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The Proceedings of Economic and Policy Implications of Structural Realignments in Food and Ag Markets

A Case Study Approach (Proceedings Include Revisions)

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Comments on:

Transaction Costs, Trust and Property Rights as Determinants of

Organizational, Industrial and Technological Change:

A Case Study in the Life Sciences Sector

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In this case study, Prof. Moore focuses on one of the more intriguing of recent industrial realignments, that of biotechnology, and agricultural biotechnology in particular. At a sectorial level, biotechnology is interesting because it is contributing to a major shift in agricultural research from the public to the private sector (abetted, of course, by ongoing real declines in public sector research support). These changes are also captivating because, following decades of promise and hype, product are now emerging rapidly. It is estimated that for the 1997 crop year, 30 million acres were planted worldwide with transgenics, and in 1998, 40 percent of U.S. soybean acreage, according to the case (*Economist*, 1998). Of course, the real money is in pharmaceuticals, especially human pharmaceuticals, for which biotech provides both novel approaches and production techniques.

But Moore does not address those sector aspects in depth, rather focusing at the firm level, and at Monsanto and DuPont in particular. These are two old line firms which have seemingly successfully transformed themselves from slow-growth commodity-type products to biotech. Moore is quite correct that growth prospects were limited in the chemical areas and that some new product lines were needed, a point on which stock analysts concurred. It is always interesting to study successful corporate transformations - certainly there have been numerous examples of firms which were unable to change their product mix rapidly or completely enough. Evidence to date is that both these firms have succeeded, at least in the short run; the long run prospects of biotech are insufficiently clear at this point to make any judgments. More particularly, the evidence for Monsanto, with its estimated 77 percent world wide market share, is stronger than for DuPont, which still has a very limited market for biotech products.

The conclusion the advances in intellectual property rights (IPR) advanced the development of the industry is also a correct one. That situation, as noted by Prof. Jones in her comments, was abetted by government policy. IPR did not in any way create the agbiotech industry; the apparent economic benefits are responsible for that, and in the absence of IPR some other control mechanisms, possibly including plantation-style production systems, could have been used. But IPR do reduce transaction costs and hence accelerate and enhance the process.

There are a few distinct factors regarding IPR applications to living organisms, such as underlay much of the Monsanto and DuPont positions, which are shaping the development of the sector. One relates to the newness of the technology and the operation of the US Patent Office (as well as many others). At the risk of some over simplification, the Patent Office examination process mandates that the examiner identify some specific justifications for rejecting claims. In a new field like biotechnology there is little available literature for the examiner to reference with the result that early grants tend to be quite broad. While there is a general justification that path braking developments should be rewarded, it happens, as has occurred in agbiotech, that some early grants are far broader than can be justified based on subsequent scientific developments. That is, what once took a Ph.D. can not sometimes be done by a good high school student. That situation of broad grants has been one of the contributing factors to the litigious nature of biotech IPR. Barton (1998) concludes that much of the biotech IPR litigation has been focused on "driv[ing] all competitors out of the market" with a particular incentive to sue outsiders attempting to enter the market, as opposed to major participants who can counter sue. Certainly the high stakes of IPR litigation is also shaping the industry structure.

Moore's particular focus though is on the differing approaches taken by the two companies to amassing the inputs, skills and markets necessary for their successful entry into biotechnology. Monsanto operated largely through purchases, being involved in 16 purchases in 1997 and two in 1998 prior to merging itself with American Home Products a few months ago. DuPont, in contrast, repositioned itself largely through joint ventures, over 20 of them, according to the case study. Moore

takes the position that joint ventures which require lower fixed investments are preferable in a risky industry like biotech. Why then did Monsanto select the less flexible, riskier, alternative? Moore concludes that Monsanto lacked the record of past successful joint ventures needed to attract venture partners, which would see a potentially unviable partnership as a risk. Accepting that conclusion fully of course raises the issue of how a firm establishes a reputation as a viable venture partner certainly Monsanto would seem to be doing little presently to advance itself in that regard.

A possible explanation is Moore's assertion that (Monsanto's) the contractual limitation of a seed company to sell seeds compatible with a single proprietary herbicide would be anti-competitive - but achieving the same objective through a vertical merger is acceptable. That interpretation of anti trust law may however not be entirely correct for in the past the courts have allowed restrictive vertical agreements if needed to protect product quality or reputation (see e.g., *US vs. Jerrold Electronics Co.* [Eastern District Court Pa, 1960] and *Dehydrating Process Co. v. A.O. Smith Co* [First Circuit Court Appeals, 1961]). Given the 'stewardship' required to maintain the effectiveness of the current generation of agbiotech products, that argument could certainly be made by Monsanto and others.

Barncy and Lee (1998) in a literature review consider a number of additional issues related to transaction costs, property rights and learning than are included in Moore's case. They summarize the conclusions of the several competing theorems as follows:

Transactions Cost: threat of opportunism is minimized through more hierarchical governance,

Options Theory: flexibility under high uncertainty is maintained through less hierarchical governance,

Organizational Learning: exogenous learning is best advanced through less hierarchical governance while for endogenous learning the situation is reversed, and

Property Rights: when learning is endogenous, less hierarchical systems may be used, while exogenous learning suggests more hierarchical systems.

Moore suggests that of these, and possible other factors affecting corporate strategic decisions, that property rights and transaction costs considerations prevail, leading to his conclusion that the less hierarchical system is the preferred one (and assuming that learning is endogenous). Again, DuPont is following that course, while Monsanto might, but is prevented by lack of an enabling reputation.

The type of analysis presented is predicated on the differing reputation as a joint venture partner being the significant operable difference between the two firms which are the focus of this case. Certainly, there are strong parallels, both companies starting in chemicals and moving to the 'life sciences', as the analysts like to call biotech and related enterprises. However, there are significant differences between the two as well, as shown in the Table, which adds American Home Products (AHP) to the mix.

FIRM:		DUPONT		MONSANTO	AM. HOME Prod.
SALES, \$/b, 1997		45		9	14
MARKET, CAP, \$/b		86		33	60
RECENT,P/E		34		82+	28
PRODUCT, SHARES %	petro 46	ag 44	NA - pharm., over the counter medications		
	fibers 32	food ing. 19			
	chem. 10	pharm. 35			
	life sci 5.6				

Table: Market Attributes of DuPont, Monsanto and American Home Products

Particularly noteworthy differences are the fact that Monsanto, and more so Monsanto-AHP, are heavily in the pharmaceutical business. Monsanto is also ahead of DuPont in biotech sales so their industry stage is different. DuPont is a far larger firm measured in terms of sales and capitalization, indeed, close to the combined size of Monsanto/AHP. And Monsanto's share prices and P/E have been advancing strongly; a recent P/E exceeded 100, three times that of DuPont and five times the market average. Might those differences explain in part Monsanto's decision to employ stronger hierarchical arrangements?

One additional institutional factor needs to be identified, that of the expiration of Monsanto's key patents on its Roundup herbicide, a glyphosate, in 2000. Roundup sales are said to contribute the bulk of Monsanto's ag product sales, up to one third of total corporate sales in 1997. That situation could explain, for example, why Monsanto is using a complex licensing agreement with its Roundup Ready seeds, including a requirement to use only Roundup (see Carlson, Marra and Hubbell, 1997). Misuses of Monsanto's seeds is the basis for cross suits between Monsanto and Zeneca, which is developing its own proprietary glyphosate herbicide (Reuters, 1998).

Given these additional considerations then, it is possible to revisit the corporate decisions for alternative explanations for the forms of their strategic alliances. One possible key factor is that Monsanto was first and DuPont, to a degree, is catching up. Thus, DuPont may be learning more exogenously than could Monsanto, a situation (according to the theory) which is advanced by less hierarchical control. Monsanto as the leader would also potentially be more subject to opportunistic behavior, and select hierarchical control as a means of minimizing the threat. Certainly that situation could explain Monsanto's decision earlier this year to complete its purchase of DeKalb, to which some of its products were licensed. If a competitor had acquired DeKalb, Monsanto would have lost a degree of control over its products.

Monsanto with its emphasis on pharmaceuticals (a focus emphasized by the AHP combination) may also be more subject to opportunism, but I am sufficiently unfamiliar with the pharmaceutical industry to make any informed judgment. DuPont's far greater size compared to Monsanto may place it in a different organizational situation, but the several theories do not address the issue of size. Perhaps it can be observed through any change in Monsanto's tactics post- agreement.

But perhaps most significant is the astronomical levels of Monsanto's price-earnings ratio. With many of the mergers and acquisitions funded through stocks, Monsanto management may simply have been operating opportunistically itself in making acquisitions when they are comparably inexpensive for the company. Presumably, Monsanto knew first of the success potential of its new products and recognized that joint venture partners would also be benefited by the success of Monsanto's products - that certainly is what happened to Delta Pine Land stock price, to take one example. As another, Moore cites the ten-fold capitalization rise for DeKalb over the 14 month period during which Monsanto's ownership went from 40 to 100 percent.

Thus by acquiring early, Monsanto used its highly valued stocks to acquire assets with considerable appreciation potential. Moreover, the knowledge which led to Monsanto's first generation products, for all their innovativeness and control through patents, is of recognized fleeting value. Entry through improved products is difficult to prevent in the rapidly evolving biotech area. More difficult to replicate is the traditional breeding firms through which the agbiotech products are commercialized, and controlling those firms controls entry.

The situation is not unlike competition in the airline industries. In the 1970s, economists focused on the airplane as the key to entry, and since access to planes was open, so should be competition. But they were wrong, for it was access to landing slots at key airports and the scheduling of connecting flights which really determine competition, and a shrinking number of firms control those aspects. Already with seeds, there are, with Monsanto's acquisition of Delta and Pine Land (if approved), no independent sources of cotton seed, and only one small university seed collection from which to build a program. Monsanto appears to be active very astutely in solidifying its position by owning the least mobile assets - joint ventures would not serve that purpose nearly as well.

One other factor particular to biotechnology may be involved as well, the unclarity of property rights. Sometimes, the focus is on the ownership if the gene controlling the commercially important trait - the glyphosate resistance, or the *Bt* gene - but often there are many near substitutes. Likely more important is the ownership of the multiple other proprietary pieces which go into a single commercial product. In the case of a virus resistant papaya developed at Cornell, at least five proprietary components are involved, and commercialization rights to these have not all been secured even after three years of negotiations (see Lesser, 1997, Lesser *et. al*, 1998). Sometimes, negotiations had to be started afresh when the owner firm

was acquired - DeKalb is again a relevant example here. In some cases up to eleven pieces are involved. Monsanto is certainly aware of this situation; its 35S promoter is one of the most commonly used pieces, and one said to be the most difficult to reach commercial use agreements over. Ownership of the firm may be the most expedient approach to controlling key pieces of technology.

Overall, Prof. Moore provides a very appropriate focus on an intriguing new industry and on two key firms within that evolving industry. My points have been an attempt to indicate that he may have focused a bit too narrowly on the considerations for the different firm strategies. My reading, and certainly that of the stock market, is that Monsanto has acted very shrewdly through its multiple acquisitions, acting from strength rather than weakness as Moore's conclusions could be read to imply. Indeed, Monsanto could have created a real problem for the farmers of the world, and for those of us who have some claims to maintaining competition in the input sectors. Perhaps the time is overdue for the Department of Justice to look more carefully at the potential consequences of the firm actions described by Prof. Moore, particularly as regards the merger guidelines.

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