Capability Prerequisites and the Competitive Process

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Abstract
It is argued that the competitive process and processes of economic development may be understood better if economists focus on the role played by barriers to substitution caused by the use of trade-off-preventing decision rules and the production processes that require specific human and physical resources. Job selection criteria embody this via ‘essential’ requirements, but non-negotiable requirements of workers may result in poor structural adjustment. Production systems involve prerequisites and co-requisites but though firms can trade in factor markets this does not guarantee them instant means to achieving particular performance standards that potential customers demand.

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1 Introduction

This paper explores the implications of combining two notions that have long histories in the economics literature but which have always proved problematic for mainstream thinking. One is the idea that the population of decision makers often includes significant numbers of agents who employ decision rules that violate the Principle of Gross Substitution/the Axiom of Archimedes. Their decisions may be made in terms of a hierarchy of objectives (see Drakopoulos and Karayiannis, 2004, for a survey of the historical development of this idea) or in terms of a checklist that specifies a set of targets, all of which must be met if a prospective course of action is to be deemed satisfactory (see Earl, 1986). The paper’s other key ingredient is the notion that what firms can produce is constrained not by a ‘given’ set of technological possibilities in conjunction with a set of prices for factors of production, but by the pool of resources and associated capabilities that the firm has at its disposal. This is particularly associated with the work of Penrose (1959) and Richardson (1972) and has been influential in the strategic management literature in what is known as the ‘resource-based view of the firm’ (see Foss, ed., 1997 for a collection of key readings). However, as with so many modern economic notions, it can be found in Alfred Marshall’s (1920, p. 355) evolutionary analysis of firms, which emphasized that firms differ in how they do business because they have learnt different things after experimenting in different ways. Emphasis on differences between firms associated with learning is also evident in the ‘growth of knowledge’ approach to economics that Loasby (1999) has been developing with inspiration not merely from these writers but also from Hayek and Shackle.

These two themes are brought together in several ways. Section 2 is an attempt to make clear the ontological foundations of the paper, so that orthodox economists will have a better chance of seeing where the arguments are coming from and what makes them different from orthodox thinking. Section 3 examines the substitutability of human resources between different tasks and the role of non-compensatory decision rules on both the demand side and supply side of the labour market. Sections 4 and 5 examine the role of specific tools and flows of other inputs in production systems, likening them to prerequisites and co-requisites in university degree programmes.\(^1\) Section 6 can be

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\(^1\) Following a suggestion by myself, Drakopoulos and Karayiannis (2004, p. 364) inserted a footnote motioning that scope for taking a ‘hierarchy of capabilities’ approach to production along such lines. However, they then added the suggestion that Encarnacion (1964) constitutes an early attempt to do so. This appears to misread Encarnacion’s paper, which brings the hierarchy idea into the firm only in terms of a hierarchy of managerial objectives.
seen as a contribution to the theory of monopolistic competition in which the product and other non-price attributes of the marketing mix become variables. It looks at the strategic implications of a conjunction of non-compensatory purchasing rules and supply-side capability constraints, while section 7 examines potential for firms to overcome capability shortfalls. Section 8 offers some concluding reflections.

2 A complex systems perspective
Orthodox economists are likely to have trouble appreciating the resource-based view of the firm as a significant advance in our understanding of how the economic system works. To argue that what a firm can do is presently constrained by its current labour force, its existing capital equipment and its relationships with supply chain members, customers and financiers naturally tends to sound like nothing more than a short-run analysis in fancy dress. Barney (2001) acknowledges this in his retrospective musings about the resource-based view, a decade after his classic (1991) paper on its significance for strategic management. Though presently there may be some limitations on what the firm can do, managers wishing to emulate what other firms are doing can change the sets of resources at their disposal. Machines can be sold and alternatives purchased. Existing employees can be replaced by ones with different skills, or retrained, whichever is the least-cost option. Evidence that this happens is abundant: for example, General Electric has become a leading player in financial services and disposed of its small appliances interests, whilst Kodak is changing its focus from film-based photography to digital photography products. If resources are slow to be reallocated in response to changes in the production possibility set and consumer preferences, this is a reflection of transaction costs and/or sluggish adjustments in managerial vision. The former can be addressed by microeconomic reforms aimed at ‘freeing up markets’ while the latter will tend to be eliminated as more dynamic firms capture bigger markets shares.

As Potts (2000) emphasises, orthodox economics is based on a formal view of the economy as a ‘field’ in which everything is connected to everything else to some degree. Any combinations and re-combinations of firms, workers, customers and products are possible, with relative prices determining which ones get selected. How the economy develops is thus driven by processes of substitution that are channelled by changes in relative prices consequent on changing mixes of supply and demand. By contrast, in arguing that the resource-based approach to the firm is not orthodox short-run thinking in fancy dress, I am seeing the economy in terms of what Potts calls a
‘complex systems’ perspective. That is to say, only some elements of the system are capable of connecting and the present set of connections, which is a consequence of past choices, constrains the sets of connections in terms of which we might subsequently map the economy. The economic system, from the heterodox standpoint, thus has a definite architecture and how it evolves is significantly shaped by breaks in chains of substitution.²

From the complex systems standpoint, a resources/capabilities view of firms naturally goes with the hierarchical/checklist view of choice. However, they have hitherto tended to be written about separately. Taken together, as is done here, the two approaches seem to offer a way of making sense of supply and demand elasticities. It should be understood that it is not my intention to claim that substitution in consumption and production never takes place in response to changes in relative prices. Rather, the aim is to produce a change of mindset, away from the orthodox tendency always to go looking for substitution potential and towards a more pluralistic way of thinking that looks also for ways in which barriers to substitution channel the workings of the competitive process.

3 The right person for the job
Orthodox production theory is underpinned by the same ‘everyone has their price’ axiom that underpins orthodox consumer theory. On this way of looking at the world, anyone can be a brain surgeon or rocket scientist, or whatever, but some people are faster and more reliable at particular tasks and hence will command higher earnings for performing them. On the supply side of the labour market the message is that jobs that are unpleasant to perform, are located inconveniently and/or involve foregoing earnings in order to receive training can nonetheless attract applicants if the wages that are offered exceed those of jobs that do not have these disadvantages by a margin sufficient to compensate for having them. It is assumed there will always be a wage, albeit possibly a very high one, that will

² The argument here can be thought of as an extension of the kind of thinking that underlies the different between conventional monetary economics and Post Keynesian monetary economics. In the former view, a reduction in short-term interest rates will cause a wide-ranging set of ripple effects: people who would have bought Treasury Bills will substitute into long-term bonds, depressing their yields, too, which will induce substitution in favour of equities, and rising equity prices will stimulate investment. Lower interest rates will also lead banks to want to lend and consumer to want to spend more. From the Post Keynesian standpoint, by contrast, the effectiveness of monetary policy may be undermined by the failure of these substitutions to occur if confidence is bw: banks may have trouble finding would-be borrowers who match their lending criteria, and those with financial assets may prefer to shoulder a loss of interest income rather than switch to assets that carry a much bigger risk of capital loss (cf. Karacaoglu, 1984).
induce such substitution. Similarly, employers would offer more jobs to people with poor skills if the latter were willing to work for a low enough wage to compensate for their lower marginal revenue products. On this view, a firm whose members of staff are not particularly competent still has a chance of matching what its rivals do, so long as it can pay them low enough wages to offset their slowness and high defect rates. Individuals with particular preferences about the kind of work they are willing to do, and comparative advantages in doing certain kinds of work, will tend to end up with earnings that reflect relative scarcities of opportunities and capabilities and the preferences of themselves and employers in terms of net advantages.

Clearly, the conventional wisdom provides a useful starting point for analysing some parts of the labour market. People who are better than others at performing a particular task tend to earn more, capturing at least some of the Ricardian rents that they generate, because firms compete with each other to hire them. For example, an unknown junior lawyer will command a much smaller fee than a very experienced one with a good reputation because of the lower probability that the junior would win a given case. It is also evident that some people will undertake very dangerous tasks if they judge the odds of getting themselves killed or maimed are small enough relative to the payoffs involved—for example, consider the supply of North Sea divers to oil rigs, 58 of whom lost their lives between 1971 and 1999 (see Limbrick, 2002).

Despite this, a moment’s reflection on how modern labour markets work also provides evidence that is sharply at odds with a trade-off-based perspective. Consider the situation faced by someone who has their sights set on becoming a full professor of economics. The path to this goal comprises a set of hurdles.

First, they must achieve good enough grades at high school or college to achieve admission to an economics degree programme. To graduate with an economics degree, they will have to take a number of ‘core’ units that serve as prerequisites for other units. If, say, they fail introductory econometrics, it may be catastrophic for their chances of graduating in economics, no matter how good they are at microeconomics and macroeconomic theory. They will also need a good enough grade point average to qualify for postgraduate study. If they fail to complete and be awarded their PhD, they will have no hope of achieving employment in a reputable research university.

It is interesting to note, however, that those facing possible death sentences for drug smuggling in Asia quite often claim that they only got involved under threats that they, or members of their families, would be killed if they refused to participate; it was not that they got involved because of large payments being promised to offset the risks of being caught and sentenced to death.
To advance to a tenured position, they must demonstrate adequate skills in teaching and achieving publications. When they seek full professorships, they will find that hiring or promotion criteria almost invariably include lists of both desirable and essential characteristics. For example, one might be expected to have an international reputation as a scholar, signified by success in achieving publications in top-league economics journals, a track record in raising research funds, experience of supervising PhD students, and so on. If criteria are listed as ‘essential’, the message is ‘don’t even think of applying if you do not have them to a sufficient degree’. Whereas with the ‘desirable’ features there is room for one’s deficiencies in some respects to be offset by one’s stellar achievements in other areas on the list, the ‘essential’ criteria imply an intention on the part of the selection committee to use a non-compensatory decision rule.

It was not always like this. When production theory was conceived, academics did not have to have PhDs to establish their careers, students were able to make a ‘knight’s move’ from one kind of degree to another, totally unrelated programme, and it was much easier for academics to switch between discipline areas.

In the modern world, specialization appears to get in the way of substitution in production processes to a far greater degree than is recognized in the notion of diminishing marginal rates of transformation. Specific tasks require specific capabilities, so organizations set out to hire the right person for the job. On the other side of the labour market, workers set out to acquire particular sets of capabilities mindful of likely job opportunities and in the knowledge that, as the saying goes, ‘a square peg does not fit a round hole’. This can backfire and add to problems of structural unemployment if too many people invest in highly specific skills. For example, TV dramas have led many students to wish to study forensic science. A corresponding expansion in the number of university courses in this area has resulted in many more potential graduates than there are jobs available (see SEMTA, 2004, especially pp. 11-12).

From this standpoint, the labour market works not so much as an equilibrating mechanism but as a sorting device in which positions get filled insofar as demand-side templates are matched by the profiles of those who offer their services. In the short run, mismatches between employers’ templates and workers’ capability profiles result in output being constrained by staff shortages, or some workers finding themselves structurally unemployed. In the long run, the traditional story partly comes back into its own: changes in relative wages may lead to flows of labour between areas and types of work, while changes in relative costs of particular skills may permit changes in relative prices of products and hence the diversion of demand along
channels that will eliminate product shortages and labour surpluses. However, there are two problems.

The first difficulty is that such demand diversion may be limited by the use of priority-/checklist-based decision rules that serves as barriers to substitution in product markets. Secondly, some of the substitution that takes place between grades of skills may not be in terms of a given production function; rather, some production systems will be redesigned to permit the use of cheaper but less qualified workers. As Loasby (1982, pp. 237-8) observes:

>[A]s soon as we admit that technology is not given but has to be laboriously and expensively acquired, it is reasonable to ask why anyone should ever bother to develop techniques which would become worthwhile only if relative factor prices were to become very different from what they are. It would be rational, therefore, to discover—or rather to invent—only a small section of the isoquant...

The deskilling process at the heart of what Ritzer (2000) calls ‘McDonaldization’ is thus essentially not a matter of substitution within a given production function, any more than were the processes whereby Henry Ford cut the cost of building cars by finer and finer division of labour and the development of more and more specialized machinery. Deskilling requires the development of new systems of production to tap into cheaper but less capable sources of labour.

Many jobs are impossible to do if one lacks basic skills in reading and mathematics; others require particular physical attributes. However, how competent one might be at performing a task in a world of specialized knowledge will depend not upon the level of education and training one has achieved but also upon the area in which one has specialized. At a basic level, different activities may require a similar kind of knowledge, and those who possess that knowledge can switch between them, but at more sophisticated levels of knowledge, potential for substitution becomes increasingly limited. In a medical emergency, we would be far happier to be attended to by final year veterinary science undergraduate if no doctor were available, than by someone with a PhD in economics, but in normal times we would settle for nothing less than a properly accredited medical physician. If we have, say, a puzzling problem with our digestive system, then we will insist on seeing a gastrologist, rather than a mere general medical practitioner; if we have trouble with our eyes, we need to see an ophthalmologist, and so on.

At each stage in the process of becoming competent to perform a particular set of tasks with a particular degree of reliability a person
will have had to master other pre-requisite tasks to particular standards. In terms of our medical skills example, the idea of a hierarchy of capabilities would mean that, at their level of specialisation, a gastrologist and an ophthalmologist could not do each other’s jobs, but they could function as general practitioners unless they had forgotten too much of their original training in medicine. If they had indeed forgotten much of their broader medical knowledge and their specialist positions could no longer be funded, they would only be as valuable as medical students, or in an entirely different profession that required some of the non-medical skills that they had picked up.

It is worth pausing at this juncture to reflect on how an increasingly specialized training can eventually result in people developing skills that enable them to switch into a different kind of activity. As professionals such as medical specialists, academics, engineers and lawyers get to know more and more about their areas of expertise, they will face choices between specializing further within their fields or coordinating those who have specialized further and know more about certain aspects than they do. Skills that they acquire in budgeting resources and in people management will be much more generic than the skills they had earlier acquired. These new skills may make it possible for them to move to a higher organizational level as senior managers. As they attempt to move up their career ladders, they may find themselves competing once again with colleagues with whom they had earlier ceased to compete directly due to their differences in expertise. For example, a professor of economics and a professor of biology could not do each other’s jobs, but either might one day become a vice-chancellor after gaining experience in head of division and dean of faculty roles. However, without having track records in the latter roles, they could not hope to become a vice-chancellor. They might also find themselves competing with those who had acquired the required managerial capabilities outside of academia.

This ‘hierarchy of capabilities’ view thus offers a way of making some sense of the segmented structure of the labour market, including how it is divided up between internal labour markets and markets for positions that have open ‘ports of entry’, as in the work of Doeringer and Piore (1971/1985). By following a rather similar line of thinking, Martens (2004) is able to make sense of why specialists cluster together and why payoffs to high-level education in developing countries are often very poor. Highly-trained people often will be unable to make use of their skills to the full unless they can do so in conjunction with colleagues who have been trained to a similar level: someone with leading-edge skills in information technology will be much more valuable in Silicon Valley amidst like minds than trying to
work in a developing country with colleagues whose level of training is far lower.

The unavailability of staff at the level required may have a discontinuous impact on operations, even to the extent of necessitating closing down until replacements have been attracted or others trained up to the standard required. For example, early in 2006, Brumby’s, an Australian bakery franchise operator, was driven to hire 20 qualified bakers from Vietnam on 4-year working visas due to a shortage of local skills that had in 2005 forced it to scale back its expansion programme and even close a couple of its northern Queensland operations because its local franchisees could not find staff (see Millar, 2006). Without bakers, bread could not be baked and, for a national chain, whose uniformity of quality and service is vital for the value of its brand (for example, so that shoppers can buy bread from unfamiliar outlets ‘on the run’), the solution was not temporarily to bring in staff who were not properly trained. Brumby’s search pool for workers from developing countries who might be willing to move overseas temporarily to achieve developed-country baker’s wages was also highly specific: as a former French colony, Vietnam has European baking traditions that its near neighbours lack.

Institutional arrangement and lifestyle issues may extend the length of the ‘short run’ considerably. Trades unions and professional associations may be able to limit entry by workers from other areas, as with doctors from Russia facing accreditation problems if they move overseas, despite having years of experience, because of closed-shop practices by local colleges of surgeons. These bodies may also insist on over-long apprenticeship arrangements that both delay supply responses and also deter people from signing up due to the poor pay they will receive during the apprentice phase. (In the Brumby’s case in Australia, it appears that the firm can train its franchisees to run its bakery systems to the firm’s required standard in just 12 weeks, whereas the staff the franchisees will need to hire to work alongside them and relieve them have been required to undergo four-year apprenticeships.)

It may also prove impossible to find staff prepared to move to the location where their particular skills are needed. Non-trade-off based decision making may apply on the supply side of the labour market, too, with workers being reluctant to change location because of local ‘ties that bind’, such as their wish not to disrupt their children’s schooling, move away from their aged parents or social involvements. In some case, the prospective local climate may simply be seen as ‘too hot’ or ‘too cold’. In cases where jobs are very dangerous, there may simply not be enough people who are both in the geographical area and willing to take the risk, regardless of the remuneration that is
offered (cf. the ‘safety first’ view of choice under uncertainty in Roy, 1952 and Blatt, 1983). In such cases, the only way to increase output may be to redesign the process and bring the hazards within boundaries acceptable to enough potential employees.

A ‘safety first’ barrier to labour immobility may arise not merely where risks are of a physical kind. A new job in a distant location can also look very dangerous in terms of one’s emotional security and social standing. For example, workers with the right skills may hold back from applying for such posts because they are nervous that they might not ‘fit in’ and could then suffer adverse social comment if they gave up and returned home, ‘their tails between their legs’. Such an outcome might, in prospect, seem too humiliating. (They might also find themselves unable to go back to their previous kinds of work there.) If it is not the remuneration that is the problem in attracting workers, employers in such situations need to remove the causes of anxiety in order to attract applicants, not increase the pay they offer (for example, allowing generous leave to fly home regularly, or flying them in to see where they will be living rather than expecting a conference-call interview and large wage offer to be enough).

Quite aside from these considerations, it should be noted that mismatches between supply and demand may persist for far longer than mainstream theorists might expect in part because the very idea of gearing up to work in a particular trade may be unthinkable to those who might be able to improve their positions financially by doing so. It is not the case that everyone has their price when it comes to moving between jobs. Moreover, even if some people will, as it is commonly put, ‘sell out’ if the price is right, a firm may experience long delays in finding out what that price is. Labour markets do not work as in a Walrasian auction and a firm will raise its offers only gradually in order to avoid needlessly letting its workers capture the rents that they will generate.

One further consideration when labour supply is highly inelastic is the intra-marginal cost of paying those workers who are, reluctantly, prepared to move. Paying them way over what incumbents are earning may be difficult to sustain once word seeps out to the latter, yet paying the higher wage to all may cost the firm vastly more than the marginal revenue it can get from making up its shortfall of skilled workers.

To sum up this section, we may say that the idea that certain kinds of production require particular sets of capabilities for which other sets will not serve as substitutes provides a way of illuminating the nature of structural unemployment and labour market bottlenecks. If such problems are to be dealt with rapidly, it may be insufficient to rely upon changes in relative wages.
4 The right tools for the job

Employees who have reached a particular level of capability may be of little use without particular physical assets. Examples abound: a saw is for cutting, and a screwdriver is for joining components together; their roles cannot be reversed with any success no matter how well trained a carpenter might be. Indeed, the more highly skilled a worker is in a particular area, the more they will often be dependent on access to an array of specialized tools to make the most of their expertise, whereas less capable workers might be overwhelmed by such a choice of special tools or find certain tools too powerful to use safely or accurately because each error they make is swiftly magnified.

Tools themselves may be highly complementary. For example, to run an Internet-based business, one must have staff with adequate computing skills and a good enough computer to run the necessary systems of software. Failures to upgrade system elements in parallel may result in the system ceasing to function as it once did. (For example, if an Internet service provider changes its provider of dial-up phone services, clients using, say Apple iMac computers that were running perfectly well on OS9.0 may find they have lost Internet access, but if they upgrade to OSX, they may then find that their version of Microsoft Office no longer runs, because System X’s ‘Classic’ requires the installation of OS9.1 in order to work. To switch to broadband may require a new computer with bigger RAM, and so on.)

Of course, in some situations substitution is possible—for example, in the absence of a screwdriver and screws, two pieces of wood might be nailed or glued together. However, to produce a particular end result in terms of strength, reliability, quality of finish, etc., a particular type of tool and technology may be essential.

As with human resources, physical capital has degrees of specialisation. Not merely are there saws for different kinds of cutting, and screwdrivers specific to particular types of screws that are differently suited to particular applications, but some tools are specific to particular end products. Probably the most famous case of the last category is the tooling developed by the Ford Motor Company during the process of making the Model-T cheaper and cheaper to produce. The specificity of this tooling was such that, when Ford switched to

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4 Where a worker with particular capabilities must be teamed with particular capital items, there is no chance of measuring the marginal productivity of either in isolation, as Georgescu-Roegen (1935, p. 46) pointed out long ago. However, to be fair to orthodox thinking, this problem is probably less extreme than it first appears, since it may be possible to measure the performance of a worker with different grades of the same kind of equipment (for example, a secretary with different vintages of computer), or the impact of different levels of training on what a worker can do with particular equipment.
producing the Model-A, the changeover took 18 months, during which Ford laid off 60,000 workers and had to replace 15,000 machine tools and rebuild a further 25,000. This also had a human resource legacy that went beyond the deskilling of the firm’s manual workers: Ford’s corporate culture remained obsessed with cost cutting for years afterwards, with marketing and public relations staff continuing to occupy a low status in the organization (see Selznick, 1957, pp. 109-110).

Investments in highly specific skills and tooling limit the power of competitive processes by limiting the flow of resources out of declining markets and deterring entry into markets where fat profits are being earned. Increased viscosity in resource flows is not due merely to the kinds of logistical nightmare that Ford faced on the demise of the Model-T or delays that one might expect to suffer if ordering bespoke machinery rather than buying it, so to speak, ‘off the peg’. Rather, the problem in both cases is the poor second-hand market for assets tailored for making just one type of output.

It is asset specificity that provides the underlying reason why economists should share Richardson’s (1960) concern with potential for failures of investment coordination (not merely in terms of physical investments but also, as the earlier example of forensic science training indicates, investment in human capital). In a market where production is based on highly specific assets, incumbent firms may have trouble switching to other activities if there is excessive entry or demand turns down, since they will be unable to raise much by selling their equipment. The least bad option may be to carry on producing so long as the price at least covers their incremental, non-sunk costs, until the assets wear out (see Salter, 1960; Harrigan, 1980). In markets where incumbents are making high profits, potential entrants may judge that it is impossible to compete by using general-purpose equipment against the incumbents’ tailored systems. However, even if they can come up with the funds to make such investments, a deterrent to going ahead would be the risk that, if a market entry attempt failed, product-specific assets would be worth only their value as scrap. This is in sharp contrast to a situation in which, say, managers change their requirements for lathes, versus welding equipment: in the latter case, they should be able to find well-functioning markets for second-hand lathes and welding equipment in which they can sell the former and purchase the latter, with second-hand prices differing from new prices in ways that are closely related to the extent of physical depreciation.
5 Production prerequisites and co-requisites
As well as its workers and items of capital equipment (both hardware and software), a crucial resource for a firm is the set of relationships that determine the quality of its supply chain; this is what John Kay (1993) calls the firm’s ‘architecture’. Just how significant this is becomes apparent if we recognize that the architecture of a production system often looks like the architecture of a university degree programme in the sense that to produce a particular end result specific ingredients are required and some of these take the form of prerequisites or co-requisites.

Workers with specific skills and specific tools will often be using inputs of particular materials. To run a bakery, one needs not merely bakers and ovens but also flour, yeast and supplies of energy. If the wrong kind of flour is delivered, it may still be possible to bake something, but not the mix of items that the bakery manager had intended. With some kinds of input flows, there may be scope for substitution as a means to keep on producing the same finished product, just as one can power a (suitably adapted) car with LPG, CNG and ethanol blends as well as via standard petrol, albeit with trade-offs in terms of some performance parameters. However, in some production systems particular raw materials and other inputs may be required for output to be possible at all (just as it is disastrous to try to fill a diesel vehicle with petrol, or a petrol vehicle with diesel fuel), or to meet a particular performance standard (just as an engine may run on lower octane fuels but to achieve higher standards of performance will require higher-octane fuel). For example, a firm that is making plaster-based building products will need a supply of gypsum, just as a pottery will need clay. Without water and electricity, neither business may be able to operate at all.

With modern, high technology products that are assembled from dozens or thousands of components, it is sometimes possible viably to retrofit non-core elements if there are problems in obtaining supplies, but in some cases it will be more costly to design products to ensure that this is possible. Competitive pressures may prevent firms from investing in such options and force them instead to concentrate on ensuring reliability in supply.\(^5\)

Where production systems take this kind of form, the division of labour between firms in the value chain will be shaped by assessments

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\(^5\) In this connection, it is interesting to note that the collapse of MG-Rover in 2005 was triggered by the non-delivery of bumper mouldings for the firm’s most successful model, the Rover 75. The supplier was frustrated by delays in payment, but since it was impossible, given the way the production system was set up, for these parts to be retro-fitted, the 75’s production ceased and with it the cashflow from which the firm was already struggling to meet its bills.
of strategic risk of what Williamson (1985) calls ‘hold-up’. Williamson focuses on hold-ups that are opportunistic, in the sense that the party withholding supply is acting with guile in the pursuit of an advantage at the expense of the other party. A typical example of what he has in mind is where a trade union or contractor threatens to withhold supply in order to get better terms, having seen the other party is faring better than they expected them to be at the time the contract was negotiated.

Williamson insists that for hold-up fears to provide a basis for vertical integration, asset specificity must be a feature of the production process. If a firm uses general-purpose equipment, being let down by an upstream supplier of inputs or a downstream customer or distributor is not a disaster, for the firm can use its resources to make other things; by contrast, if specific assets are lying idle they are doing nothing to cover their capital costs and, as noted earlier, if they have to be sold, their second-hand values may be tiny compared with their original costs.

Though plausible at first sight, Williamson’s analysis has some holes that the prerequisites perspective can help to plug. The crucial area that needs attention in Williamson’s analysis is that of the circumstances under which another supply chain member would be tempted to act opportunistically against the rest of the supply chain. As Foss (1993) points out, if you are sharing a boat, sinking it to harm the other occupants also harms you. Thus we should not expect a firm with product-specific assets to be opportunistically held up by another firm in the supply chain if the latter firm has also made investments of a product-specific nature. Rather, as was noticed by Neil Kay (1997, chapter 3), the sorts of supply chain participants to worry about are those that produce outputs that are not specific to that particular supply chain but which would be valuable to businesses in other supply chains. Such suppliers have leverage if the hold-up victim cannot arrange alternative supplies of the input at short notice without incurring considerable costs and if the input in question is in short enough supply for the threat to find other, more remunerative customers to prove credible. Ultimately, the story is still being driven by barriers to substitution, but these are additional to those on which Williamson focuses and they are best seen as providing the foundations of (or an alternative to) another of his conditions for internalisation, namely, small numbers of potential trading partners.

For example, an ‘oil company’ that invests in oil refineries has specific assets a prerequisite for whose operation is crude oil, but without refineries, crude oil is of no use except as a store of value. Because ultimately the known supply of unrefined oil will diminish, oil companies have to worry about not getting oil to keep their refineries
busy, so it makes good sense for them to try to achieve control of oil fields that would also be valuable to their rivals. If oil discoveries were vastly outstripping demand projections, or if oil refineries could work with other inputs of hydrocarbons, such as biomass, then oil companies would have no incentive in option value terms to acquire secure access to supplies of crude oil.

Although the message so far in this section is that a non-substitution view of production process is central to understanding the strategic risks that firms face and hence the kinds of market entry and internalisation decisions that they take, the prerequisites view of production needs to be seen in a broader context, namely its significance at the level of the State. From this standpoint, for example, we could understand the US invasion of Iraq as a covert means of ensuring that the oil-dependent US economy would have continued access to adequate supplies of oil rather than having to develop capabilities for coping in a less energy-intensive manner and having many of its past investments pushed down in value. Similarly, we can perhaps better appreciate why the British Labour Party was for so long intent, via the infamous ‘Clause 4’ of its constitution, on nationalized ownership of the ‘commanding heights’ of the economy, such as coal, steel, electricity and other public utilities: for ‘commanding heights’, we would now read ‘common production prerequisites’.

The argument here can also be seen as an extension, to the level of the firm of themes from development economics. They are perhaps most redolent of Rostow’s (1960) ‘pre-conditions for take off into sustained economic growth’ and the emphasis accorded to the development of ‘forward and backward linkages’ and elimination of structural bottleneck’s in Hirschman’s (1958) work on development strategies. Without, say, particular standards of literacy, public health, infrastructure and property rights, an entire economy might fail to generate enough investment to achieve ongoing growth. Likewise, a development plan may founder if complementary elements are not all delivered: for example, building a dam for a hydro electric scheme may permit irrigated farming and provide power for an electric arc furnace that will reprocess scrap steel from a ship-breaking operation (cf. the Volta Dam project in Ghana), but if any one of the elements is missing none of the rest may be viable.

Ideas from this section are also much in keeping with themes in Schumacher’s (1974) *Small is Beautiful*. Development aid can be wasted if not complementary with the skills of the local population: for

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6 Hirschman’s book provided some of the inspiration for Moss’s (1981) *An Economic Theory of Business Strategy*, as did the resource-based view of the firm, but Moss did not focus on the non-substitution issue.
example, tractors may contribute little to agriculture without spare parts back-up and skilled mechanics to keep them running, so an ‘intermediate technology’ (such as an improved design of plough) that enables output to be increased whilst still using animal power may be much more effective. More bluntly, Schumacher (p. 48) points out that ‘An expansion of man’s ability to bring forth secondary products is useless unless preceded by an expansion of his ability to win primary products from the earth’.

It is perhaps Tom Friedman’s (1999) *The Lexus and the Olive Tree* that will be of particular interest here, for his argument is implicitly in line with institutionalist and evolutionary thinking that sees the economy as a system of rules. Friedman (1999, chapter 7) characterizes economies in computing terms: they can differ in terms of the kind of basic hardware they have (free market, communist, hybrid?), and their grade of operating system. Nations also differ in the quality of ‘software’ to which they have access, which he sees as their legal and regulatory systems that shape how business gets done. Friedman (1999, p. 129) argues that,

Good software includes banking laws, commercial laws, bankruptcy rules, contract laws, business codes of conduct, a genuinely independent central bank, property rights that encourage risk-taking, processes for judicial review, international accounting standards, commercial courts, regulatory oversight agencies backed up by an impartial judiciary, laws against conflict of interest and insider trading by government officials, and officials and citizens ready to implement these rules in a reasonably consistent manner.

For Friedman, trying to run high performance software with inadequate hardware or a low-grade operating system is likely greatly to limit rates of growth: as with a computer, there will be errors, system crashes and generally very slow running.

6 Capabilities and competitive strategy

From the standpoint of orthodox theory, a lack of the capabilities required to deliver particular standards of performance on particular product characteristics is not to be seen as a major strategic issue for a firm. The firm in question may be pretty hopeless at doing some things with its existing pool of resources, but it will be relatively better than its competitors at doing other things. It should specialize in producing goods or services that make the most of its comparative
advantage. If the firm is at an absolute disadvantage, in the sense that it does not do anything better in non-price terms than its rivals and its labour costs prevent it from offering a generally inferior product at a price low enough to compensate for the product's non-price inferiority, then it may still be able to supply against its more competent rivals if it relocates production to a lower-wage economy. Relocation offshore may not be necessary. If the firm is in an economy where there is a general shortage of the capabilities in respect of which it is deficient, and if its rivals are overseas firms, then sooner or later its costs should fall relative to its rivals due to a trade deficit putting downward pressure on the country's exchange rate. Either way, if it cannot produce goods that match those of its rivals in quality, it may stay in business by undercutting them in terms of price.

There are several problems with the standard story, which leave open the possibility that such a firm would be forced out of business unless it managed somehow to obtain capabilities to match those of its rivals. First, relocating production offshore may be impossible with many kinds of service products. Secondly, the capabilities that are available in lower-wage economies may be far less well developed than those that the firm presently has, for example in areas important to quality such as attention to detail. (European carmakers such as Ford and Volkswagen have tended to run into this issue when using South Africa as a low-cost centre for assembling right-hand-drive models for export to markets such as Australia and the UK.) The lower wages will need to be low enough to permit the even more inferior product to sell at an even lower price than the low price required for it to sell at the non-price standards achievable in its country of origin (not to mention increased transport costs). Thirdly, if a viable offshore location for manufacture cannot be found, there is no guarantee that the domestic exchange rate will fall rapidly enough to maintain the viability of local production, for capital inflows may offset a widening current account deficit. If so, the burden of adjustment will fall on money wages in the domestic economy.

The fourth problem is arguably the most significant: a firm that tries to compensate for its lack of competence in some areas by making the most of what it is good at doing or by selling at a lower price may end up far less profitable than firms that are much more rounded performers. The latter may fare far better if the population of potential buyers is predominately choosing in a non-compensatory manner using checklists or hierarchical decision rules. If buyers are prepared to spend up to a particular sum to obtain a product of a particular standard and can find firms that offer products of that standard, then if they stick to their decision rules they will buy from such firms, not from firms that offer cheaper products that fail to
match up to their requirements. Thus, for example, a car that, in terms of widely-employed decision rules looks wonderful or handles brilliantly but has a reputation for unreliability, rusting, precipitous depreciation, inadequate luggage space and a poor safety rating will pick up very limited market share even if it is relatively cheap, as will a product that is generally adequate but whose dreadful appearance reflects its manufacturer’s shortage of capabilities in the area of styling. From the non-compensatory view of choice, a shortfall in a single area of capability could prove catastrophic to a firm if the shortfall is in an area that is a core requirement/high priority for the bulk of its potential customers. The firm’s first priority should be to use its resources to improve its capabilities in the core area and get its product up to the required standard. Next, it should attend to meeting the next-most important area in which it is presently failing to match the typical customer’s requirements (see further, Earl and Wakeley, 2006).

If these non-compensatory decision rules are common, being over-endowed with talents in some areas may prove detrimental to the firm’s profitability in another way: for example, over-engineered products that exceed the requirements of the bulk of one’s market in some areas may cost more to make than the offerings of rivals who have smaller teams of engineers and/or are not paying for the top engineering talent or facilities, but have merely spent enough to meet customer standards. The firm would have done better to spend less on capabilities in engineering and more on capabilities in other areas, beginning with capabilities in market research to discover the hopes and areas of intolerance of its potential customers.

7 Correcting Capability Deficits
In the long run, a firm that is presently unable to meet particular performance standards may be able to acquire the necessary capabilities, either by processes of internal learning or from outside, or some combination thereof. But what do we mean by the ‘long run’ if we are viewing production theory in terms of capabilities and emphasizing prerequisite or co-requisite relationships between them or between capabilities and output standards? Rather than seeing the long run as the situation in which a firm can vary all of its factors of production within a given production function, it seems appropriate to see the long run in terms of the time by which the firm will be able to achieve a particular capability if it sets out now to try to reach it. This way of looking at the long run can refer to performance standards with an existing genre of products (such as a fuel economy target for a particular size of car, or reaching the top five in customer satisfaction
ratings at JDPower.com) or commercial viability of a new genre of product (such as a fuel-cell powered car).

The capabilities that are being pursued may be spelt out in terms of both non-price and price performances, such as the capability to produce a digital single lens reflex camera with seven-megapixel photographic capacity that could be retailed for less than $1000. Different capabilities will take different lengths of time to cultivate or acquire: achieving ‘zero defects’ in production of a given item may be possible much more rapidly than the achievement of certain performance standards that involve innovation. For some capabilities, the long run may take several decades to achieve, but for others merely months. For example, the first filmless camera was patented by Texas Instruments in 1972, and a few years later Kodak developed its first solid-state image sensors. It then took until 1986 for Kodak to develop the first one-megapixel sensor and it was 1991 before Kodak was able to release a commercial digital camera for photojournalists. Kodak’s first mass-market product was launched in March 1995, eleven months after Apple’s Quicktake 100 had been launched (see Bells, n.d.). Since then, however, digital camera performance standards have increased far more rapidly: what was once a revolutionary new technological paradigm now has a much clearer prospective evolutionary trajectory, enabling it to develop momentum (cf. Sahal, 1985). Different organizations will take different periods of time to reach the same level of competence in some areas, and for some of them, the goal will be impossible to attain—just as with music students who start to learn the piano at the same time but, because of differences in their motivation and raw talent, get to different end standards at different rates.

In some cases, a firm will be able to improve its standards in some areas by diverting resources from improving performance in other areas and using non-specific skills and capital equipment to solve problems. However, in other cases, progress will require a specific capability that the firm does not yet possess. If so, the choice is between trying to develop the necessary capability by oneself or gaining (faster) access to it via takeover, joint ventures or outsourcing, drawing upon the capabilities of other organizations.

The latter set of strategies may sound like a return to the standard viewpoint in which capabilities are merely something to be purchased in the market if one has the wherewithal, rather than the firm’s trajectory being constrained by its existing capabilities. However, these strategies for dealing with present capability shortfalls have their own problems that may prevent the firm from getting on to the trajectory to which it aspires.
The takeover route is inherently problematic: a firm seeking to acquire improved capabilities on a wide front may need to acquire a firm that is already doing better than itself in the same market. A minnow will normally only be able to eat up another minnow, or something even smaller. We can get a sense of what can happen from the case of emerging Malaysian carmaker Proton, which tried to develop its own designs to reduce its dependence on slightly adapted older-generation cars built under license from Mitsubishi. It purchased Lotus, a British sports car maker and automotive engineering consultancy firm, to assist in this process. The first fruits of this strategy were vehicles that handled well but had major interior quality problems that necessitated redevelopment work and a virtual re-launch. This is pretty much what one might have expected given the background of Lotus: it would have had much to contribute on suspensions but virtually no experience in mass production.

Successful capability outsourcing requires particular capabilities itself, for example, how to choose between suppliers of consulting services or temporary staff and coordinate the interaction between their personnel and regular employees (or between different contractors if one is outsourcing a variety of different activities to different firms), or which supplier of components or services to use, and how to negotiate deals and ensure timely supply. There is also the ‘it takes one to know one’ issue: to recognize that one lacks knowledge of a particular kind or up-to-date equipment may be rather easier than to judge whether one is being provided with inputs of the standard one seeks, or of the standard one needs to have to match one’s opposition. To obtain advice, a third party may need to be enlisted, possibly someone defecting from the rival one is seeking to match.

Outsourcing the activities the firm is not good enough at doing itself may seem perfectly natural in terms of notions of specialization and comparative advantage, but it can be problematic if it calls into question the integrity of the brand. For example, prior to coming under German ownership, Rolls-Royce was increasingly using other carmakers’ parts, such as automatic gearboxes from General Motors and suspension systems from Citroen, which were rather at odds with its attempts to maintain its position as the producer of cars that would be seen as the best in the world. It is easier for an upwardly mobile firm to enhance its products via outsourcing some of their elements from suppliers with better reputations, than for a firm with an established reputation that is falling on hard times: the former can usefully publicize their bought-in aspects, whereas the latter may need to keep knowledge about them from seeping out.

If a firm seeks to increase its pool of internal of capabilities it faces a number of problems. One issue, emphasized by Penrose
(1959), is the problem of integrating new staff into the firm’s existing way of doing things and personnel structure so that their skills can be used to best effect. New staff are not like a new printer that can simply be plugged into a computer and is then ready to go (and even that is not always the case!); rather, it takes time and experimentation to discover where best to deploy them and for them to get to know the idiosyncrasies of the organization, namely who is who, what is what and how things are done.

It should also be noted that there is the question of what is the most cost-effective cognitive way of developing capabilities (i.e. in respect of individual learning as distinct from the question of whether to try to ensure existing staff develop more skills rather than expanding the skills base by hiring more staff). Essentially there are three possibilities: (i) teach oneself beginning with a blank sheet of paper and no preconceptions, so to speak; (ii) learn by inference from reverse engineering rival firms’ products; and (iii) learn with the assistance of a more experienced business via a technology transfer or joint venture arrangement. The first two strategies seem more likely than the third to promote deep learning because they force staff to engage in more creative problem solving than they would if they were being guided closely by others. The difference is rather like that between learning economics by studying the history of economic thought and original articles, versus being spoon-fed the subject from a textbook. Routes (i) and (ii) may be more costly in the short run, and may well increase the time it takes for the firm to reach particular standards of competence, but the self-sufficiency they promote may stand the firm in good stead should its suppliers of technology decide to cease providing assistance. Moreover, a technology licensing agreement, even one that includes tuition from staff of the source company, does not guarantee that capabilities to perform at the same standard as the source company will be achieved: because of the tacit knowledge problem identified by Polanyi (1962, 1967), attainments will depend on the particular insights that the recipient firm’s staff are capable of achieving, just as students who take the same course and study equally hard from the same books and lectures will not achieve equal scores.

8 Conclusion
Orthodox economic theory has an optimistic view of the potential for substitution as a means of ameliorating limited access to particular kinds of resources. It presents economising as the activity of exploring whether small switches of resources in one direction or another can be used as a means of improving profits or consumer welfare. In this paper, by contrast, the focus has been on barriers to substitution in
economic systems. If consumers are unwilling to compromise on particular requirements (and why should they be, if they can find suppliers who offer exactly what they are looking for?), firms need to have the skills, equipment and supply chain partners with the combined capacity to offer products with profiles that match customer templates. To meet customer requirements at minimum cost, firms may have to use workers with particular sets of skills and equipment that has been designed specifically for that purpose. To attract the specific types of workers, firms may in turn have to offer employment packages that offer particular bundles of features. When trying to attract buyers for products or one’s labour services, or when trying to attract employees, it may be unwise to see a lack of interest as due to too high a price being demanded or too low remuneration being offered; from the heterodox standpoint, non-price aspects may frequently dominate in a non-compensatory way. If they do, that is where attention needs to be devoted to improve performance.

References


