CHEAP TALK AND INVESTMENT RIVALRY IN THE PULP AND PAPER INDUSTRY

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This memorandum reports several results supplementing those reported in this paper, published in the Journal of Industrial Economics, March 1997, pp. 47-73. Each of these is mentioned briefly in the paper but without explicit reporting of the results, which appear in this supplement.

1. Reputation for completing announced projects. We tested whether such a reputation might be a valuable asset to an established firm, making it more likely to complete any given project (holding constant other influences on its decision), the more substantial is its general track record for completing projects that it announces. Given the (serious) limitation that we know nothing of that track record before 1977, any measure of reputation must deal with the following issues:

a. A reputation might be based only on recent past behavior, on a longer-term past record, or it might (on a stretched interpretation of rational expectations) also anticipate its record of completion subsequent to the project at hand.

b. A firm announcing its first project has no reputation. We can treat "no reputation" as a separate category, or we can allow novices to be presumed either to be "finishers" or "quitters."

We calculated six reputation measures on these assumptions:

(1) Only most recent project announcement matters; novices are assumed to be finishers.
(2) All previous announcements matter; novices are assumed to be finishers.
(3) All previous announcements matter, and the completion/abandonment of future projects subsequent to this one is on average correctly anticipated; novices are assumed to be finishers.
(4) Only most recent announcements matters; novices are assumed to be quitters.
(5) All previous announcements matter: novices are assumed to be quitters.
(6) All previous announcements matter, and the completion/abandonment of future projects subsequent to this one is on average correctly anticipated; novices are assumed to be quitters.

In Table 4, equation 3, of the published paper, version (2) gives the result for the variable labeled Reputation, which the t-statistic = 1.44.

In Table S1, equations 1 and 2 report the versions of Reputation giving the next highest t-statistics. In equation 1 it is variant (3); in equation 2, variant (6).

2. Effect of weighting future projects by their capacity shares. We observed that projects proposed for a given sector and time period tend to be very similar in average size (tonnage capacity), and so employed in the reported results merely a count of projects proposed in the year followed an announced project. To make sure this assumption was warranted, we subsequently recalculated that variable using tonnage weights. In Table S1 equation (3) is specified identically to equation (1) of Table 4 in the published paper. It documents the assertion in the text that the variable's t-statistic is slightly increased, but nothing else in the estimated model changes appreciably.

3. Regional interdependence. The paper documents that both regional and continental definitions of markets for pulp and paper are economically relevant. In the published Table 4, equations (4) and (5) show that the basic results differ sharply between the old eastern region (little exports, serving mainly the heavily populated northeastern part of the continent) and the southern and western regions (serving broader continental markets and exporting extensively, especially from new plants).

We also recalculated the variable Other projects (t+ 1) so that it picks up only projects in the same region as that of the announced project. In Table S1 equation (4) documents the substantial increase in the strength of the variable's effect.

4. <u>Sources of small firms' disadvantage</u>. It is clear that firms holding initially small shares in pulp and paper markets (including zero shares) are disproportionally active in announcing new projects, although they are also more likely to abandon them. One reason why they face greater hazards is that a larger proportion of small firms' projects are "green-field" developments, which intrinsically encounter more uncertainty than plans to add a machine at an existing mill site. Is this the only source of small firms' greater likelihood of abandonment, or is their novice status (or other traits correlated with small initial shares) independently responsible? We re-estimated the basic equation (1) of Table 4 in the published paper, allowing the coefficient of Firm share to differ between green-field and other projects. In Table S1, equation (5) suggests that the effect of initial share on likelihood of abandonment is twice as strong for green-field projects as for others. However, Firm share is a significant predictor of abandonment for expansions at existing sites. Indeed, the coefficient of Firm share for green-field projects is rather less precisely estimated.

5. <u>Multimarket contact</u>. The larger firms in any of the eleven pulp-and-paper segments analyzed in this study commonly operate in other segments as well. They come into multimarket contact with one another. Such contacts raise the possibility, analyzed theoretically by Bernheim and Whinston (<u>Rand Journal of Economics</u>, 1990) and tested by Scott (<u>Review of Economics and Statistics</u>, 1982), Feinberg (<u>Journal of Business</u>, 1985), and Evans and Kessides (<u>Quarterly Journal of Economics</u>, 1994), that parallel multimarket structures can give rise to equilibria in which cooperatives prices become sustainable in individual market that could not be sustained without the multimarket contact. One corollary of the Bernheim-Whinston model can be tested by means of the data organized for this project. The corollary holds that in reaching cooperative multimarket equilibria firms can implicitly trade shares among markets (for example, each expanding where it is relatively more efficient and contracting where it is relatively less efficient), to take advantage of the lowered threshold for the smallest share consistent with sustained cooperation.

For a subsample consisting of the completed projects in our data base, we identified instances in which the announcing firm and one of its rivals initially hold capacity shares among the ten largest in both this product and one of the others. We observed the change in capacity shares between the announcement year and the third year following for both the announcing firm and each multimarket rival, and in both the market site of the announcement and each other market in which contact occurs. The Bernheim-Whinston share-trading mechanism should show up in negative associations between a given firm's share change in the market of the initial announcement and the one linked by multimarket contact. We controlled for the levels of firms' shares in each market, because of the greater propensity already shown of small-share firms to expand their capacities.

When a firm announces and completes an investment project, it indeed increases its mean share, although on average by less than one percent. There is no negative correlation, however, between its share changes and the combined share changes of its multimarket rivals in that "base" activity (the correlation is positive though insignificant). There is a significant negative correlation between the share change of the announcing firm in the base market and in other markets where it operates and faces multimarket rivals (-0.41). However, short-run constraints of finance or organizational capability suffice to explain that relationship, and multimarket contact is not necessary. No correlation is found between share changes of the announcing firm's multimarket rivals in the base market and the other market sites of multimarket contact. Thus, this corollary is not supported. Notice that rejecting this corollary about share-trading as an outcome of multimarket contact does not call into question other investigators' empirical findings about the effect of multimarket contact on prices or profits. However,

it might hold implications for the mechanism by which multimarket contact affects price and profit outcomes.

Table S1. Supplementary results, logit models of determinants of abandonment of announced projects
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Exogenous variable	(1)	(2)	(3)	(4)	(5)
No date	3.42	3.38	3.43	3.41	3.55
	(6.92)	(6.83)	(6.94)	(6.92)	(6.91)
Firm share	-0.15	-0.13	-0.14	-0.15	
	(2.37)	(2.04)	(2.35)	(2.52)	
Unexpected projects (t+ 1)	0.22	0.21	0.09	0.49	0.23
	(2.37)	(2.27)	(2.54)	(2.55)	(2.39)
Growth deviation	-0.12	-0.13	-0.13	-0.13	-0.13
	(2.32)	(2.49)	(2.39)	(2.38)	(2.54)
Utilization deviation	-0.01	-0.01	-0.01	-0.01	-0.00
	(0.20)	(0.09)	(0.16)	(0.11)	(0.02)
Growth	-0.09	-0.09	-0.09	-0.09	-0.09
	(2.52)	(2.50)	(2.39)	(2.50)	(2.54)
Utilization	-0.07	-0.07	-0.05	-0.06	-0.07
	(1.18)	(1.15)	(0.86)	(1.05)	(1.15)
Reputation	-0.67	-0.49			
	(1.04)	(0.96)			
Share (greenfield)					-0.26
					(1.66)
Share (other projects)					-0.13
					(2.15)
Constant	5.88	5.43	3.54	4.69	5.19
	(1.06)	(0.97)	(0.65)	(0.85)	(0.94)
Fraction correctly classified	0.90	0.90	0.90	0.90	0.90
-2 log L	142.2	142.4	142.6	142.5	142.6

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