in 1920s Australia) can only be produced as one item in a range of final outputs, from a global production structure.

A fundamental point is now crystal-clear. The complete range of final outputs produced (in any historical context) and all the investment chains, the capital structure, yielding this final range, comprise a single unit, a social (inter-individual) formation: in reality and therefore in analysis. The capital combinations forming successive links in these investment chains are composed of the investments made in many individual firms. Flour, yeast, salt, ovens, power, are produced by different firms, but together they make up one capital combination. Or, to put it another way, a *single* firm's investments *can* be successful only as *part* of a link in an investment chain, part of a capital combination in one or more 'stages of production', in a vertical division of labour, shaped by the final outputs actually purchased. Steel, for example, goes (*inter alia*) into the production of mining machinery, far removed indeed from final outputs, and also into tins for e.g., fruit, vegetables, and other foodstuffs. But it is only *one* item in the capital combinations involved, in the respective stages of production [Menger (1976) pp. 68, 73; Hayek (1935) p. 58n., (1941) pp. 24-25, 73-75; (1939) pp. 21, 75-76].

Thus investment chains are 'processes through time' [Menger (1976) p. 67]. The goods passing through successive production stages in this vertical division of labour *can* only appear as final outputs *eventually*: at time-periods successively further into the future [Menger (1976) pp.67-69; Hayek (1941) p.119n]. E.g. (in late 20th century US and Australasia) [NB: Note the capital combinations in all of the following]:

(1A) Fruit is currently being put into tins in factories. The first-order good (tinned fruit in pantries) can appear relatively soon.

(2A) The fruit now growing in orchards can emerge as tinned fruit only very much later, after it has ripened, been picked, transported, tinned, transported, wholesaled, transported, retailed, transported, and placed in pantries.

(3A) The assorted fruit trees being planted now can yield ripe fruit only several years into the future. In the interim, they must be treated with fertiliser, pesticides, fungicides, pruned, etc. And only then, in several years' time, can their fruit be picked, tinned, etc. to become (eventually) tins of fruit in the kitchen cupboard.

(4A) Research is now being conducted into the improvement of fruit varieties, the production of more efficient fertilisers, pesticides, etc. (the last two in Germany and the US). These can only appear as better fruit even more years into the future, after the research is successful, and the better varieties have been planted, started bearing, etc.; and the improved fertilisers, pesticides, etc., produced, distributed, and used.

Thus entrepreneurs *can* only aim at meeting people's requirements, their buying patterns, in the future [Menger (1976) p. 151; Hayek (1941) p. 119n]. As mentioned, people pursue their several ends with the use of material resources. People's rankings of these ends are therefore reflected in their buying patterns, in the types, quantities,

and range of material goods and services they purchase. Such rankings obviously change as people's circumstances or values change or are modified, or as people alter their appraisals of their situations. Thus people's buying patterns vary correspondingly. Successful entrepreneurs, then, are the ones who contribute to produce those outputs that match people's changing buying patterns; the patterns prevailing at the times when these outputs successively reach the stage of final use (and continue to so contribute).

Taking the instance already given, of fruit production: Integrally with their respective contributions (in each investment stage) to the overall, continuing, process of producing final outputs, the entrepreneurs involved make gains or losses, and therefore gain or lose resources, as follows:

(1B) In producing tinned fruit, entrepreneurs consider the kinds and assortment of fruit, and sizes of tins, that they feel people will buy, at what prices, and in what quantities. They buy and pack accordingly. Some of these assessments will be proved wrong: people will not buy particular fruits, assortments, or sizes. So firms will make lower returns or losses on these lines. Consequently, these firms will now control fewer resources. Other firms will be proved correct or more than correct in their assessments of what people will buy. These firms will make operating profits/capital gains (correspondingly large or small); they will be able to expand.

(2B) Orchards: Manufacturers of tinned fruits buy fruit according to their assessments of the products that people will buy (above, 1B) at the time (in the future) that the various products go on sale. So some fruit-growers will find that manufacturers are happy (or more than happy) to purchase the fruit, at prices that satisfy both sides. These growers will make gains and be able to continue/expand operations. Other growers will find the opposite and make losses, and so have to curtail or even cease, production.

(3B) Fruit-trees being planted now: Entrepreneurs are assessing simultaneously: (a) the types and quantities of fruit that manufacturers of tinned fruit will want to continue buying for many years into the future (after the trees have matured); and (b) the prices they (the entrepreneurs) might obtain, then. Again, in due course, some fruit-growers' estimates of all three elements will be proved correct. To that extent these growers will carry on with or expand, their businesses; while those growers whose estimates are proved wrong, will contract operations accordingly, or even perhaps go out of business.

(4B) Research into varieties of fruit; fertilise, pesticides, etc: Firms again incur the 'costs' 'today'. Whether or not these costs are justified, or to what extent, is determined by future sales to fruit-growers, who in turn estimate their own future returns. Positive returns provide firms with the resources to continue (at least), or to expand; negative returns mean that resources are curtailed or even that there are none.

In sum: at every stage of production, the entrepreneurs involved have to assess: which products to turn out, in what *quantities*, and what *prices* they might obtain. From this basis, entrepreneurs decide what 'costs' they feel are worth incurring now. It is sales to entrepreneurs in the *next successive* production stage, closer to final use, that determines returns. Positive returns (operating profits/capital gains) justify the costs already incurred; hence these firms retain/extend their resources. Negative returns

(operating and capital losses) demonstrate that it was a mistake. Firms lose control of at least some resources [Hayek (1941) pp. 332-33; (1948) p. 175]. Thus at every link in the investment chain, 'prices' ultimately determine 'costs' [Hayek (1948) pp. 167-71, 173-75, 198]; and investment chains are simultaneously price chains. And these prices ultimately derive from the prices expected to prevail (at the stage of final use) for the final outputs now being shaped, stage by stage, in the production structure.

In the historical contexts mentioned above (1920s Australia and late 20th century US and Australasia), besides the handful of investment processes sketched, there are other significant and related investment processes also continuing. Thus in the 1920s: improved machinery for flour-mills is also being produced (in Britain) to equip new mills or to replace older machinery in existing mills (in Australia); better commercial bread ovens are likewise in production (in Britain); so too, machinery and equipment for chemical factories (in Germany). Better varieties of wheat are being developed (in Australia). In DCs in the late 20th century better machinery for making tins is being produced (in Britain, Japan, Germany, the US) for both new and older factories.

Certain other production processes are found in both historical contexts. In the 1920s, steel is being turned out in Britain. Coal is being dug up in Britain and iron ore in Spain. Some mining machinery is being produced in Britain. In the late 20th century, steel is produced in Japan and the US. Coal and iron ore are being dug up in Australia. Far more mining machinery is now being turned out, in Germany and the US.

In sum: to classify goods into 'lower' orders is to say they are closer to the stage of final use. To place them in 'higher' orders means they are further from their final uses [Hayek (1941) pp. 74, 326; Mises (1966) p. 94]. Production is a sequential process. 'Higher-order' goods are used sequentially to provide 'first-order' goods, in due course.

The sort of highly extended capital structure found in the DCs from the later 19th century forwards, could only be built up over very long periods of time. As Mises puts it, every single act of wealth production "is based on the saving and...preparatory work of earlier generations. We are the lucky heirs of our fathers and forefathers whose saving has accumulated the capital goods with...which we are working today. We are better off than earlier generations because we are equipped with the capital goods they have accumulated for us" [Mises (1966) p. 492].

Menger has a succinct summary. When people "direct goods of ever higher orders to the satisfaction of [their] needs", then the hunter moves from club to "bow and hunting net", to simple stock farming, and then "ever more intensive forms." From gathering "wild plants", people turn to "ever more intensive forms of agriculture." Manufactures rise, they are improved "by...tools and machines." Thus people have gone from "barbarism and the deepest misery to...civilisation and well-being, and...vast regions inhabited by a few miserable, excessively poor" people have changed "into densely populated civilised countries" [Menger ((1976) pp. 73, 74]. Menger's observation rested on the historical materials known at the time he wrote. When we examine the historical materials available now, at the end of the 20th century, his insight is even more acute and penetrating.

We now look at a pre-historic context and three further historical contexts through the analytical lenses developed above, to see what invisible linkages and complexities

become evident. Thus the growing and more complex interconnections amongst people's actions become visible. We see how an inter-individual formation develops gradually through time. We begin with the final production stages, the turnout of final outputs (goods of the 'first order'). This enables us to see what the preceding investment stages, the overall production structure, have to be. These quick comparative snapshots of capital structures, and therefore of final outputs, demonstrate that, as investment chains 'lengthened', quantities, qualities, and range of final products improved.

A warning for non-historians: we are examining specific pre-historic and historical periods here, to see how this inter-individual formation, the capital structure, appears in each context. This means that specific facts are shown to be linked together, as part of this formation. Therefore the factual content in what follows *has* to be very high.

THE EUROPEAN UPPER PALAEOELITHIC

We begin at the beginning, the very early actions of people, in the Upper Palaeolithic of Europe.

Final goods in Upper Palaeolithic Europe (c. 33,000-c. 10,000 bp): freshly-killed meat (various types of deer, mammoth, bison, woolly rhinoceros, aurochs, small mammals etc.); freshly-caught fish and birds; nuts, berries, fruit (according to season); cave-shelters or huts or skin shelters or mammoth-bone houses (according to region/season); handmade fur or plant-fibre clothing, caps, shoes; bone, ivory, animal-teeth, shell, stone, pendants; bone, antler, ivory beads (on clothing), also necklaces; bone, ivory bracelets; bone flutes; animal, bird, fish, human figurines of clay, ivory, bone or stone; cave art (in specific areas only); exploding clay figurines (ditto, early pyrotechnics); etc. Ornaments were often polished and decorated.

Note that amongst the final outputs there are items used for religious, ceremonial, decorative, and leisure purposes: e.g., shamanistic figurines, cave paintings and carvings, 'Venus' figurines, beads, flutes, etc. Even at this period, and with such relatively scanty resources, people had a *range* of ends that they followed. Hence they produced a corresponding *range* of material means.

As compared with previous periods, however, people in the Upper Palaeolithic used a substantially greater variety of better tools, made from a much wider range of materials (stone, bone, antler); their hunting was far better organised and specialised; and specific goods (particular types of flints, beads, shells, etc) were traded over much longer distances. *Inter alia*: people used tent-poles for their skin shelters; wove baskets, some of which were then daubed with clay; and made leather bags. They built ovens to fire clay figurines and pellets. And population appears to have been higher than previously [Gamble (1999) pp. 313-50, 387-414, see pp.402-404 for exploding clay; Hoffecker (2002) pp. 142-248; Mellars (1994); Schick and Toth (1993) pp. 293-301].

We now take a single final good and see how people produced it, in this period, i.e., the investment chains they had to build up to obtain this final product. Comments follow after.

Table 1
Fur garments, Upper Palaeolithic Europe: sequential production processes

1	Final good: Tailored fur garment, ready to wear.
2	To make garment: Prepared skins, bone needles, awls, sinew for thread. Labour.
3	To prepare skins: Hide, stone scrapers and polishers. Labour. Needles and awls: Appropriate bits of bone, stone tools (borers, etc). Labour. Sinew: killed and skinned animal, stone tools for cutting up. Labour.
4	Hide: Killed animal (e.g., fox, hare, woolly mammoth). Stone tool for skinning carcass. Labour. Stone scrapers and polishers: Appropriate bits of right sort of stone, stone tools. Labour. Bones (for needles, awls): Stone tools for scraping, cutting up. Labour. Stone tools for butchering: Appropriate bits of stone, stone tools. Labour.
5	Plant-fibre net (to catch small animals, e.g., fox, hare). Heavy stick or stone tool (to dispatch beast). Labour. Spear-points and spear-throwers (to kill larger animals e.g., mammoth). Labour.
6	Net: Collected plants. Labour. Spear-points: Appropriate bits of stone, stone tools. Resin and/or sinew/plant fibre (to bind point to tip of spear). Spears and throwers: Appropriate bits of wood, stone tools. Labour.

Comment: These production processes all occur within the household or hunting band. A single individual undertakes two or more ‘stages of production’: e.g., females (helped by children where possible) stitch the clothing, prepare the skins, make nets, and hunt the smaller animals. Men make the various stone and bone tools; and hunt the larger beasts, in teams. Similarly, women and children gather fruits, nets, berries, plants, etc., while men make the ornaments, figurines, etc. There is no ‘capital structure’ as developed later. This is clearly a ‘face-to-face’, hand-to-mouth society, with very few inter-personal links beyond the hunting band.

How did people extend production processes in this context? One quick instance: Aurochs are the ancestors of domestic cattle. Initially, hunters spend somewhat less time in hunting. They use the time instead to follow a herd of aurochs, scare off or kill predators, scare off other animals who compete for grass, in short, begin herding. Thus, in due course, more and better fed animals become available, with a little more certainty, and a little more ease in killing.

But with less time and effort spent in hunting, the *immediate* ‘production’ of food, there are *fewer* freshly-killed animals (of all sorts). This is because *some* time, effort and tools are being used *indirectly* to ‘herd’ the still-wild aurochs and to kill their predators. The (superior) outcome *can only* appear a little further into the future. Production processes are lengthened. The eventual result is more, better, more easily killed, meat, available with more certainty. So long as time, effort, hunting tools are invested in stages further from final consumption, so long will more, better (etc.) meat continue to be produced. And so on.

The peoples of Palaeolithic Europe used hardly any second or third-order goods, never mind those of even higher orders. Thus they could turn out only sparse quantities of a very few final goods indeed. Hence only a tiny population could be supported, and the division of labour could hardly develop. Even so, these extremely short production processes could still be (and were) pushed back.

The Palaeolithic peoples could not know that their situation resulted from an extremely short production structure, of course. We can *now* make such an assessment

only because we have experience of (1) the vast range of final outputs produced when investment chains stretch through a huge number of production stages far removed indeed from final use, (2) the concomitant extensive and minute division of labour, with all kinds of specialised occupations, (3) the very substantial numbers of people who can be supported thereby, in good health, and well into old age. These characteristics are evident in the next historical context we examine: England in the 16th and 17th centuries.

INVESTMENT CHAINS AND FINAL OUTPUTS IN ENGLAND, 16TH AND 17TH CENTURIES

As compared with the Upper Palaeolithic, vastly greater quantities of an immensely wider range of final outputs are now *produced* as the results of complex and extended investment chains. In other words, there is now a well-developed vertical division of labour and therefore many concomitant occupational specialisations. Vastly more people are now linked together as inter-dependent participants, in this complex and extensive formation.

This is not 'better technology'; it is the *continuing production* of vastly more, better, and many more *types* of goods and services. This is true especially with respect to diet, clothing, and housing. Therefore much greater numbers of people are now able to enjoy (*inter alia*) better health and substantially increased longevity. Relative to the Upper Palaeolithic, these are unimaginably better supplies of final goods and services, and they improve further over the period.

The *categories* of consumer outputs have grown substantially; these categories are quite usable even in the late 20th century. It is now necessary to distinguish between mass-consumption outputs, produced on a larger scale, and those produced in much smaller quantities, that are therefore 'luxury' goods. Here, I consider only the former [Thirsk (1988)]. I shall then go on to consider the investment chains that produced one of these final goods: flannel work-shirts (Appendix, Table A). As with the initial examination of the production of bread in 1920s Australia, this will give us some idea of the capital structure that produced the entire range of final products.

This range is now such that I can only give a very brief listing here. We shall begin (as usual) with the basics, then go on to the others. The object of this exercise is to realise how vast are the increases in range and quantities of '*produced*' final outputs, the results of investment chains, and *therefore not producible* in the Upper Palaeolithic.

All the following final outputs are produced, and *can only* be produced, through previous investments. The continued production and improvement of these final outputs requires continued investments. These preceding, inter-linked, investments are invisible, until they are inquired into. Only then are their complexity and inter-linkages revealed. The entire set of preceding investments is integral to the final product: all together form a single whole.

Here, I shall make only general observations, pointing to the broad, general features of the investment chains concerned. Only when the detailed outline of investment chains producing a single final good, flannel work-shirts, is examined (Appendix, Table A), can their interconnections be seen. Only then can the fact emerge, that the entire range of final outputs with the entire production structure, constitutes one *single* formation.

Diet. Principally barley bread (wheat is still produced in relatively small quantities and is therefore a luxury). Also: thick stews, dairy products, bacon, eggs, poultry, meat, saltfish. Flavourings include herbs, caraway, mustard, etc. Roots and green vegetables are eaten, also apples, cherries, pears (the fruit came in scores of varieties), and prunes. Imported items include: oranges, lemons, dried fruits, spices (esp. pepper and ginger), sugar, and tobacco. Ale declines; beer output and consumption rise (better quality, longer keeping, cheaper).¹

These varied outputs require and result from, long-term agricultural and other investments, in crop rotation, 'up-and-down' husbandry, new seeds, agricultural implements, storage, transport, marketing, etc.

Clothing: Quantities, qualities, range all improve considerably and the lower classes dress far better. An indirect indication comes from sumptuary legislation [Harte (1976)]. Tailoring services expand [Patten (1979) Table 2]. There is a vast range of textiles: woolen, linen, hemp, silk; also mixed fabrics of all kinds. All vary hugely in weight, width, colours, and finish. Patterns are woven in, and the array changes substantially over the period. Fabrics are put to an enormous variety of uses: for household purposes; making clothing; furnishings; sails; etc. Clothing fabrics are further specialized [Kerridge (1985) chs.2-9]. There are substantial imports of linens: in a vast variety, including mixed cotton fabrics, from the Low Countries, Germany, Northern Italy; also of French velvet. By the later 17th century: 25 different sorts of linen and cotton are imported for shifts and shirts alone, never mind other items of clothing, and furnishings. There is a huge range of prices for all fabrics [Spufford (1984)].

Other items produced include accessories: ribbons, lace, 'aiglets' etc.; combs, looking-glasses, etc.; a variety of headgear, made from fabrics or fur, or knitted; and an enormous variety of knitted stockings (healthier than cloth 'netherstocks'). Decorated stockings are denounced from the pulpit [Spufford (1984); Thirsk (1988), (1973); Kerridge (1985) pp. 133-4].

Again, these final outputs are only the final links in intricate chains of investments: in breeding and rearing different types of sheep, there are carpet, knitting, and other breeds; in pasture and meadow; in wool-sorting, preparation, spinning, weaving, distribution, etc.; see the example of flannel work-shirts (Appendix, Table A). Also see below, on household furnishings.

As the leather trades expand, a large variety of relatively cheap footwear, with fashion features, is produced. Footwear is available in readymade sizes by the early 17th century.²

Once more: we see here only the final stages in the production process. Previous stages are invisible until they are looked for: investments in cobblers' tools, leather production (vats, materials to soak the hides in, etc). The continuing production of large numbers of livestock is a prerequisite, plus the improved pastures and meadows to raise and then fatten them, butchering and transport facilities, etc.

Household furnishings improve in quality and range and increasing quantities are produced from the late 16th century onwards. This overall betterment accelerates in the 17th century, particularly at the lower end of the mass-consumption scale. In the

early 16th century, most people slept on straw pallets; some actually had flock mattresses with sacks of chaff for pillows; only the wealthy had feather beds. But then outputs increase, and bedsteads with feather and flock mattresses, pillows, bolsters, sheets, 'pillow-bearers', blankets, bed-hangings, etc., all spread right down the socio-economic scale, to servants and agricultural labourers. A range of fabrics are used, including various types of linen, domestic and imported, and Indian cottons (from the late 17th century). Towels are hemp cloth or linen.

Other specialised linen and woolen fabrics are used in the kitchen, for sifting flour, sieving and straining, cleaning floors, etc.³ Tablecloths and napkins are available from the earlier 16th century; quantities increase through the 17th. By its end, fabric sets, to make up a tablecloth and two napkins, are being sold. Decorative furnishings are produced from the late 16th century onwards, including "painted cloths", wall hangings, tapestries and cushion covers of linen or mixed linen and canvas; also 'carpets' to cover furniture, and 'cupboard cloths'. Chair seats and backs (only) are upholstered.⁴

Again, only the final links are seen here, in the long chains of preceding investments necessary, in the production of fabrics of all kinds. These links include shipping, for instance, to bring linens in from the Continent, not to speak of the investments in export goods. Continental investments, in the production of flax and its preparation, in spinning and weaving all the varieties of cloth, all feed into the investments in transport and distribution that ultimately supply linens to final buyers in England.

Kitchenware: At first, only wooden items are produced, in a narrow range: e.g., bowls, crocks, kneading troughs, pails, etc. Then metal items are turned out, in a far wider range: pots, pans, skillets, kettles, pothangers, spits, racks, ladles, kitchen forks, cleavers, other kitchen knives, etc., in line with the increased quantities, wider range, better qualities, of foodstuffs being produced.

Tableware is initially wooden ('treen'); then of pewter and tin, in even the poorest inventories. Pewter, once produced in small quantities and so a luxury, is now sold by weight, so much is produced. A wide range of dishes (platters, saucers, pie plates, tankards, spoons, etc.), all in various sizes, are now turned out. Warming-pans—very expensive in the late 16th century, are now sold in the cheapest shops. Ewers and wash-basins, and even chamber-pots, are now of pewter or tin.⁵

This increased output of metalware requires more charcoal iron, not to speak of more and better tools, hearths, skilled labour, etc., in the metal-producing districts. Hence the preceding investments required for the above include a switch to the timber suited for charcoal production, away from the kind of timber suited for treen and wooden kitchenware. Also (*inter alia*) production of more iron ore, more bricks (for hearths), and so on.

Glazed pottery becomes a mass-consumption good. It improves in quality and variety. Different types, patterns, finishes, decorations appear; there are new shapes, colours, motifs. Display and special occasion pieces are made. The necessary preceding investments include: more clay being dug out, more baskets and pack-horses for transport, more and better furnaces, colouring materials, potters' workshops, more charcoal fuel, more labour, skilled and unskilled.

Glass is now found in even the poorest inventories. Drinking glasses, containers for preserves, medicine bottles, beer bottles, etc., and special cupboards for holding glass, are made. Specialist glassmen and cratemmen sell glass and pottery, packed in straw, from village to village [Charleston (1956), (1957); Wolsey and Luff (1968) p. 42; Thirsk (1988) p. 123; Spufford (1984)].

Again: more and better furnaces, more skilled glass-blowers, transport facilities, etc. are the preceding investments. Glass-making expanded and improved considerably over the period, re-locating to more forested areas.

Furniture improves considerably in quality and substantially in quantity. In the early 16th century, it is made by carpenters and so is simple and heavy, with little variety. Then, as the period progresses, turners make improved, lighter types; joiners make even better-quality items. There is greater variety; most households have presses or 'close' cupboards by the early 17th century. Joined chairs, chests, stools, tables, benches –all spread down the socio-economic scale, as do turned chairs and bedsteads, then joined chests of drawers. Some upholstery is introduced for chairs.⁶

The investments needed: more and better timber, more and better tools, more workshops, more skilled labour.

Publishing: Ballads, broadsheets, pamphlets, almanacs, chapbooks, etc.; also popular literature: historical and other fiction, crime stories, cookery, gardening, etiquette, etc. are all published. There are legal guides for small craftsmen and husbandmen. All are very cheap: from ½ d. to 6d. each, with average prices declining by the later 17th century [Spufford (1981); Capp (1985) p. 229].

Printing becomes centralised in London. Investments in printing-works, warehouses, etc. multiply. The transport network also carries publications to shops in even remote upland areas like Cumbria.

Leisure: The alehouse becomes an entertainment centre, amateur and professional. Traveling entertainers (jugglers, fiddlers, bear-keepers, singers, dancers) are put up there. Alehouse keepers build bowling alleys and provide materials for all sorts of games and contests. Many new indoor games appear and spread; card production rises. The professional entertainment industry develops much further in London [Clarke (1982) pp. 152-7; Burke (1985) pp. 39-41]. Clearly even here investment increases: in building bowling alleys, producing bowling balls, the various items needed for games, etc.

Housing: Initially: people lived in earthen houses with low thatched roofs, one or two rooms, with open hearths in the centre of the room. Then came enclosed hearths (against a wall) with chimneys. Houses now have wooden floors and glazed windows; are warmer, more draught-proof [Harrison (1968); Palliser (1992) p. 129; Hoskins (1953) p.45]. Agricultural labourers' housing goes from impermanent (wood frame, clay; cob; flint and clunch) to craftsmen-built permanent structures. Numbers of rooms increase. Farmers (small to large) modernize and enlarge their houses, creating or adding more rooms; also staircases, fireplaces and chimneys. Living areas increase and improve considerably; production areas become more separate; storage areas expand and become more specialized. There is more variety in arrangement, in the later 17th century. Even in the North of England, fireplaces, chimneys and more rooms are added. Large numbers

of houses and even cottages are now stone-built. Improvements are most extensive in the textile areas. Overall: modernization begins to spread around the 15th century, accelerates in the late 16th century, and continues into the 18th.⁷

In line with the above: A huge variety of locks is produced, for doors, chests, cupboards, gates, etc. Door-knockers are a new item. Candlesticks are improved. Blacksmiths make simple chandeliers. The necessary fireplace items are also produced: cob irons, rakes, shovels, pokers, firepans, etc. [Hughes (1956), also see pp. 95-6; (1957) pp. 111, 113-4; Spufford (1984)].

Investments in: digging brick-earth, furnaces, charcoal and then coal fuel, labour, transport, etc. supply the vast numbers of bricks needed for such expanded housing. More timber is cut and transported from managed forests to supply doors, window-frames, etc. Planks are imported from southern Sweden. For metalware, see above. And so on...

We turn now to the investment chains that yield one only, of these outputs: flannel work-shirts, used especially by ironworkers and the like. This will give us some idea of the various production chains that turned out all these first-order goods in that period. Because of the detail, I place the outline in the Appendix (Table A). But the comments below refer to the material in this last.

Early modern England has long since ceased to be anything approaching a face-to-face society. Interlinked investment chains producing a substantial range of final outputs cover virtually the entire kingdom; practically everyone is involved. The overwhelming bulk of production activities are for exchange; only a small part are autarkic: keeping a cow or two, a pig, a beehive, some chickens, perhaps some rabbits, growing vegetables, some fruit, etc. Most people have two occupations, e.g., small farmers also weave ordinary cloth; nailers also help at ploughing and harvest; agricultural labourers also produce small wooden items (taps, spoons, and the like); women in farming households combine tasks such as dairying with spinning; spinsters also pick fruit, etc.

The flannel work-shirts we look at below (Appendix, Table A), are only one amongst a vast array of items produced in this historical context: textiles, yarns, furniture, metal products; carpenters', turners', joiners' products, etc. There are equally extended production processes for many other final goods e.g., beer, sugar, tobacco, soap, candles, cutlery, other metalware, etc. Carriers transport a vast variety of goods, at all stages of the capital structure; etc. While it is possible to outline a fair number of interlinked processes of the capital structure, it is already so complex that much simply could not be brought in. As compared with late 20th century Mali (below), there appears to be a far more extensive and intricate *vertical* division of labour.

FOUR TECHNICAL INNOVATIONS EXAMINED

Certain 'significant technical innovations' are assigned to this period. When we examine some of these, we see that they are in fact imbedded components in capital combinations that form one link in investment chains. Thus these particular investment goods cannot be extricated from the overall production structure.

By the later 16th century, 'Saxony' wheels were being used in many places for spinning. They had a bobbin and pedals, so could be used two-handed. Then double

wheels with two spools were made. By the end of the 17th century, spinning ‘engines’ were being used in Norwich, for jersey, linen, and waste silk. Each ‘jenny’ employed a *number* of workers.

Note that the spread of these spinning instruments *can* only be *one* side of the coin. The other side: greater flows of wool, i.e., greater outputs from *preceding* production stages; and more weaving looms, clothiers, shops, etc., in succeeding stages of investment. In sum: overall extension of all the investment chains involved including, *inter alia*, more wood from managed forests (to make more, and more intricate, spinning wheels).

Velours looms and drawlooms were used from the mid-16th century onwards. The latter was a complicated affair. It produced complex patterns, which had to be worked out on paper first. A boy was required to assist the weaver in working the pattern into the fabric.

Greater investment in *preceding* stages (more wood etc. for each drawloom), plus additional labour (drawing the pattern, boy assistant) for the loom to be worked, results in a better quality final output (patterned fabrics). *But* this last is only *one* amongst the *many* composing the range of final products. And drawlooms require suitable yarns, made with appropriate spinning wheels from appropriate types of blended wool. The fabrics require finishing and dyeing (or else the wool has to be dyed), and they have to be distributed to shops throughout the country. Etc. Once again, the drawloom is imbedded in a capital combination in an investment chain.

Dutch engine-loom appeared at the beginning of the 17th century. They wove many lengths of narrow ribbon or lace simultaneously, with a single weaver. (Narrow looms could be worked on top of a table and produced only a single length). Engine-loom very soon could produce up to 24 ribbons at once. By the late 17th century, engine looms had fallen greatly in price, such were the quantities produced; they did most of the plain weaving.

The story is as before, especially so, in this case. Ribbons and lace are accessories: they are *complements* to clothing. So quantities of the latter also had to increase: *more* dress textiles, i.e., *larger* quantities of suitable wool, from *more* sheep, all blended and distributed to spinners, who spend more time in spinning and who also increase in numbers, i.e., there are also *more* spinning wheels. The yarn then goes to weavers, who spend more time weaving and who increase in numbers, i.e., there are now more looms. The textiles are then finished and dyed, distributed and converted into clothing. Concomitantly, for ribbons and lace: larger outputs of wool and flax, distributed to spinners and made into suitable yarns and then turned into these accessories on drawlooms. We are looking at *some* of the *components* of an entire capital structure, which is being extended.

Knitting frames began to be used in the late 16th century; they spread rapidly in the 17th century. They had up to 360 needles, usually steel, but also iron. At first jersey stockings were made. Then in the early 17th century, silk stockings were added. Outputs rose substantially [Kerridge (1985) pp. 134-7, ch. 13].

Once again, stockings are accessories, and only one item in the range of final outputs. Increasing the output of stockings requires increased flows of wool and silk from

preceding production stages; and so on, as we have already seen. To increase the output of knitting frames, more steel has to be imported; this has then to be worked on, to make the needles. More wood must be produced. Thus again knitting frames are entrenched as elements of capital combinations of an overall production structure, which is being lengthened.

THE COMMON LAW TRANSFORMED

Legal rules and production activities are the two sides of the one coin. As already noted above, in this society of people, very large numbers are linked and interact together *indirectly*, several hundred times more than those known face to face. Only *instrumental* legal rules can tie such substantial numbers together. The early part of the period saw a radical re-shaping of the common law (below).

Now it is well-known that right up to the mid-19th century, the major part of justices' incomes came from fees and from their lands (virtually all professionals came from the landed classes). Justices' salaries were a minor part of the whole, and were always in arrears for months at a time. Although their salaries were raised twice in the 17th century and again in the early 18th century, fees rose much faster and far outstripped these tax payments. Chief Justices appointed court officials, who lived off fees; only three officials had extremely nominal salaries. Thus Chief Justices sold these clerical offices [Baker (1978) p. 352 and n12; Hastings (1971) pp. 82-84; Lemmings (1990) pp. 249, 253n; Prest (1991b) pp. 77, 83, 87]. The other side of this coin is of course the vast rise and diversification in production and exchange, and therefore in legal activities, from the early 15th century onwards.

Between the end of the 15th and the mid-16th century, the common law was completely transformed: its "rate of development, distortion and innovation was so accelerated" that it was virtually reborn. This "regeneration" meant it was "capable of adapting, without further radical alteration, to the needs of many generations of Englishmen, not to mention the new world and an empire." King's Bench developed an entirely new range of remedies, covering an enormous range of circumstances. Cases were brought directly by 'bills' devised by the attorneys themselves. The result was to "throw up endless questions of law that had never been posed before...new questions [that] required new, more precise formulations..." Between 1498 and 1549, some 40 new types of action appear in King's Bench records. Its commercial cases covered, *inter alia*, loans, bills of exchange, partnerships, factors, charterparties, marine insurance, etc. Common Pleas followed [Baker (1978) pp. 23, 52, 60-61, 88-92, 259, 286, chs. 7-9; (1986) p. 391; (2002) pp. 389-90].

In agriculture, the transmutation from manorial status to contractual landlord-tenant relationships, begun in the early 15th century, was now completed. Now leasehold and 'copyhold' tenants got security, while 'covenants' in tenancy agreements protected the landlord's long term interest [Baker (1978) ch. 7].

The law of contract was practically re-created in the 16th century: 'assumpsit', 'action on the case', replaced 'debt' and 'covenant'. The action of 'debt' permitted recovery of a specified sum only, with a smaller amount for damages; and it required a sealed deed. Assumpsit covered oral and unsealed agreements. The case went to a jury who could

look at the actual loss suffered (to award damages). The actual sum laid out could be recovered, e.g. expenditure on materials, which could not be specified in advance. Thus there appeared to be “a general remedy for any breach of promise causing damage.” The various developments here hinted at, culminated in Slade’s Case (1602), from which date the “modern [unified] law of contract traces its life...”

The seven main legal categories for classifying commercial disputes were developed by the middle of the 17th century: “...goods sold,...work done,...money lent,...money paid (that is, laid out to the plaintiff’s use at his request),...money had and received to the plaintiff’s use...money due upon account stated...the use and occupation of land.” These categories remained till the legislative changes of 1852 [Baker (2002) pp. 325-48, 365-71; (1978) p. 390; Ibbetson (1984) p. 309].

In general the numbers of barristers and attorneys⁸ multiplied. The practising bar went from an estimated 80-90 barristers at Westminster in 1560, to around 440 in 1638. Virtually all attorneys lived in the provinces. Their numbers expanded from an estimated 340-380 in 1560 to around 1,750 in 1640. Most were attached to Common Pleas, a minority, to King’s Bench. The link with output can be seen from the metalware and iron producing areas. There were perhaps two (two) attorneys in the whole of Warwickshire in 1560. In the early 17th century there were 18, 10 of whom practised in the areas between Birmingham and Coventry, areas with the greatest expansion in the products mentioned. By 1640, there were 30 attorneys throughout the county [Prest (1991a) p. 331; Brooks (1983) pp. 28, 29, 98, ch. 6].

Between 1560 and 1640, the number of civil cases brought before the two major central courts of Common Pleas and King’s Bench, rose nearly 5 ½ times; the bulk came before Common Pleas, of course. Many cases were actually heard on circuit, at *nisi prius*. The overwhelming bulk of these civil cases were classified as ‘debt’ actions. The number of litigants rose 70% [Brooks (1983) pp. 69, 281, 283].

As we have seen, production processes extended across the kingdom. This meant that any disputes *had* to go to the central courts in Westminster, the only ones which covered the realm. Prof. C. W. Brooks sums the situation nicely: “...in an economy where wool from Suffolk might be made into cloth in Wiltshire, where coal from Newcastle came...by sea to London, where cheese and dairy products from Warwickshire went down-river to Bristol,” only courts “whose authority stretched through the realm” could provide satisfactory services. Other instances: Midlands ironmongers sold metalware through their London agents and provincial dealers, across the country and overseas. Agricultural wholesalers regularly traded across regional boundaries, hence their disputes ended up in Chancery, Requests, and Exchequer. Thus, as exchanges became wider and wider, local courts contracted [Brooks (1983) pp.97-8; Rowlands (1975) pp. 11-13, 93-95; Everitt (1967b) Table 17].

Since outputs were growing, far more people used legal instruments more often, far down the social scale. As mentioned, DIY legal manuals were amongst the cheapest books in the 17th century. They included forms of bonds for various trades, including metalware. Late seventeenth inventories (from Cambridgeshire) include bonds and bills, for both large and small sums [Spufford (1970) pp. 143-4]. Thus in their production activities, people interacted, at all levels, through the *same instrumental* rules.

In sum: extending the vertical division of labour, using goods of ever higher orders equals more, better, wider range of final outputs. The other side to this same coin is extending the use of instrumental legal rules. The historical context gives specific content to this abstract picture; above, we have seen how such developments occurred in early modern England.

THE DCS, LATE 20th CENTURY

We now turn to a contemporary historical context: the developed areas in the late 20th century. Investment chains are now world-wide; indeed, they have been increasingly so since the early 17th century. On a face-to-face basis, people continue to interact with perhaps fewer than 80 or so people; but through the capital structure found in *this* historical context, they, in effect, interact with and are dependent on, perhaps a thousand million or so. As we shall see, the capital structure here can only be barely hinted at, as its complexity is so immense.

Final outputs produced/available in the DCs in the late 20th century include *inter alia*, the goods and/or services found in supermarkets, department stores, car dealers, newsagents, solicitors' and accountants' offices, doctors' surgeries, gyms, hairdressers, beauty shops, house painters' and decorators' firms, pet shops, veterinarians' offices, and specialist retailers: clothing, shoes, furnishings, furniture, carpets, household and other electrical goods, electronic goods, wines and spirits, gifts, books, umbrellas, sporting equipment, bicycles,...*et hoc genus omne* (see any Yellow Pages in any DC).

To get a faint, dim idea of the extraordinarily complex world-wide production chains that provide this vast cornucopia of such extremely diverse, high-quality goods and services, we select one relatively simple grouping: cotton clothing. As we shall see, even here it is possible *only to indicate* some of the main investment processes involved. All sorts of subsidiary products and processes have *had* to be left out. Again, because of the detail, I place the outline in the Appendix (Table B). The comments below are directed towards the material in this last.

Some comments: 1. In tracing through the investment chains that yield cotton clothing, we find that the clothing can only be produced as one *of a vast range* of final outputs. The production structure, successive linked capital combinations, *can* only turn out this *entire* gamut, amongst which are the cotton garments here referred to.

2. The capital interrelationships actually listed (Appendix, Table B) are only the tip of the iceberg; a few selected interconnections from a vast, extremely intricate and complex web of capital combinations, all leading to a vast range of final outputs.

3. The global coverage of the production process, I. From the 15th century onwards, more and more investment chains linked together the various regions of Western Europe, including Britain. This production structure began extending across the globe from the early 18th century onwards; its world-wide interconnections accelerated especially from the early 19th century. As we see below (Appendix, Table B), the investment combinations in late 20th century mainland China, are simply another link in this worldwide production structure.

4. The global coverage of the production process, II. This investment structure simply ignores political boundaries—it *has* to. 'Economic' influences are overriding—as they

must be, for the structure to be built up and expand further. Political boundaries are in the nature of haphazard lines, crossing various portions of the capital structure, completely at random.

The legal rules used in this global production structure, are all instrumental. The common law covers the Anglophone world, both developed and underdeveloped. Similarly Roman law covers Western Europe, Scotland, Quebec, Louisiana, South Africa, and the Francophone portions of the LDCs, with Sri Lanka and Indonesia added. Islamic commercial law is used throughout the Muslim world. And Japan has had its own “merchants’ law” since at least the 16th century, if not earlier. International contracts may specify the legal system under which any disputes will be settled, and courts honour this choice. Otherwise, courts and arbitrators both, determine the law most nearly connected with the contract and apply that. Thus extension of the vertical division of labour, of the capital instruments that people use, both requires and results in, the greater development of instrumental legal rules.

MALI, LATE 20th CENTURY

Now to our last comparison: the production structure found in another contemporary historical context: Mali, one of the poorest areas in the late 20th century. We shall see that investment chains here are relatively short, as compared with the global production chains also found in the world at the same time; but even in Mali, there is some continuing interaction with these world-wide investment chains. Outputs from these far more extended chains have extended the range of final products used by even a poor family in Mali.

Mali: Final goods, late 20th century, of one Muslim family (husband, two wives, children, relatives). Foodstuffs: Poor-quality corn, red rice, millet [all ‘inferior’ grains], onions, okra, tomatoes, dried fish, tamarind, *very occasional* meat (sheep, goat, or cattle); sour milk, well water.

Clothing: Traditional fabrics, hand- or mill-woven; a few manufactured items, e.g., shirt, trousers, for oldest son. One pair cheap manufactured slippers (oldest daughter).

Kitchen and table ware. Battered aluminum or pottery utensils, wooden ladles, cane or reed sieves and baskets, clay pots (various). Small wooden container for condiments. Single, very large aluminum pot, from which entire family eats. Small aluminum or pottery bowls.

Other items: Very large wooden mortars and pounding staffs (for millet). Pot, plastic cans, aluminum pail for fetching, storing water. Large plastic and aluminum bowls for washing clothes in river; utensils also washed there. Baskets for storage, including clothes. Battered transistor radio, battery-powered. Bicycle. Cheap watch.

Mud-brick house (built by family). Wooden overhead rack in courtyard: for shade, to dry clothes.

Other goods: Agricultural implements: hoes, spade, sickle, axe, to grow millet (see further and below). Winnowing fans. Mud-brick mould, wooden. *Very* large griddle, for millet cakes for sale. Solar-powered calculator for family business: women make small millet cakes for sale, from home-grown millet; cultivate and sell *very* poor-quality jungle

mangoes from family orchard; buy and sell grain, sales are often in town some distance away, requiring overnight journey; buy cloth, embroider it and re-sell; etc. Husband supervises, also involved in grain transactions, stores and fetches grain. [D'Aluisio and Menzel (1998) pp. 84, 166-79; Menzel and D'Aluisio (1994) pp. 14-21; (2005) pp. 206-17].

We now look at one standard item of diet, to get an idea of the relatively short production chains found in Mali.

Table 2

Millet Porridge, Mali, Late 20th Century: Successive Production Processes

- 1 Final good: Millet porridge with tamarind juice
- 2A Aluminium/pottery cooking vessel. Pounded millet. Small, low earthen platform on floor, with U-shaped opening for fire. Twigs, small sticks, collected by household labour. Hand fan of reeds. Well water (see 2D).
- 2B Pounded millet—hand-pounded several times daily. Threshed millet, wooden pounding staff, large wooden mortar. Household labour.
- 2C Soaked tamarind: small plastic bowl, tamarind fruit. To get fruit from tree: stones + labour (to throw at fruit) or labour (to climb tree) or pole + labour.
- 2D Well water: drawn by household labour, rope, bucket. Pottery/aluminium vessel to carry water home (on head) and then store it.
- 3 Threshed millet: stored in sacks in house. Picked over, winnowed. Winnowing fans (flat, made of reeds). Household labour.
- 4 To thresh harvested millet: threshing floor (clay), donkeys (to tread crop). Household labour.
- 5 To grow millet: Small piece of land for each wife (obtained from lineage head). Seeds, pointed sticks, hoes, spades. Household labour throughout season. Sickles (for harvesting). Baskets, sacks, donkeys, to transport harvested millet.
- 6 To make pounding staffs, mortars, pottery utensils, baskets, fans, rope, sacks, wooden handles for hoes, spades, etc.: Different types of craft labour: e.g., carpenter, potter, reed-weaver, etc. Hand tools. Wood, clay, reeds, hemp. To fire pottery: branches and wood, or charcoal or coal, in mud or clay furnace. Labour of craft households. Donkeys, sacks, baskets for transport. Craftsmen sell directly to users.
- 7A Woodcutter, axe. Donkey + rope for transport.
- 7B Clay, dug out, transported in baskets on donkey. Household labour.
- 8 Blacksmith—makes hoes, sickles, spades, hand tools for craftsmen. Hand tools, shed, furnace, charcoal or coal, iron bars. Leather bellows. Apprentice (household) labour. Donkey for transport.
- 9 And so on...

Comment: Clearly, in this particular historical context, in comparison with the Upper Palaeolithic, the vertical division of labour is far, far more extensive, there is a vastly extended capital structure. Thus population is far greater; and there are vastly more, better, far more diverse, final outputs.

But as compared with even early modern England the vertical division of labour and investment chains are very restricted and most transactions are within the immediate village group. But there are certainly wider contacts as well, in a nearby town, as also links with the global production structure (the various manufactured items). Thus people in this historical context obtain *most* of their final outputs through participation in a relatively short capital structure, but obtain some of their final goods by participation in world-wide production chains.

Law and custom: The family obtain land according to tribal custom. The lineage head assigns land for growing millet, etc. Intra-village and town transactions follow

inter-tribal customs, since potters, blacksmith, etc., all belong to different tribal groups. Such customs are therefore instrumental, i.e., they enable people to interact to obtain their several aims. This means these rules cannot assign status to anyone. Merchants, who deal long distance, follow both custom and Islamic commercial law. In the larger cities, the upper elite and some very large businesses use French, i.e., Roman law; hence the manufactured items in the remoter villages.

Thus there is a mix of *types* of transactions/legal rules: (a) 'ends-oriented', status, customs (e.g., to obtain land and within the family business); (b) customary instrumental rules, for exchange between members of different tribal groups; (c) the highly-developed, purely instrumental and 'international' rules of Islamic and Roman law, for participation in wider investment chains.

How to extend investment chains in this historical context? Clearly, by linking up with global production chains. This has already started happening: i.e., the worldwide capital structure which began developing some 500 years ago, has begun to reach even into such remote areas.

INPUT-OUTPUT THEORY (ECONOMICS); INVESTMENT CHAINS (HISTORY)

It is now clear that neo-classical input-output theory is quite distinct from the analysis of the capital structure. Input-output theory is neo-classical and therefore scientific. It operates with industries, and the flows of goods amongst industries. The outputs of one set of industries flow, as inputs, into other industries; the latter's outputs flow into still others as their inputs, and so on. These flows of inputs and outputs are purely mechanical and statistical. Such mechanical/statistical flows are scientifically observed, measured, recorded; these data-batches are labelled by time and place (if needed). The whole is a scientifically-conducted empirical exercise which enhances and contributes to the further discussion and development of input-output theory. Thus neo-classical economists achieve the objective of being scientific, of conducting scientific exercises.

The capital structure is found only in people's actions. Therefore its (abstract) analysis is an analytical tool for historians, as they study specific historical contexts. Since people have ends and use means, there is definite meaning to the interconnections brought out, through analysis, amongst people's actions. Goods and services go *towards* the supply of a range of *final* outputs that *people* use. Hence the components of any capital structure, its investment chains made up of capital combinations, are the specific, particular, goods and services that people produce in a specific historical context. Thus the capital structure is a particular historical development of the context under study. Hence, *according to context*, such a structure may be easily described. Or it may be so complex, that only its outlines may be dimly discerned, only its principles of formation can be seen. Thus historians achieve the objective of a greater understanding of the particular historical contexts they study.

People's actions bring about a particular historical context and the investment chains within it. We have just seen the extraordinarily complex, global investment structure found in DCs from the later 20th century onwards. Statisticians then sample various industries and produce various statistics that are then aggregated at various levels. From these statistics, input-output theorists then, in order to conduct empirical studies,

observe, measure, record, the mechanical flows of goods amongst industries. Theorists note that, empirically, the outputs of certain industries flow as inputs into other industries, whose outputs in turn become inputs, and so on. Thus neoclassical theorists, in developing their theories further, conduct scientific exercises (i.e., neoclassicals follow after philosophers of science and therefore, scientists). Where the object is to be scientific, there obviously input-output theory is the route to follow.

As distinct from this, historians study people's actions, with the aid of analytical auxiliaries (as needed). Where the object is to grasp people's actions, i.e., the historical *reality*, there the route is to study history.

APPENDIX

Table A
Flannel Work-Shirts, England, Later 17th Century:
Successive Production Processes

- 1 Final good: Flannel work-shirts in (wooden) clothing chest at home.
- 2 Length of coarse flannel, coarse buttons, buttonholes (readymade, on short length of cloth). Sewing services (domestic/semstress); scissors, needles, linen and woolen thread, thimble. Table, bench.
- 3A Shops in *market towns*. Bolts of textiles. Accessories (buttons etc). Thread (various sorts). Metalware. Etc., etc. Labour. Most stock obtained from *London* merchants.
- 3B Carpenter's services, tools, wood (to make table, bench; also wooden chest).
- 4A Merchant draper, *London*. Shop in house. Warehouse (behind house): Stocks of various textiles (in bales). Labour. Textiles dispatched to *provincial* merchants.
- 4B Ironmonger, *London*. Shop in house. Warehouse (behind house): Stocks of metalware (including needles imported from *Sweden*). Labour. Goods dispatched to *provincial* merchants.
- 4C Mercer, *London*. Shop in house. Small warehouse (behind house) with stocks of various accessories: including buttons, lace, thread, caps, (knitted) gloves, stockings, etc. Goods dispatched as above.
- 4D Carrier's services: Pack-horses, pack-saddles, saddlecloths, *or* draught horses, harness, horse-collars, wagon, *or* cart, tilt-cloth. Labour.
- 5A *Shrewsbury* draper: Finished flannel cloth sent for dyeing: red dyewood (powdered, previously boiled with gall-nuts), alum and other mordants [to 'fix' dye], pewter vat, mineral coal, well-water, pump. Dyer's services, other labour. Draper then gets cloth pressed into bales and sent to merchant draper in *London*.
- 5B Linen thread: made in *Maidstone, Kent*. Linen yarn, twisting mill. Labour. *Maidstone* merchant dispatches to *London* mercer.
- 5C Button-making: towns and villages in *Cheshire*. Wooden moulds, linen thread. Labour. Button-holes (ditto). Waste bits of cloth, scissors, needles, linen and woolen thread, thimble. Labour. *Cheshire* merchants dispatch to *London*.
- 5D Metalware: produced by craftsmen in *Sheffield and surrounding districts*. Metal bars, tools, large and small anvils, stone or brick smithy with hearth, charcoal fuel, leather bellows, buckets, benches, stone water trough, etc. Labour. *Sheffield* ironmongers dispatch to *London*.
- 5E Carrier's services (as in 4D).
- 6A *Shrewsbury* draper sends fulled flannel cloth for calendering: apparatus (table, metal rollers, heavy, weighted metal box, draught horse to draw box over rollers and press and smooth cloth. Harness for horse). Hot water (to dip cloth into): vats, wood fuel. Wooden buckets to fetch water. Labour. Pressed cloth returned to draper.
- 6B Dyewoods , imported from *Brazil, Mexico, the West Indies, etc.*; gall-nuts: from *Sicily and Turkey*; by *London* factors and distributed to *provincial* merchants.
- 6C Linen thread for buttons (see 5B).
- 6D *Maidstone*. Linen yarn for thread: Prepared flax, spinning wheel. Labour. Yarn goes to thread-twister.
- 6E Making of twisting-mill. Craftsmen's services, other labour, wood, tools.

- 7 *Shrewsbury* draper sends unfinished flannel cloth for fulling: Fulling mill (wooden hammers run by water-wheel), fuller's earth, water, wooden trough [cloth is immersed in mixture and beaten, to draw the fibres together. A skilled process, requiring judgment to ensure even beating of the entire bolt]. Fuller's services, other labour.
- 8A Clothiers/ master weavers in *Vale of Hereford* towns and villages. Weaving of flannel: Rooms in houses, or weaving sheds. Horizontal looms; jersey warps (from yarnmasters); weft of coarse carded wool. Labour (male). Cloth sold unfinished to *Shrewsbury* draper. Carrier's services (as in 4D, 5E).
- 8B To make fulling-mill: Timber, tools, carpenter's and wheelwright's services, other labour.
- 9A Making of warps: *Cheshire, Wiltshire, Gloucestershire, large towns*. Woolcomber/Yarnmasters. Warehouses, stocks of yarn (for sale to clothiers), combed wool (for giving out to spinsters), blended uncombed pasture (long) wool (for giving out to woolcombers). Labour. Horses etc. *Cheshire, Wiltshire, Gloucestershire, smaller towns and villages*. Spinning of warps: blended combed long wool (from warehouse), small jersey wheel (improved over time). Labour (female). Yarn returned to warehouse. *Same areas*. Woolcombing. Uncombed pasture (long) wool (from warehouse), iron comb-pot, charcoal fuel [mineral coal unsuitable], two wool combs (each with three rows of iron teeth, T-shaped wooden handles), post and pad to fix one comb to, with quantity of uncombed oiled wool. Second comb heated and drawn through wool (to straighten and align fibres). To oil wool: rapeseed oil (for coarser cloth), olive oil (for better cloth), or waste butter. Labour (male). Combed wool returned to warehouse.
- 9B Making of wefts: *Same areas*. Spinning of wefts: blended coarse short wool (from clothiers), carded and scribbled, great spinning wheel. Labour (female). Wefts go to clothiers. Carding/scribbling of blended fallow (short) wool. Woolcards (wire teeth, coarse or fine, attached to leather piece on small board with handle). Wool is passed from one card to another (first with coarse, then fine teeth). Fibres are straightened and aligned. Labour (female). Wool from clothiers. *Oswestry, Salop [Shropshire]*. Wool merchants. Warehouses, stocks of blended fallow (short) wool from the *Midlands, Eastern and Southern England*. Clothiers buy wool and pass to spinsters, who card the wool, spin, return yarn.
- 9C Making of looms: *most major towns*. Hardwood, tools, turner's services, other labour. Some parts available ready-made.
- 10A Wool sorting and blending: *London* wool merchants. Blended, second-sorted wool (pasture and fallow, of a number of grades each) sold to provincial merchants. Carrier's services (as in 4D, 5E). Labour: breakers, sorters, blenders. (Good sorting essential for good cloth). Unblended, first-sorted wool (pasture and fallow, around three grades each) from wool-growers. Travelling buyers. Horses, pack-saddles, etc.
- 10B Making of wool combs and comb-pots. *Particular large towns*. Craftsmen's and other labour, tools, iron bars, hearth, etc. bars, hearth, etc.
- 10C Making of spinning wheels: *most major towns*. Suitable wood, tools, turner's and wheelwright's services, other labour.
- 11 First wool-sorting :essential for good cloth. Labour (female). Shearing and washing of wool. Labour (male), shears. Pasture (long) wool. Five main breeds of pasture sheep, more productive than fallow sheep. Improved pastures, extension of area under pasture, in areas less suited to crops; also wastelands, fens, etc. 'Up-and-down' husbandry: land used for arable for a number of years; crop rotations: grains, le.g.umes, oilseeds, etc. Then 'converted' to pasture. After several years, ploughed up for crops. First crops usually woad (blue dyestuff) because soil so rich. Fallow (short, 'crimpy') wool. Eight main breeds. Increasingly *specialised* grain areas: sheep are 'folded' on the arable after harvest and during fallow periods.
- Other concomitant production processes. Horse-dealers, horse-breeding, horse-raising (re.g.ional specialisations). Various *kinds* of horses, according to task. Leather workers produce (inter alia) pack saddles, harness, horse collars (cloth-lined): Tanned leather (appropriate grades), tools, shed., Horse-collars have to be fitted to the individual horse. Lorimers: specialists in making buckles, bits, other metal harness and saddle parts. Metal bars (from ironmongers), tools, shed, hearth, charcoal fuel, bellows, etc., as for other metal-workers. Carpenters: wagons, carts. Timber, tools. Wheelwright for wheels: timber, tools, iron bands etc. Managed woodlands, on landed estates. Foresters; also woodcutters with tools, carts, horses. Charcoal-burners: timber, earth to cover controlled burning. Sacks, carts, horses.

Table B**Cotton Garments, DCs, Late 20th Century: Sequential Production Processes**

- 1 Final product: Cotton garments in cupboards at home. *DCs*.
- 2 Retail clothing shops. Buildings, shop-fittings, stocks of clothing (various sorts). Shop assistants' labour. Offices (equipment, supplies. Labour). Power. *DCs*.
- 3A Wholesalers. Warehouses, equipment. Stocks of clothing (various types). Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *DCs*.
- 3B Shopfitters: Supplies, tools, transport (fuel). Labour. Offices (equipment, supplies, power. Labour). *DCs*.
- 4 Docks. Cranes, warehouses, depots, equipment. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *DCs*.
- 5A Shipping from *China* to *DCs*: Container ships (made in *Japan, Korea*; registered in *Liberia, Panama, Greece, Norway*). Shipping containers (made in *UK, US, Germany, Japan*). Labour (from *LDCs*). Fuel. Shipping companies' offices (buildings, equipment, supplies. Labour).
- 5B Docks. Cranes, warehouses, depots, equipment. Labour. Offices (equipment, supplies. Labour). Power. *China*.
- 6 Factories making garments: Finished cotton textiles (various types, grades); accessories (various sorts of buttons, zippers, ribbons, lace, other trims, shoulder-pads, etc). Cutting tables, shears, measuring tapes, etc. Industrial sewing machines, other equipment, sewing thread. Packaging materials. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *China*.
- 7A Dyeing, printing and finishing works. Buildings, vats, machinery, equipment, chemicals, dyestuffs. Stocks of unfinished cloth (and yarn). Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *China*.
- 7B Button and accessory factories: Machinery, equipment. Plastic etc. (for buttons); specialist textiles (for accessories). Labour. Offices (equipment, supplies. Labour). Power. Transport (fuel, labour). *China*.
- 7C Factories producing zippers: Machinery and equipment, aluminium, plastic, steel, specialist fabric. Packaging materials. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *Japan*. Shipping to *China*.
- [7D] [See below]
- 8A Weaving mills producing textiles: Weaving machinery, various types of dyed and undyed cotton yarn. Labour. Power. Transport (equipment, fuel. Labour). *China*.
- 8B Factories producing dyestuffs, chemicals for cleaning and finishing textiles: Buildings, machinery, equipment. Chemicals, other materials. Drums, etc. for holding dyestuffs, chemicals. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *Germany, UK, US*. Shipping to *China*.
- [8C] [See below]
- 8D Factories producing specialist fabrics for accessories: Machinery, cotton or artificial fibre yarn. Labour. Offices (equipment, supplies. Labour). Power. Transport equipment, fuel. Labour). *China*.
- 9A Spinning-mills producing yarn: Machinery, equipment. Baled, graded, cotton. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). (NB. Some yarn goes to dye-works, then weaving mills). *China*.
- [9B] [See below]
- 10A Cotton dealers. Warehouses, equipment. Stocks of baled, graded cotton. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *China*.
- [10B] [See below]
- 11A Cotton wholesalers. Warehouses, equipment. Stocks of baled, graded cotton. Labour. Offices (equipment, supplies. Labour). Power. *US, Uzbekistan, Egypt*. Transport (equipment, fuel. Labour). *Uzbekistan*. Shipping from *US, Egypt*, to *China*.
- 11B Cotton gins: Raw cotton. Baling equipment. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *China, US, Uzbekistan, Egypt*.
- 12A Farms producing different varieties of cotton: Fields, cotton seeds, fertiliser, pesticides, herbicides, irrigation facilities, pumps, agricultural equipment/tools. Farm buildings. *China, US, Uzbekistan*,

- Egypt*. Plough animals, transport animals, carts. *China, Uzbekistan, Egypt*. Labour. Power, fuel. Transport (equipment, fuel. Labour). *China, US, Uzbekistan, Egypt*.
- [12B] [See below]
- 13 Fertiliser, pesticide and herbicide factories: Buildings, machinery, equipment, chemicals. Labour. Offices (equipment, supplies. Labour). Power. *Germany, US, China*. Transport/Shipping/Transport. *Germany to US, Egypt*. Transport in *US, China*.

Concomitant Investment Processes

- 7D Factories producing machines and equipment for garment factories: Machinery, equipment, steel, other materials. Labour. Crates etc for packing. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *UK, Germany, Japan*. Shipping to *China*.
- 8C Factories producing dyeing, printing and finishing machinery and equipment: Buildings, machinery, equipment, steel, other inputs. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *UK, France, Germany, US*. Shipping to *China*.
- 9B Factories producing weaving machinery, and equipment for button, ribbon, zipper factories: Machinery, equipment, steel, other materials. Crates etc for packing. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *UK, Germany, Japan, US*. Shipping to *China*.
- 10B Factories producing spinning machinery: Machinery, equipment, steel, other materials. Labour. Crates etc for packing. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *UK*. Shipping to *China*.
- 12B Factories producing cotton gins: Machinery, equipment, steel, other materials. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *US, UK, Germany, China*. Shipping from *UK, Germany to Egypt*.

Other Concomitant Production Processes

- i. Lorries for transport (stages 3, 5, 6-13): Factories: Buildings, machinery, equipment, steel, engines, other materials and components. Labour. Offices (equipment, supplies. Labour). Power. *Japan*. Shipping to other *DCs, China, Egypt, Uzbekistan*.
 - ii. Factories producing tyres: Buildings, machinery, equipment, rubber, other materials. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *US, UK, France*. Shipping to *Japan*.
- [iiA] [Rubber factories: Buildings, machinery, equipment, processed rubber, other materials. Packing materials. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *US, UK, France*].
- [iiB] [Rubber plantations. Trees, fertiliser, herbicide, mulch, tools, equipment. Processing plant: buildings, equipment, power. Packing materials. Labour. Offices (equipment, supplies, power. Labour). Transport (equipment, fuel. Labour). *Malaysia, India, Brazil, Indonesia, Thailand, Vietnam*. Shipping to *US, UK, France*].
- iii. Shipyards (stages 5A, 7C, 7D, 8B, 8C, 9B, 10B, 11A, 12B, 13). Dry docks, cranes, other machinery, equipment, tools, shipbuilding steel, other materials. Labour. Offices (equipment, supplies. Labour). Power. *Korea, Japan*.
 - iv. Steel (stages 7C, 7D, 8C, 9B, 10B, 12B; also i, iii). Steel mills: Buildings, hearths, equipment, tools, coal, iron ore, other materials. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment, fuel. Labour). *Japan*. Shipping to other *DCs, China*.
 - v. Mines producing coal (various grades), iron ore, other minerals: Mining machinery, power, labour. Offices (equipment, supplies, power. Labour). Transport (lorries, trains, fuel. Labour). *Australia*. Shipping to *Japan*.
 - vi. Factories producing machinery and equipment for factories producing...(stages 7D, 8C, 9B, 10B, 12B; also see i-v): Buildings, machinery and equipment, steel, other materials, etc. Crates etc. for packing. Labour. Offices (equipment, supplies. Labour). Power. Transport (equipment fuel. Labour). *UK, Germany, France, Japan, US*.

NOTES

1. Diet generally: Everitt (1967a) pp. 416, 417, 450-3; Thirsk (1967) pp. 175, 177, 185-88, 192-97; Chartres (1977) pp. 20-23, 25-27, 35-36; Palliser (1992) pp. 7, 33; (1990) pp. 216-18. Imported foodstuffs: Clay (1984) II: p. 124, Table XVII; Willan (1976) pp. 20, 30, 36-39, 52, 55, 61, 66, 80, 81; Spufford (1984) pp. 62, 64, 66, 169, 178; Hoskins (1976) pp. 153-4; Pound (1988) pp. 56-7; Patten (1977) p. 305; Youings (1984) p. 96. Sugar and tobacco: Clay (1984) II: pp. 111, 124, 128, 137-8, 168-9, Tables XVII, XIX; Farnie (1962) p. 208; Davis (1967) p.10; (1969) pp. 80-2, 87-8, 96; (1973) pp. 34-5; Pound (1988) pp. 56-7; Willan (1976) pp. 35, 55, 72, 81-83, 93, 101, 137, 143; Patten (1977) p. 305; Clark (1983) pp. 85, 125, 134-5, 138. Drink: Clark (1983) pp. 95-106; Everitt (1967) p. 453; Thirsk (1967) p. 196.
2. Waterer (1956) pp. 154-5; Clarkson (1960-61) p. 252; Willan (1976) pp. 56-7, 78-9; Palliser (1992) p. 134; Patten (1979) Table 3.
3. Harrison (1968); Kerridge (1985) pp. 15, 21-3, 47, 53, 79, 87, 106, 125, 233-4; Spufford (1974) pp. 75, 141-2; (1984); Pound (1988) pp. 137-8; Everitt (1967) pp. 447-9, 456; Fastnedge (1957) p. 34; Skipp (1970) p. 109; Barley (1967) pp. 751-2; Wolsey and Luff (1968) p. 6.
4. Spufford (1974) pp. 141-2; (1984); Everitt (1967) pp. 446-8; Wolsey and Luff (1968) p. 9; Skipp (1978) p. 71; Kerridge (1985) pp. 19, 42, 53, 56, 72, 79-80, 87.
5. Spufford (1984); Thirsk (1988) pp. 49-50; Pound (1988) p. 137; Harrison (1968) pp. 200-202, 367; Clay (1984) II: p. 59; Hunt (1956) pp. 36, 44; Hughes (1956) pp. 92-3, 95-6, 98; (1957) pp. 113-5.
6. Hunt (1956); Fastnedge (1957); Skipp (1978) p. 63; Wolsey and Luff (1968) pp. 27, 31, 34, 36-7, 65-6, 70-71.
7. Everitt (1967a) pp. 442-8; Barley (1954-55) pp. 291-306; (1967) pp. 710-24, 734-66; (1985) pp. 591-60, 619-32, 677-82; Hoskins (1953); Machin (1977).
8. American readers should be warned that only 'barristers' are allowed to appear in 'higher' courts. Barristers also provide opinions, negotiate settlements, etc. Commercial barristers advise and negotiate on commercial matters. 'Attorneys' (nowadays, 'solicitors') are the workhorses of the legal profession, doing most of the day-to-day work (conveyancing, contracts, leases, mortgages, etc). Solicitors are allowed to appear only in very low courts, before magistrates. Solicitors bring clients to barristers when matters have reached the stage of possible court proceedings. Barristers may not deal direct with clients.

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