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COORDINATION PROBLEMS IN TERTIARY EDUCATION AND RESEARCH

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1. INTRODUCTION

This paper is a Richardson-inspired attempt to analyse investment behaviour by those involved in the tertiary education sector, both in the past and in prospect. The analysis relates to Richardson's work on two levels. At one level it involves the application to this industrial sector of Richardson's analysis of both competitive and complementary investment coordination problems and the way in which they may be coped with using particular kinds of institutional arrangements. At another level the fate of Richardson's own academic contributions is examined as a case study of how the market for contributions to knowledge may work rather inefficiently. The paper begins by considering the provision of teaching services and the coordination of student admissions. After that the focus switches to the coordination of research activities and the means by which scholars can try to ensure that they are not engaged in reinvention or simultaneous invention of ideas or simply ignoring relevant earlier work by others which may have powerful implications for their own studies. The roles of a variety of information networks are considered, including, at the end of the paper,

* Paper prepared for the G.B. Richardson Colloquium, St John's College Oxford, 4–6 January 1995. This paper has not previously been published but may make interesting reading with hindsight given its comments about the implications of reforms in tertiary education and its predictions about the impact of information technology on research processes. I wrote a different paper for the Richardson festschrift, namely, 'George Richardson's Career and the Literature of Economics', in Foss, N.J. and Loasby, B.J. (eds) (1998) *Economic Organization, Capabilities and Coordination: Essays in Honour of G.B. Richardson*, London, Routledge, pp. 14-43. The latter paper was what I had intended to write for the Colloquium but it required access citation data for Richardson's work from the Social Sciences Citation Index, which I did not have at the time I wrote the original paper.

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developments based around information technologies such as the Internet and on-line journals. Alternative screening methods used by academics are considered and related to changes in information technology and styles of publishing.

2. THE SUPPLY OF AND DEMAND FOR ADMISSION TO PARTICULAR TEACHING PROGRAMMES

Educational services are unusual in that the inputs that a teaching institution needs to offer to deliver a particular end result, such as an upper second-class degree in economics, are dependent on the capabilities and inputs of the customer. If there are legal and/or institutional restraints on the ability to bill students according to the costs they impose individually on those from whom they purchase educational services, then, other things equal, the purveyors of such services will compete to teach those who will be less trouble and more satisfying to teach—in other words, students with documented ability and motivation. These institutions may offer products with similar titles, and they may be externally examined but, nonetheless, questions may remain about the relative significance of similar attainments from different institutions. If so, and if third parties such as employers and graduate schools seek to make judgments about the relative merits of graduates without subjecting them to a standard range of examinations (such as GMAT), then purchasers of educational services who wish to signal their attainments to third parties may find that, other things equal, their best signal is how difficult it is to enter the institution at which they studied. Universities that have become relatively difficult to enter, for whatever reason, may tend to remain that way, for their students will be rated relatively highly by employers and may be more valuable alumni members. For a given salary, it will be possible to attract higher calibre academics to teach them, owing to the greater job satisfaction and the better resourcing.

Like Groucho Marx, who would be wary of joining a club that would have him as a member, many students would prefer not to enrol with the universities that would let them do so, but would prefer to be studying with ones rather higher in the pecking order. Since examination results remain uncertain until very close to the start of the academic year, there is great potential for the annual admission of new students to approximate closely to an Edgeworthian recontracting process: students might accept offers subject to their examination results, only to apply to higher-ranking institutions in the event that they achieved unexpectedly high grades and, if given places there, to pull out of places they had earlier ‘accepted’. In practice, rules of admission systems tend to be designed to prevent students from pulling out of places they have accepted, and few students are inclined to test the legal

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status of such regulations (note the public row that broke out when Fokrul Islam, an unexpectedly high-scoring student, withdrew from his accepted place at De Montfort University in order to study at Westminster College, associated with Oxford University: this was reported on the front page of the *Times Higher Education Supplement*, 9 September 1994).

The existence of well-known pecking orders among providers of tertiary education somewhat reduces the significance of the fact that consumers of tertiary education services face a particularly acute case of the experience good problem: to make a well informed choice of what to study and where to study it may be helpful to be educated already at the tertiary level and be mixing with other people who have already experienced particular institutions, courses of study and subsequent career pathways. To some extent, the scale of the problem can be reduced by seeking advice from parents and other family members who have non-obsolete experience of the tertiary sector or good connexions, or from teachers and careers advisers. Prospective students may also refer to published guides that rate universities in terms of teaching quality and present comparative statistics on issues such as staff student ratios, library size, social facilities and so on. Otherwise, would-be tertiary students are very much dependent on regulatory frameworks and market institutions when attempting to make successful choices between institutions prepared to grant them entry; in these areas, major structural changes have been taking place, complicating the students' task.

In the past decade a number of governments have undertaken revolutionary reforms of the means by which they sought to regulate and signal the quality of tertiary education. In the UK and Australia, for example, the binary divide between universities and polytechnics/colleges of advanced education was scrapped. Many relatively poorly resourced institutions became able overnight to call themselves universities. In most cases, they did not have to go through what had historically been a standard credibility-building apprenticeship for emerging universities, namely, the pre-charter 'university college' stage in which their degree programmes and standards were monitored by an established neighbouring institution. In some cases, considerable disquiet arose when 'new' universities awarded personal chairs to established staff members whose academic credentials were not considered to be comparable with those required to obtain a position of similar status in 'old' universities—an example of this disquiet was the case of Dr Phil O'Keefe of Northumbria University who resigned his new personal chair during his inaugural lecture, in protest at the promotions that were being made (reported in the *Times Higher Education Supplement*, 18 March 1994).

Having thus considerably deregulated the tertiary education institutions, the governments in question sought to let competition shape the quality of

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services provided by them, rather than having education ministries actively involved as, in effect, controlling shareholders, in sorting out disputes such as those that arose over professorial promotion, student overcrowding, and so on. The forces of competition in the external market were supplemented by the use of government audits of teaching and research standards which could provide a basis for future decisions about funding, as well as providing signals to prospective students and staff about the quality of rival institutions.

University deregulation may thus have been achieved without students finding it harder to choose between rival institutions in terms of judging quality, but the audit system that was central to the restructuring has serious problems. As Williams and Williams noted at the outset (in the *Times Higher Education Supplement*, 16 October 1987, p. 15), the new systems for managing funds allocation to universities turn institutions into the equivalent of profit centres in an normal kind of commercial business organised in the M-form style, with each university itself becoming segmented into a set of rival disciplinary profit centres. There may well be benefits from a divide-and-rule regime in terms of pressure to devise ways of increasing productivity, but there are also costs. Dynamic efficiency seems unlikely to be assisted by promoting a concentration on activities that have immediate publications or commercial potential of the measured kind, with a collapse in more reflective kinds of scholarship conducive to effective teaching and breakthroughs in primary knowledge. Unless universities divert resources into senior management positions it is unlikely that managerial decisions will be of a consistently high quality if taken in an environment of permanent stress to generate results in time for audit deadlines. Instead of a lean administrative structure based on limited auditing and collegial contributions by academics who were trusted to teach and research on the basis of professional integrity and expertise, the change in the competitive rules of the game have led to meetings, meetings and more meetings, and a proliferation of advertisements for new Pro-Vice-Chancellor positions.

Though universities may seem to be based around extensive capital expenditure programmes (buildings, libraries, computer systems) and specialised human skills, the tertiary education sector is one where there is considerable potential for excessive entry of the kind discussed by Richardson (1960). The problem exists to some extent at the level of new entry for, in many subject areas, (a) the capital requirements involve assets that are not particularly specific, such as offices and conference rooms; (b) undergraduate and professional teaching can be conducted with reference to relatively small core collections of library materials; and (c) staff with established track records as teachers and researchers can be poached from existing institutions. Indeed it can be argued (see further, Earl, 1994) that if universities did not already exist as institutions then it might well be

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necessary to invent them as devices to increase the efficiency of competition in a market that could be entered by freelance teachers setting up in rented premises: within individual universities, heads of department and other senior staff can prevent dysfunctional subject duplication whereas, in the world of freelance academics, there would be a tendency for academics to hedge their bets by offering a wide range of subjects unless confident that they a commanding competitive advantage in a few subject areas and could therefore pick up enough of that market to make a living.

It is in respect of the credibility of claims about one's product that a more significant restraint on entry may be found. New entrants in the tertiary education arena may experience considerable initial difficulty in presenting convincing quality signals to potential customers and staff, particularly if they are private institutions whose students might not expect to be absorbed by the public sector in the event of the entry being unsuccessful: 'wait and see' attitudes may be a source of stigma sufficient to prevent an institution from taking off. Other deterrents to staff and students include administrative costs and the likely need for experimentation to make teaching systems work effectively, which may get in the way of remaining at the forefront of research. It may hence be necessary to engage in costly investments in buying in high profile senior staff to show the world that the institution 'means business', and to go through the rigours of obtaining international standard accreditation and having examinations externally audited.

These problems are far less acute in cases of diversification into related product areas. For example, with investments in only a few new staff, promotion and library resources, an established university may be able to add on to an existing commerce and management programme new degrees in hospitality and manufacturing management, and an MBA programme. There is thus considerable potential for product proliferation to be based on 'me too' thinking when universities are under pressure to find new ways of bringing in fee paying students. Universities will be vulnerable to lobbying from local industry bodies whose members would prefer to avoid, as far as possible, giving job-specific training to the graduates they hire. Though local needs may be relatively small, the global market for professionally focussed credentials may be alluring despite being very difficult to size up with market research methods. The globalisation of the tertiary education business makes it much more difficult for individual institutions to assess their opportunities for attracting enough students to cover the incremental costs of new programmes: for example, in New Zealand, with only seven universities, much inter-institution mobility of staff and considerable local networking, it is relatively easy for rival vice-chancellors to obtain intelligence on each other's new developments, not least of all because new proposals eventually have to be sanctioned by a Committee for Academic Programmes that

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contains representatives from the rival institutions and Ministry officials. However, these seven institutions are potentially competing with hundreds of others on a global basis, so global intelligence is far harder to gather. In this sort of environment, investment uncertainty provides a strong justification for forward bulk sales of programmes of study (my own institution, for example, has carried quasi-integration as far as a joint venture arrangement to supply largely off-campus commerce degrees to staff of the Malaysian electricity company Tenaga Nasional Berhad, with visiting Lincoln academics teaching intensively in Tenaga's facilities), and the concentration of marketing activities in particular areas where alumni links are strong.

The use of product differentiation as a device for distancing a university from rival suppliers in the same broad area is a questionable strategy when product is a university degree and potential customers lack the expertise to make good judgments about which product attributes are to be desired. Moreover, credentials that are significantly different may not be well understood by potential employers, regardless of how happy students are with their learning experiences. A further pressure towards McDonald's-style uniformity is that it facilitates mobility between universities in terms of cross-credits. These pressures seem likely to favour the use of franchising as an institutional device for allowing new entry and cross entry in tertiary education, so that inexperienced institutions can, for a fee, piggyback on the shoulders of those that have been through set-up costs in establishing particular programmes in terms of both credibility resources that students will use. Franchising and related joint ventures have limits in this context, however, as some institutions have already discovered to their cost. Established universities may be reluctant to get involved in franchise arrangements when diversifying into new areas, for fear that this casts doubt on their capabilities in other areas. Franchisers may prefer to limit the availability of their programmes given the problems of arms'-length monitoring of franchisees' standards of delivery (anyone who has taught a large class with the assistance of a team of tutors will recognise the nature of this problem). For those institutions that seek to get by without paying royalties to franchisers, or who cannot find suitable franchisers willing to sign them up, the use of established textbook packages as a basis for subject units provides a means of reducing set up costs and enables the learning achievements of students to be more readily gauged by third parties, such as graduate schools and potential employers.

3. COORDINATION FAILURES IN RESEARCH

Coordination failures in respect of the supply of teaching impact upon the research time available to individual academics. In the short run, a shortage

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of students can be a great blessing because it reduces the number of essays and examination scripts to mark and the number of student inquiries that need to be handled. In the long run, promotion opportunities may be limited, in contrast to the case at a university department that finds its subjects oversubscribed and is allowed to hire new staff at all levels. Regardless of whether coordination is achieved in the teaching market, the academic has to contend with the question of how best to spend such research time as can be found. Rewards in terms of reputation and, perhaps, in pecuniary terms will go to those who succeed in staking claims to authorship of pioneering contributions valued highly by their peers, or whose contributions succeed in capturing the attention of their peers because of the way that they have been marketed, despite not being the first in which the ideas were developed. To put it another way: academics will not tend to profit by spending their time reinventing the wheel unless those who invented it earlier failed to succeed in capturing the attention of the latent market for their ideas.

Physical scientists are not shy about debating in public their claims for primacy as discoverers of particular phenomena, a recent case in point being the battle between French and American AIDs researchers over the initial discovery of the HIV virus. Economists tend to be rather more reticent, or simply ignorant of potential for dispute, so that it is left for historians of economic thought to explore possible instances of simultaneous invention or of credit going to reinventors who, whether out of ignorance or opportunism, did not give credit where credit was due. A case of the former is the question of the extent to which Keynes, Kalecki or the Stockholm school can fairly claim to have pioneered what is now known as Keynesian macroeconomic theory. In respect of a case of the latter, I have elsewhere (Earl, 1993) shown how the career of P.W.S. Andrews illustrates that advanced thinking can fail to win support when first released and then be reinvented with acclaim on the other side of the Atlantic by scholars more adept at presenting their work in technical language and in coining buzz phrases, such as contestability and X-inefficiency.

Here is a touch of irony: George Richardson's own career as an academic illustrates well the potential for simultaneous invention ideas and for an academic to be in the right place at the wrong time. In respect of the former we can note two examples. First, Richardson's (1972) article on the coordination of complementary investment and the subtle possibilities for coordinating vertical production and distribution processes—perhaps his best known work—appeared around the same time as a paper on a similar theme by Blois (1972) from which the term 'quasi- vertical integration' seems to have come into the language of economics and strategic management. Richardson had the greater richness of vision, but Blois had the buzzword. Secondly, there is Richardson's (1975) awareness that he and

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Kaldor (1972) were thinking on similar lines about the significance of increasing returns: he notes (1975, p. 351) that "This paper was already in draft before the publication of Professor Kaldor's article "The Irrelevance of Equilibrium Economics" in the *Economic Journal* ... and I did not try to adapt it to take account of what he said. The arguments I put forward here are similar in important respects to those of Professor Kaldor.' Like Kaldor, he acknowledged the significance of Allyn Young's (1928) 'justly celebrated article' as a source of inspiration (1972, p. 352). To date, Kaldor's paper has attracted more attention, probably due to its location in a core journal and Kaldor's fame, but the profession would benefit from being familiar with Richardson's paper too, and seeking to pull together links between the different points of focus of the two contributions: unlike Richardson, Kaldor has nothing to say on the relationship between specialisation and diversification in the growth strategies of firms.

In respect of the question of primacy, we should note that, although the profession at large may ultimately follow Brian Loasby and myself (Earl, 1983) and label the investment coordination problem in his honour as The Richardson Problem, he was by no means the first to recognise it. Nor was he first to write about the potentially beneficial role of market 'imperfections'. Discussions of interlinked expectations and the importance of frictions for the practical workings of the competitive system are to be found in the work of Clark (1923, pp. 417, 460) and Dobb (1937, pp. 206–7), though in relation to the process by which prices are changed. More noteworthy is a neglected article by Williams (1949), which is concerned with the economics of structural change: its main theme is that 'dynamic competition cannot be "perfect"' (p. 124). The closeness of Williams's thinking to that of Richardson may be gauged from the following extracts:

The fact that there are fixed factors means that capital losses inevitably follow a change in demand. Furthermore, these fixed factors, or frictions, are a pre-condition of the operation of the pricing mechanism. For if there were perfect mobility the emergence of a difference between price and cost in one sector would cause such a flood of resources there as to ensure losses for all. Nor could the flow back to the now prosperous deserted sectors be orderly, for with static expectations and perfect mobility (which implies that no producer has a preference or special competence for one industry rather than another) there would be nothing within the price mechanism as such to make it possible for producers to choose a profitable transfer. [to footnote]

[footnote]... he cannot rely on the law of large numbers to bring

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it about that too many firms will not go to one industry or another, for it is likely that industries will have need for widely varying numbers of firms (p. 126).

The avoidance of such a breakdown of the pricing mechanism is due to lack of mobility, and to firms having, at any one point of time, differing degrees of mobility (p. 127).

The difficulty of coordinating structural change and cyclical demand patterns was also considered by Joan Robinson (1954), but she did not raise the possibility that less than perfect flexibility of response might be a desirable feature. That she did not do so is perhaps surprising given both her closeness to Keynes and Keynes's (1936, pp. 239, 269) macro-level realization that stickiness in the wage unit was essential to provide and anchor for the price level because, in the event of a shortfall of or excess of effective demand changes in money wages would not necessarily change the level of real effective demand and hence the demand for labour. The greater overall far-sightedness of Williams's paper obviously includes the role he assigned in passing to special competences as limiting the industries in which firms will wish to participate: this theme resurfaces not only in Richardson's work (including his 1972 paper) but is, of course, central to recent work on the resource-based view of the firm that takes its lead from Penrose (1959).

Though others may have come to see the essence of the Richardson Problem before Richardson did, they focused on it briefly, relative to the attention that he lavished on it, and without his subtle appreciation of what might be included on the list of beneficial imperfections. Given the importance that his work has recently been recognised to have, an inquiry into how his work failed to take off rapidly in the early 1960s seems worthwhile as a source of lessons to academic economists writing today and wondering how their work will fare with its intended audience. According to Loasby (1989, p. 99), Richardson's great misfortune was that his critique of general equilibrium analysis appeared just after Debreu's exposition of an abstract economic model in which complete contingent claims markets 'solved' the coordination problem. Richardson's prose lacked the hard scientific appeal of Debreu's mathematics. This is a view that can be challenged.

4. NETWORKS AND THE FATE OF SCIENTIFIC IDEAS

In the analysis of life cycles of consumer products it is commonly recognized that social factors play a major role in determining how much attention potential buyers pay to new products and whether or not they

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experiment with them. The same holds in academia and, as with consumer markets, some people may have more influence than others. For academics in the future, the Internet is likely to become the ultimate networking device for affecting the spread of new ideas (see further, MacKie-Mason and Varian, 1994, and Goffe, 1994). Prior to the age of the Internet, academic communication about the merits of new products was either face to face—among colleagues or between teachers and protégés, or at conferences (it would be interesting to know how far Richardson was able to use this last medium and the extent to which his current followers are economists who can trace their lineage directly back to his teaching)—in letters, and via reviews and citations (Earl, 1983). Academics also could (and may continue to) prime their markets via preliminary publications, such as articles and discussion papers, that foreshadowed their major works whilst staking their claims as market leaders in particular areas of research. Richardson's articles from the 1950s pave the way directly to his (1960) book in intellectual terms. He also helped his readers discover his earlier work by his own citations (oddly enough, in his 1972 paper, his footnote reference [p. 891] to *Information and Investment* lists it as published in 1961, not 1960!). His Oxford colleague Malmgren (1961) helpfully discussed his work in the *Quarterly Journal of Economics* at a very early stage. This should have helped stir up interest among potential readers in America who were not regular readers of *Oxford Economic Papers* or *the Economic Journal*. Malmgren's work, unfortunately, seemed to suffer much the same fate as Richardson's.

Reviews provide clues as to how contemporary economists were prone to construe particular contributions and choose between theories. In my 1983 paper I did not have room to document how poorly *Information and Investment* was served by reviews, but here I can make amends. None of the reviews I have seen makes any reference to Debreu's contribution, and none notes another point that would be obvious to modern-day economists, namely, that Richardson might have done well to relate his work to the literature that by the late 1950s had appeared on the theory of games: Morgenstern, one of the co-founders of game theory recognized as long ago as 1928 that the attainment of economic equilibrium could not be explained in terms of existing theory in cases where an agent's choice of a plan of action required knowledge of plans of other agents (see Borch, 1973, p. 67). Rather, the reviewers focused on the overly theoretical nature of the book, which perhaps may be taken to imply that, in the early 1960s, it was not Debreu's technical virtuosity that got in the way of Richardson's success. Potential readers of the book can hardly have been encouraged by the observation of Power (1961, p. 761) in an otherwise perceptive and favourable review in the *American Economic Review*, that

The method of the book is essentially armchair reasoning with

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only occasional reference to empirical studies.... Readers may find the concluding section of the volume disappointing in the light of earlier bold statements about the omissions of conventional theory.

The intended implication of the second comment seems to be that the book does not offer much to fill the gap that it exposes.

Lesley Cook (1964, p. 168) begins her *Economic Journal* review by suggesting that the title, *Information and Investment*, is slightly misleading' and that the book is 'theoretical examination of the effects on investment of uncertainty resulting from inadequate information'. The book is surely better characterized as a critique of conventional theories of the workings of the price mechanism and an alternative analysis of how allocation mechanisms work in the face of incomplete knowledge; however, Richardson may well have been wiser than his publisher in wanting to call the book *The Economics of Imperfect Knowledge*. While also broadly favourable, Cook's review can only have damaged the book's impact by suggesting that 'He is largely concerned with problems related to the cobweb theorem.' Conventional theorists seem to be predisposed to view the cobweb theorem as affecting only agriculture and the construction industries. Thus they would have been inclined to agree with Cook when she argued that Richardson was probably exaggerating the importance of the coordination problem when he applied it to investment decisions in general. The fact that Richardson's book was four years old before this review appeared could hardly have helped its chances with, particularly, British economists if they had not noticed it on its publication and had in the meantime tuned into the message of Debreu. (I could find no review of it in *Economica*, merely one by Laurence Harris (1965) of Richardson's 1964 textbook. Harris does note Richardson's focus on the restrictive nature of the perfect knowledge assumption but gives no clue to the problem Richardson has in mind; instead he goes on to criticize the text for being too brief and superficial and lacking any discussion of method or suggestions for further readings.)

Cook argued that an orderly process of market adjustment through sequential market entry would have seemed much more plausible, especially if he had chosen to analyse the problem in disequilibrium terms rather than with comparative statics. In fact, Richardson (1960, pp. 51–2) did present an examination of sequential entry but noted difficulties for entrepreneurs in assessing precisely how much capacity rivals had already commissioned, the more so the larger the number of firms participating in the market. Cook further failed to explain to potential readers that Richardson's aim was not to demonstrate, as Joan Robinson (1954) wished to do, that the coordination problems causes chaos and 'the impossibility of profits' but, rather, he was more concerned to show how

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such problems may be avoided in practice and thereby to put readers in a better position to appraise the implications of competition policies based on conventional theories which neglect the information structures that help markets to function.

The reception given for Australian audiences by John Grant (1962) in the *Economic Record* echoes the sentiments of both Power and Cook:

[T]he book is not wholly satisfying, because the argument remains on a purely theoretical plane throughout. The reader cannot fail to wonder about the magnitude of the problem under discussion in the real world. Some empirical research would not only have made the book more interesting but may also have increased the author's contribution to economic analysis.

The line of this kind here seem to be that the price mechanism in practice does not seem to produce chaos, so Richardson is worrying about a problem that does not really matter and that therefore it is safe to continue with conventional theoretical analysis. The reviewers seem blind to Richardson's key point: the traditional theory has a logical flaw and chaos is avoided, insofar as it is, because supply decisions are reached in ways fundamentally different from those posited by traditional theory. This being so, it is conceivable that attempts to make the world resemble the traditional theoretical world more closely in terms of the competitive rules of the game may result in inferior patterns of resource allocation, due to the world then functioning in a more chaotic manner or entrepreneurs in general becoming more hesitant about investing. Thus, even without any buttressing from Debreu's make-believe world of complete contingent commodity markets, the traditional theory seemed to have been quite acceptable to Richardson's reviewers as an approximation of how the world works. It is also interesting to note that in his review of Debreu, the young Frank Hahn (1961), of all people, praises the Theory of Value as a technical achievement but criticises it for proceeding implicitly 'as if' the non-existence of contingent commodity markets does not matter; for leaving no role for money; and for having nothing to say about what happens in an economy when conditions are insufficient to produce an equilibrium.

In taking issue with Loasby here on the impact of Debreu's success on the reception of *Information and Investment* I am not denying that the timing of its release might have been more fortuitous. On the contrary, there are several reasons to believe that the market for Richardson's message has ripened steadily since 1960 and that the book would have fared far better had it been published around 1972, with Richardson's originally-intended title and including material from his 1972 article, which is logically linked with it:

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- (i) One might expect traditional theory to look less good as an approximation when the ‘golden age’ of economic growth came to an end and excess capacity creation would no longer rapidly tend to be rendered non-problematic by ongoing demand growth. During the golden age interest in investment coordination problems tended to centre on the question of which firms should exit from markets suffering from chronic excess capacity due to changes in global competitive conditions—for example, traditional staple industries such as cotton textiles (see Miles, 1968) and wool textiles (see Wool Textile EDC, 1969)—and on the possibility of dysfunctional defensive investment (Lamfalussy, 1961). Richardson, however, had not focused on exit games under conditions of gross immobility of capital and human resources. Nowadays, with frequent periods of recession and new investment occurring despite chronic overcapacity in many modern industries (for example, the motor vehicles industry), it is not easy to dismiss Richardson’s work as empirically insignificant.
- (ii) Those who were less enamoured of the price mechanism doubtless learnt a lot more about the nature of the coordination problem in the decade after *Information and Investment* appeared. Attempts at indicative planning, such as those of the UK Labour Government in the late 1960s, and the ‘balanced versus unbalanced growth’ debate in development economics may have aroused a greater recognition of complementary aspects of investment as well as of the difficulty of ensuring the right amount of investment in any one sector if directives were not to be given to individual firms and communication between them was not allowed. It is easy to see why Richardson’s (1971) timely article ‘Planning versus competition’ was so swiftly reprinted in Wagner and Baltazzi (eds) (1973). Had his 1960 book not already been published, Richardson’s (1969) report on collusive tendering in the UK’s heavy electrical engineering industry would have made a powerful empirical addition to it, since it embraces both the complementarity problem (a capacity problem due to the electricity industry expanding rapidly in keeping with the National Plan, only to find that most of the rest of the UK economy did not), and the question of whether market imperfections might enhance dynamic efficiency.
- (iii) It was around 1972 that the so-called Crisis in Economic Theory really seemed to break out, with widespread criticism (for example, Kaldor, 1972) of the kind of abstract and institutionally implausible research that Debreu’s work had helped to foster.

Had Richardson’s work attracted wide attention during the early 1970s, it is conceivable that a good deal of subsequent work on industrial economics would have been done differently. In particular, those involved with the

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development of contestability theory would have had reason to be rather more cautious in advocating the removal of entry barriers in industries such as passenger aviation and financial services that have since suffered from severe adjustment problems.

5. SERENDIPITY AND SEARCH

Reviews and networks of personal contacts might have had a far smaller role to play in shaping the esteem attached to particular contributions to knowledge if researchers habitually searched for relevant materials with the aid of indexing and abstracting systems in the manner that libraries nowadays try to inculcate among students. In some cases, the confidence of librarians in their information systems is such that they see lecturing staff not as experts in their subject areas who point students speedily to pertinent contributions but, rather, as dangerous individuals whose use of reading lists and inclination to place material in restricted loan sections is liable to 'bias students' reading' (to quote the words of the Librarian of Lincoln University). However, I suspect that until recently very few academics made great use of such potential as existed for systematic search, with the result that networks were of vital significance. Although the bulk of Richardson's work appeared at a time when there were relatively few economics journals to keep up to date with, it was also a period in which indexing systems were poorly developed and economists were not accustomed to making extensive use of abstracts (the *Journal of Economic Abstracts* commenced publication as late as 1963 and only turned into the more extensive *Journal of Economic Literature* in 1969). It is also probably fair to say that it was only in the 1970s that the Harvard system of referencing really caught on and made it far easier for potential readers to get a flavour of a work by examining its bibliography. In terms of presentation and layout, the reprint of *Information and Investment* is remarkably uninviting to the casual browser of the 1990s, for Richardson's works were typical of their time, still the world of infrequent references scattered around in footnotes and of a notable absence of the use of section headings in chapters and papers.

To illustrate the kind of haphazard way in which poorly networked researchers might operate, particularly if operating under pressure, I will take the case of my own discovery of Richardson's work. In 1976, I unwittingly reinvented both Richardson's critique and his heretical view of the role of 'market imperfections'. I was, at the time, a second year Cambridge undergraduate working on an essay based around the following quotation from Ricardo (1951 Sraffa edition, p. 12):

There are some commodities, the value of which is determined by

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their scarcity alone..... These commodities, however, form a very small part of the mass of commodities daily exchanged in the market. By far the greatest part of those goods which are the objects of desire are procured by labour; and they may be multiplied, not in one country alone, but in many, almost without any assignable limit if we are disposed to bestow the labour necessary to obtain them

In the light of this, I was invited to 'Discuss the implications for economic theory of distinguishing between scarce commodities and produced commodities'. I knew that what was expected was an essay on Sraffa's (1960) book but instead I set about considering if there were any other angles on the question. My route to the Richardson Problem was a remark Joan Robinson had made in a lecture, as she discussed Clower's neo-Walrasian reappraisal of Keynesian economics. She suggested that the trouble with the Clower perspective was that Walrasian economics was really the economics of a prisoner of war camp and had never really got to grips with the time and knowledge dimensions entailed in a production economy; exchange was stressed and production and marketing were neglected. (She read to us from a letter from Clower in which he argued that production can be subsumed under exchange—presumably the one from which she quotes to this effect in Robinson, 1977, p 1321.) There is, of course, no Richardson Problem in a prisoner of war camp economy where only endowments from Red Cross parcels are traded. I suddenly realised how different things were when entrepreneurs had to work out what to make and could not sell their output forward for a known price prior to making commitments, and shortly after the potentially helpful role of imperfections dawned on me and with it the link to Keynes's views about the benefits of sticky money wages. The Clower connection is particularly significant here because my interest in uncertainty as I set about the essay came directly as a consequence of having had to read, a few weeks earlier, Leijonhufvud (1968), who actually quotes and notes Richardson (1959) in precisely the part of his book that had got me interested in the problem of uncertainty (Leijonhufvud, 1968, pp. 69–70). But I had been too busy to pay much attention to Leijonhufvud's footnotes.

My tutor, Ken Coutts, commented that it was 'A very interesting essay' and suggested I might like to read a discussion paper he had just seen, by Brian Loasby, and I had a brief look at it. I was later to discover that it had been an early version of Loasby's (1978) paper on Marshall, and notice that it referred to Richardson. I spent much of the rest of my time as an undergraduate wondering why 'my' view on imperfections was not being taught as a standard part of economic doctrine. I developed the essay into an entry for the Adam Smith Essay competition and was awarded an

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'honourable mention' by the judges, one of whom was Alan Hughes: the last point is significant, as long after graduating I happened to be glancing through my old essay/reading lists for the final year undergraduate paper in industrial economics and discovered a handout from Hughes that included Richardson (1960) as a suggested essay reading, which I had not followed up. Though Hughes had never mentioned *Information and Investment* in lectures, he probably wondered if I had plagiarised Richardson's ideas. My eventual discovery of Richardson actually took place in October 1977 on my first day as a postgraduate, when I went to the Marshall Library in search of Loasby's (1976) *Choice, Complexity and Ignorance*, which I had seen on display in Heffers Bookstore some months after Coutts referred me to the discussion paper on Marshall and which I had vowed would be the first thing I read once I became a postgraduate with time to read in a more reflective manner. The book, much to my surprise, had not yet been purchased by the library but in the index was a reference to a discussion paper entitled 'On imperfections and adjustments' that has ultimately turned into chapter 6 of Loasby (1989). It was a relief to discover that I was not alone in my views on imperfections, but I was still faced with the question of how I had had to discover this by such a tortuous route. (Joan Robinson had been reading the discussion paper, too, and linking it to her critique of the neo-Walrasians: see Robinson, 1977, p. 1322.) When, after reading the University Library copy of Loasby (1976), I moved on to Richardson (1972), I had another surprise: I had known about the article, without knowing it was by Richardson, since my work on economics as a sixth-former in 1972, for my teacher talked about how, in the local library's latest copy of the *Economic Journal*, he had been reading about interlinkages between firms, that stopped short of merger, and he had recounted the cigarette industry example at some length.

I hope that this is a rather extreme case of a tortuous process of discovery, due to the inexperience of the researcher in question, but it would be interesting to discover how others who value Richardson's work came to do so.. For the present, however, I will now my attention to ways in which academic publishing has been organised to assist academics in deciding how to spend their research time in a profitable manner when they are trying to operate in a relatively systematic manner.

6. INSTITUTIONAL DEVICES AFFECTING THE COORDINATION OF ACADEMIC RESEARCH

The informational nature of academic outputs means that they are subject to the Arrow Paradox (Arrow, 1962): no one would be willing to pay for them if they had already been given the chance freely to examine them in detail

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prior to reaching a decision about whether or not to purchase them. The Arrow Paradox is, of course, limited somewhat in its significance by the opportunity costs of time, uncertainty about the availability of a copy to examine and the decay of human memories—which is why I was keen to purchase *Information and Investment* despite having access to library copies—but publishers nevertheless have a strong incentive to limit the amount of information they reveal about their products. Titles, catalogue entries and abstracts to some extent ease the time-constrained, boundedly rational academic's task of deciding what to examine in depth, but they may not signal very effectively the quality and contents of scholarly contributions.

Richardson's suggestion that economists should focus on institutional devices that are used to facilitate coordination in the world of business is perfectly applicable to the world of academic scholarship where the sheer volume of published work makes it particularly important that usefulness can be judged rapidly. A multiplicity of institutional aids exist, a fact that is significant given the danger that any single aid will be of limited effectiveness. I have earlier mentioned the potential significance of citations and reviews, all of which can be recorded in databases. Attention should also be given to the role of learned societies, the academic equivalent of trade associations. Although it is rare for such societies to insist that members conduct their research in a particular manner—unlike trade associations who may debar from membership those whose standards of work do not meet with association norms—their ability to control what gets presented at their conferences or what gets published in their official journals means they have a major gatekeeping role in respect of the marketing of contributions to knowledge. A further aspect of this professional control is the ability to determine which journals are abstracted in the society's abstracting publications. This is important not merely because articles published in unlisted journals have a smaller chance of being discovered but also because librarians, concerned to see that their investments are thoroughly used, may refer to the places in which a journal is abstracted as criteria for deciding whether or not to agree to take out a subscription—woe betide the economics journal which is not abstracted in ABI-Inform and the *Journal of Economic Literature*.

If academics feel locked out by dominant professional societies they commonly set up new societies with like-minded scholars and seek to establish their own journals as arenas within which particular kinds of scholarly contributions may regularly be found. Publication of an article sends out signals to the academic community: signals that it has been through a pretty stiff competitive refereeing process if it is published in a dominant professional grouping's generalist journal, or signals about the height of refereeing hurdles and about the likely style and content if it is published in a sub-disciplinary or heterodox journal. Commercially

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published journals serve a similar signalling role, and, of course, many of these are associated with academic societies or networks.

Firms that publish a large number of journals of high quality have an incentive to maintain their standards as they add new journals to their catalogues, for fear of damaging their overall images and hence the subscriptions they can command. Editorial boards of reputable academics signal the standards that are being targeted even if no learned society sponsors the journal. In respect of book publishing, endorsements are sought from reputable scholars and published in catalogues, while branding is extensively used to signal the type of book to potential purchasers: most publishers run a variety of imprints and under any particular imprint may also include a number of series of books of particular kinds.

7. THE IMPACT OF INFORMATION TECHNOLOGY

The risk that academics will unwittingly reinvent each other's ideas or pursue dysfunctional lines of inquiry owing to their ignorance of particular contributions is reduced to the extent they can search systematically with the aid of subject and citation indexes, abstracts and book reviews or contents listings. Though such resources were poorly developed or nonexistent in the 1960s as Richardson's work was failing to be recognised as highly significant, now, as the century comes to an end we are entering a new world where information technology will permit scholars to operate in a far less haphazard manner as they attempt to screen contributions for their likely usefulness. Screening will take place on-screen and ideas will be able to spread far more rapidly. Already, with the aid of Mosaic software, the World Wide Web can be browsed and fully formatted working papers can be viewed (Goffe, 1994, pp. 104–5: I am grateful to Don Lamberton for alerting me to this reference via an e-mail!). Researchers in Australasia have long been accustomed to using working papers as a second-best guide to recent research as they wait three months for journals to

arrive from the Northern hemisphere (even this situation is a remarkable improvement on that which Karl Popper reports as hindering his research in New Zealand during the Second World War: see Popper, 1976, pp. 112, 118–19). Now, via Internet, they can be as up to date as anybody else in their knowledge of such discussion papers; soon online access to journals will remove a competitive advantage from North American academics.

That the information revolution will not only change how we screen scholarly works but also our access to them is relevant to the conduct of research assessment exercises that have been a preoccupation of academics in the mid-1990s. The prestigious, large circulation, long established academic journals that have ranked highly in during university research

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assessments have supposedly achieved their rankings on the basis of the frequency with which their contents achieved citation, excluding self-citation, with citation frequency being taken as a proxy for the quality of the contributions. (for a critical discussion, see Burton and Phimister, 1994). However, it is important to note that prior to the dawning of the information superhighway, it is likely that the use made of journals, and hence the citations of their contents, would have been significantly affected by the ease of accessing them. In the absence of fliers from journal publishers, it is far easier to assess the likely quality of a journal article once one has handled a complete journal issue and seen who edits it and who else has been publishing in it. Papers in core journals may stand a bigger chance of being read and subsequently cited due to the scale of circulation being in the thousands rather than hundreds.

This is doubtless a reason why, even prior to ratings being assigned by research assessors and departments being awarded research funds on the basis of where their members published, there has long been stronger competition for places in higher ranking journals; furthermore it is difficult to submit papers to a journal one has never seen or heard of and of whose submissions details one is therefore ignorant. To be sure, interlibrary loan systems have ameliorated somewhat the position of small-circulation journals but their success in doing this has been limited by their costs in terms of form filling and delays. These hurdle costs may be large enough to make hard-pressed academics try to get by without examining a contribution that is not immediately accessible, unless a citation or abstract has indicated that it is of central importance to the work being undertaken. After all, if an academic paper is submitted to high ranking mainstream journal, it would be surprising to see it being refereed by non-mainstream scholars with a knowledge of the contents of fringe journals and rejected with reference to a failure to take account of work published in such journals.

With the rise of on-line full text services and other online publication media, it is conceivable that an academic with a computer connection anywhere in the world may eventually be able to call up any article, browse in it and the print it off, with a fee being electronically charged against his/her university research code or private credit card. The relative frequencies with which this is done may become the appropriate audit measure of the future, for if any article has the potential to be read by anyone on the information superhighway then it could well be that an article which exists in very few hard copies in libraries may nonetheless be read by very many scholars. In principle, all scholarly work could be self-published, with academics deciding what charges to dial in when making their work available electronically; journals in principle could cease to exist.

In practice, journals of some kind are likely to remain even in a world of electronic access to research, for scholars still need means of

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discriminating between worthwhile contributions and those of limited relevance to their inquiries, given that they face limited research budgets and have limited time at their disposal. Indeed, if all scholarly contributions became available electronically the need for institutional devices to aid screening processes would seem far greater than it has historically been, because the range of rapidly accessible works would be so much larger. In the age of electronic scholarly publication one scenario that might eventuate involves the academic publishing of articles (and possibly entire books) being handled as follows to deal with the quality uncertainty problem:

- (a) There would be a seamless integration of indexing, citation, abstracting and delivery systems, with access on a user-pays basis, in contrast to the present need for researchers in business to switch around between their Online Public Access Catalogue, the Social Sciences Citation Index, ABI-Inform, Bridges to Blackwell/New Titles Online, and Business Periodicals Online.
- (b) For a fee, anyone would be able to have their abstracts and papers placed on the index and made available to the rest of the world for a fee and would receive fees for their use from a collection agency, subject to a commission. Such a seamless system might be a single global network, under the auspices of, say, a branch of the United Nations or it might be operated locally and purchased and updated in, say, disciplinary modules by the successors to present-day libraries. Tasks such as indexing and programming involved in the assembly of such database modules could be done under private enterprise by a variety of firms so long as indexing standards could be established for meshing them together such that only a single index had to be consulted by the end user.
- (c) If hesitant to order an on-demand version of a particular paper, a scholar would pay for a referee report on it from an rating agency, the requests and replies being handled electronically as part of the seamless access system (A screen prompt might request in respect of an item highlighted from the index or citations search: 'Please type 1 for abstract, 2 for rating, 3 for print out', while listing the price of each option). As with credit rating agencies, it is possible that a variety of providers of scholarship rating services might be viable, who called upon academics with different standards of expertise and different world-views to act as referees. It is conceivable that indications of the rating of the referees could be supplied along with their reports. Would-be readers might opt simply to see the overall rating(s), or the reports on which they are based. If no ratings were available, they would have to decide whether or not nonetheless to risk paying for a worthless printout. Book reviews could be supplied in a similar manner.

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- (d) If authors of papers wished to ensure that referee reports on their work could be accessed on demand by potential readers, they could pay to have their papers refereed via a particular rating agency, retaining the right to have the reports removed from the agency's database only if they removed their papers too. The rating agencies in effect take the place of journal editors as we presently know them. Academics would then be able to refer to these reports on their CVs for hiring, tenure and promotion purposes (e.g. 'my 1998 paper with title W and index reference code X was given a AA2 rating by the North-Holland agency and an AA1 rating by Blackwell') and interested parties could be checked rapidly.

Though the widespread use of such systems might reduce the incidence of undeserved neglect among contributions to knowledge that are published in the Age of Information, it should be recognised that they may actually hinder the rediscovery of neglected works produced during earlier eras. Had Richardson's contributions not been rediscovered and cited by now, there would be very little likelihood that new generations of computer-focussed graduate students would discover them by browsing in book-stacks: such students are in danger of having their reading 'biased' not by mentors but by what is stored on library information systems.

8. CONCLUDING THOUGHTS

Richardson's work provides valuable perspectives for viewing the operations of the tertiary education sector, encouraging us to look for institutional devices that assist academics to reduce coordination difficulties. As governments changed the rules of the game in this sector they created uncertainty and new pressures to attract customers, to which suppliers of educational services have responded by experimenting with new forms of economic organisation, such as franchising and joint ventures. In principle, where it seems that educational delivery can be highly programmed and monitoring costs contained, franchised provision of degree programmes could be taken much further as a means of providing globally recognisable credentials. The emergence of the educational equivalents of McDonald's, KFC and Pizza Hut oligopolies alongside up-market, one-of-a-kind purveyors of educational services could help greatly to reduce risks of coordination failures, though it might lead to a mood of despair amongst academics attached to deviant world-views. In practice, franchised degree provision is likely to be difficult in some subject areas (such as those that centre on critical thinking) and at graduate levels.

In the area of research, it seems likely that electronic

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networking/indexing will enable academics to reduce the extent to which they waste time independently pursuing parallel lines of research or reinventing old ideas, and will enable them to increase the extent to which they collaborate even when separate by great physical distances. In the past, haphazard methods of research and weaker networking/indexing made it all too easy for scholars to be unaware of works that they would have welcomed or that would have forced them to rethink their ideas. It was not wise to presume that if a contribution to knowledge was of a high standard this would necessarily be swiftly reflected in its rate of citation or number of copies in circulation. As the information superhighway becomes the normal route towards research conclusions, cases of neglect of economists publishing via the superhighway may have less to do with ignorance and more to do with paradigmatic blinkering. In the meantime, while we are in the process of tooling up and wiring up for this kind of way of searching and accessing information, historians of economic thought would do well soon to include, in their repertoires of research formats, documentary case studies of the paths that economists have taken when reaching particular end results. Such research opportunities have been neglected in the past and will be far less exciting to undertake once the information superhighway comes to play a major role in the process of discovery.

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