I. OUTSOURCING AND THE BOUNDARY OF THE MULTINATIONAL FIRM

B. Outsourcing, Routineness, and Adaptation

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Broad theory, narrow empirics

- There is now a substantial empirical literature in which U.S. intrafirm imports are treated as an international version of the make-or-buy decision. Examples include Antras (2003), Yeaple (2006), Nunn (2007), and Bernard, Jensen, Redding, and Schott (2008)
- Empirical researchers could potentially draw on a very rich menu of theories, but only two dominate the literature
- "Knowledge capital": When multinationals have important trade secrets to protect, this is done more easily if the manufacturing process is kept within the firm.
- "Property rights": A holdup problem arises when the multinational headquarters and its supplier have to make noncontractible relationship-specific investments. Applying the insight of Grossman and Hart (1986), property rights in the output of the relationship should be held by the party whose incentive to invest is more important, hence supply should be kept within the multinational firm when its headquarters makes the larger contribution to the relationship.

A neglected theory

- Our inspiration is the “adaptive” theory of the firm, to be found in fundamental contributions by Simon (1951) and Williamson (1975) and in the recent synthesizing work of Tadelis (2002) and Gibbons (2005)
- The premise of our analysis is that some activities a supplier undertakes for a multinational headquarters are more likely than others to give rise to problems the nature of which cannot be fully specified in a contract ex ante. When these unspecifiable situations arise the headquarters and its supplier must *adapt*, and this adaptation is more efficiently carried out within a firm because incentives for opportunistic behavior are lower, because ex post renegotiation is less costly or because of internal communications infrastructure
- Simply stated, the less routine is production of an input, the more likely is the multinational to produce it itself -- in a subsidiary, if the input is imported
- This hypothesis became testable thanks to the work of Autor et al. (2003) who measured “routineness” of occupations to examine trends in demand for skills in the U.S. labor market

Bridging theory and data

- Our empirical difficulty is to go from routineness of occupations to routineness of inputs or sectors
- We interpret occupations as activities or "tasks," and interpret intensity of occupations in "problem solving" as a measure of the need for ex post adaptation by a headquarters and a supplier, to which we refer as "task routineness"
- In a simple Ricardian model, tasks are produced using homogeneous labor and embodied in sectoral imports of U.S. multinational firms. Accordingly, we say that a sector is less routine than another if its employment-weighted average task routineness is lower
- The main prediction of our simple trade model is that if vertical integration increases productivity ex post, but reduces it ex ante, then less routine sectors should have a higher share of intrafirm trade

Use data for U.S. multinationals

- We follow other studies by using sector level data on the intrafirm imports of U.S. multinationals.
- The United States is the world's biggest foreign direct investor, with subsidiaries abroad worth $2.9 trillion in 2006.
- The share of U.S. imports that is intrafirm is both remarkably high, 47% in 2006, and widely varying across industries, from 4% in footwear to 92% in motor vehicles.

Suppliers of tasks in the world economy

- Consider a world economy with $c = 1, ..., C$ countries; $s = 1, ..., S$ goods or sectors; $t = 1, ..., T$ tasks; and one factor of production, labor, immobile across countries. We denote by w_c the wage per efficiency unit in country c.
- There are two types of firms, intermediate suppliers and final good producers.
- Intermediate suppliers are present in all countries. They transform labor into tasks using a constant-returns-to-scale technology. The total output of task t in sector s and country c is given by

$$Y_c^s(t) = \frac{L_c^s(t)}{a_c(t, X)} \qquad (1)$$

where $L_c^s(t) \geq 0$ is the amount of labor allocated to task t in sector s and country c, and $a_c(t,X) > 0$ is the amount of labor necessary to perform task t once in country c. The role of X will be described in detail in a moment.

Production by U.S. multinationals

Final good producers only are present in country 1, the United States. They transform tasks into goods using a constant returns to scale technology. The total amount of good *s* produced with tasks from country *c* is given by

$$Y_c^s = F^s \left[Y_c^s(1), \ldots, Y_c^s(T) \right]. \qquad (2)$$

Sectoral task intensity

We denote by $p_c(t)$ the price of task t in country c and by $b_c^s(t) \equiv p_c(t)Y_c^s(t)/\sum_{t'=1}^{T} p_c(t')Y_c^s(t')$ the intensity of task t in sector s and country c. For any pair of tasks, t_1 and t_2, and any pair of sectors, s_1 and s_2, we say that s_1 is relatively more intensive in task t_1 in country c if $b_c^{s_1}(t_1)/b_c^{s_1}(t_2) \geq b_c^{s_2}(t_1)/b_c^{s_2}(t_2)$. In line with traditional trade models, we rule out task intensity reversals. If there exists a country c such that $b_c^{s_1}(t_1)/b_c^{s_1}(t_2) \geq b_c^{s_2}(t_1)/b_c^{s_2}(t_2)$, then we assume that $b_{c'}^{s_1}(t_1)/b_{c'}^{s_1}(t_2) \geq b_{c'}^{s_2}(t_1)/b_{c'}^{s_2}(t_2)$ for all countries $c' = 1, ..., C$.

Market structure

- All markets are perfectly competitive.
- Final goods are freely traded, whereas tasks are nontraded.

- Under these assumptions, Y_c^s represents the quantity of U.S. imports from country $c \neq 1$ in sector s.

- In our model, tasks are “embodied”in imports, like factor services in traditional trade models.

Task “routineness”

- For each task, there exist two states of the world, “routine” and “problematic”. Tasks only differ in their probabilities $\mu(t)$ of being in the routine state. $\mu(t) \geq 0$ is an exogenous characteristic of a task, to which we refer as its routineness

- Without loss of generality, we index tasks such that higher tasks are less routine, $\mu'(t) < 0$

- For each task and each country, final good producers in the United States can choose between two organizations, $X \in \{I, O\}$. Under organization *I* (Integration), US final good producers own their intermediate suppliers at home or abroad, whereas under organization *O* (Outsourcing), intermediate suppliers are independently owned

Firm organization and productivity

The premise of our analysis is that firms' organizational choices affect productivity at the task level both ex ante and ex post.

Let $a_c(t,X) > 0$ denote the amount of labor necessary to perform task t once in country c under organization X. We assume that $a_c(t,X)$ can be decomposed into

$$a_c(t,X) = \alpha_c(X) + [1 - \mu(t)]\,\beta_c(X) \qquad (3)$$

where $\alpha_c(X) > 0$ is the ex ante unit labor requirement, and $\beta_c(X) > 0$ is an additional ex post unit labor requirement capturing the amount of labor necessary to deal with the problematic state.

Our central hypothesis

- ***H_0***. *In any country c* = 1, ...,*C, integration lowers productivity ex ante,* $\alpha_c(I) > \alpha_c(O)$*, but increases productivity ex post,* $\beta_c(I) < \beta_c(O)$.
- According to H_0, the basic trade-off associated with the make-or-buy decision is that integrated parties are less productive ex ante, but more productive ex post.
- Though H_0 admittedly is reduced form, there are many theoretical reasons why it may hold in practice:

Adaptation and the boundary of the firm

- *Opportunism*. It is standard to claim that external suppliers have stronger incentives to exert effort than internal suppliers (e.g., Alchian and Demsetz 1972, Holmstrom 1982), so that contracting out yields a cost advantage to headquarters ex ante. When problems require the parties to go beyond the contract ex post, however, opportunities for suppliers to “cut corners” may open up and their stronger incentives to reduce costs can backfire on headquarters (Tadelis 2002).
- *Renegotiation*. Although contracting out reduces cost ex ante, an arm’s length contract between headquarters and a supplier can lead to costly delays ex post when problems force renegotiation (Bajari and Tadelis 2001). Exercise of command and control within the firm avoids renegotiation costs.
- *Communication*. Cremer, Garicano, and Prat (2007) argue that agents within the boundary of a firm develop a common “code” or “language” to facilitate communication. Building up this communications infrastructure is a superfluous expense when a standard contract can convey all necessary information to a supplier ex ante, but if problems arise ex post that a contract does not cover, a common language shared by the headquarters and the supplier will reduce the cost of the communication necessary to resolve them.

A country-specific cutoff task for outsourcing versus integration

Let $X_c^*(t) \in \{O, I\}$ denote the organization chosen by final good producers (if any) purchasing task t from country c. Profit maximization requires

$$X_c^*(t) = \underset{X \in \{O,I\}}{argmin}\ a_c(t, X). \tag{4}$$

The first implication of our theory can be stated as follows.

Lemma 1 *Suppose that H_0 holds. Then for any country $c = 1, ..., C$, there exists $t_c^* \in \{0, ..., T\}$ s.t. task t is outsourced if and only if $t \leq t_c^*$.*

Proof. Let $\Delta_c(t) \equiv a_c(t, O) - a_c(t, I)$. By Equation (3), we have

$$\Delta_c(t) = [\alpha_c(O) - \alpha_c(I)] + [1 - \mu(t)] [\beta_c(O) - \beta_c(I)].$$

Since $\mu'(t) < 0$, H_0 implies that $\Delta_c(t)$ is strictly increasing in t. Therefore, if $X_c^*(t_0) = I$ for $t_0 \in \{1, ..., T\}$, then Equation (4) implies $X_c^*(t) = I$ for all $t \geq t_0$. Lemma 1 directly derives from this observation. ■

Ranking of sectors

Although Lemma 1 offers a simple way to test H_0 on task-level data, such disaggregated data unfortunately are not available. In our empirical analysis, we only have access to sector level import data. With this in mind, we now derive sufficient conditions under which one can relate H_0 to these sector-level data. We introduce the following definition.

Definition 1 *A sector s is less routine than another sector s' in country c if, for any $T \geq t \geq t' \geq 1$, task intensities satisfy $b_c^s(t)/b_c^s(t') \geq b_c^{s'}(t)/b_c^{s'}(t')$.*

Sector ranking applies across all countries

- Broadly speaking, we say that a sector *s* is less routine than another sector *s′* if it is relatively more intensive in the less routine tasks
- Given our assumption of no taskintensity reversals, if a sector *s* is less routine than another sector *s′* in a given country *c*, then *s* is less routine than *s′* in all countries.
- From now on, we simply say that "*s* is less routine than *s′*."

The intrafirm share of import value is higher in less routine sectors

Let χ_c^s denote the share of the value of imports from country c in sector s that is intrafirm.

Proposition 1 *Suppose that H_0 holds. Then for any country $c = 1, ..., C$, the share of the value of imports that is intrafirm is higher in less routine sectors.*

Proof. By Lemma 1, we know that

$$\chi_c^s = \frac{\sum_{t=t_c^*+1}^{T} p_c(t) Y_c^s(t)}{\sum_{t=1}^{T} p_c(t) Y_c^s(t)}.$$

Using our definition of $b_c^s(t)$, we can rearrange the previous expression as

$$\chi_c^s = \sum_{t=t_c^*+1}^{T} b_c^s(t). \tag{5}$$

Now consider two sectors, s and s', such that s is less routine than s'. It is easy to check that Definition 1 implies

$$\sum_{t=t_c^*+1}^{T} b_c^s(t) \geq \sum_{t=t_c^*+1}^{T} b_c^{s'}(t). \tag{6}$$

Equation (5) and Inequality (6) imply that for any country $c = 1, ..., C$, the intrafirm share of import value is higher in less routine sectors. ■

Going from theory to empirics

- The value of intrafirm U.S. imports is measured in practice as the total value of shipments declared by U.S. multinationals to be from "related parties." To go from our simple model to the data, we will make the implicit assumption that the probability that a U.S. multinational declares a shipment to be from "related parties" is monotonically increasing in the share of that shipment's value that is intrafirm.

- The assumption that the ranking of task intensities does not vary across countries effectively rules out technological differences across countries due to the fragmentation of the production process. We come back to this important issue below.

- The fact that in a given country any task is either always outsourced or always performed in house is not crucial for Proposition 1. In a generalized version of our model where less routine tasks are only *less likely* to be outsourced, Proposition 1 would still hold.

Data: Intrafirm trade share

- All trade data are from the U.S. Census Bureau Related Party Trade database and cover the years 2000 though 2006
- Variables reported in this database include the total value of all U.S. imports and the value of related party, or intrafirm, U.S. imports. Imports are classified as intrafirm if one of the parties owns at least 6% of the other. The data originate with a Customs form that accompanies all shipments entering the U.S. and asks for the value of the shipment and whether or not the transaction is with a related party.
- These data are collected at the 10-digit HS level and reported at the 2 though 6-digit level for both HS and NAICS codes. We use the 4-digit NAICS data for our analysis to facilitate comparison with other studies in the cross-sector regressions below.
- We constrain our sample to include only the largest exporters to the U.S., comprising 99 percent of all U.S. imports.

- This results in a set of 55 exporting countries in 77 sectors over 7 years

Data: Task routineness

- We define a task *t* as a 6-digit occupation in the Standard Occupational Classification (SOC) system.
- To measure how routine each of these tasks is, we use the U.S. Department of Labor's Occupational Information Network (O*NET). This database includes measures of the importance of more than 200 worker and occupational characteristics in about 800 tasks. Such characteristics include finger dexterity, oral expression, thinking creatively, operating machines, general physical activities, analyzing data, and interacting with computers.
- We use the importance of "making decisions and solving problems" as our index of how routine a task is.

Measurement of task routineness

Formally, we measure the routineness $\mu(t)$ of a task t as

$$\mu(t) = 1 - P(t)/100, \qquad (7)$$

where $P(t) \in [0, 100]$ is the importance of “making decisions and solving problems” for a 6-digit occupation, t, according to O*NET.

The next table shows the ten most and ten least routine tasks.

Top 10 tasks, from most to least routine	
1	Graders and sorters, agricultural products
2	Electro-mechanical technicians
3	Maids and housekeeping cleaners
4	Shoe and leather workers and repairers
5	Structural metal fabricators and fitters
6	Meat, poultry, and fish cutters and trimmers
7	File clerks
8	Textile knitting and weaving machine setters, operators, and tenders
9	Food and tobacco roasting, baking, and drying machine operators and tenders
10	Cutters and trimmers, hand
Bottom 10 tasks, from least to most routine	
1	Computer software engineers, systems software
2	Chief executives
3	Aerospace engineers
4	Computer operators
5	Operations research analysts
6	Transportation, storage, and distribution managers
7	Computer hardware engineers
8	Human resources managers
9	Biomedical engineers
10	Civil engineers

Data: Sectoral task intensity

- We define a sector as a 4-digit industry in the North American Industry Classification System (NAICS)

- Equation (1) and perfect competition imply

$$b_c^s(t) = \frac{w_c L_c^s(t)}{\sum_{t=1}^{T} w_c L_c^s(t)} = \frac{L_c^s(t)}{\sum_{t=1}^{T} L_c^s(t)}. \qquad (8)$$

Since we assume no task intensity reversal, we can simply focus on one country to compute task intensities using equation (8). We use U.S. data from the Bureau of Labor Statistics Occupational Employment Statistics 2006 on the share of employment of 6-digit occupations in each sector s = 1, …, S.

Ranking sectors by average task routineness

- Ideally, armed with measures of $\mu(t)$ and $b^s(t)$, we would like to rank sectors in terms of routineness by checking, for any pair of sectors, whether the inequality introduced in Definition 1 is satisfied.
- While this approach has clear theoretical foundations, it faces one important problem in practice: there are very few sectors that can be ranked in this fashion in our sample.
- We therefore follow a more reduced form approach in our empirical analysis that allows us to consider the full sample of NAICS 4-digit sectors. For any sector $s = 1, \ldots, S$, we compute the average task routineness

$$\mu^s \equiv \sum b^s(t)\mu(t).$$

- We then use μ^s as our proxy for routineness at the sector level. If s is less routine than s' in the sense of Definition 1, then the average routineness of tasks in sector s must be lower than the average routineness of tasks in s', but the converse is not true.
- Put differently, satisfaction of the inequality in Definition 1 is sufficient but not necessary for sector s to have a higher share of intrafirm trade than sector s' . Accordingly, if our data were not to support Proposition 1 it could either be that H_0 does not hold or that the true distributions of tasks cannot be ranked in the sense of Definition 1.

Data: Controls

- We use U.S. sector-level data on capital intensity, skill intensity, R&D intensity, relationship specificity, the distribution of firm size, and the level of intermediation to control for other known determinants of the boundary of multinationals.
- Data on the relative capital and skilled labor intensities of industries are from the NBER Manufacturing Database. Capital intensity is measured as the ratio of the total capital stock to total employment. Skill intensity is measured as the ratio of nonproduction workers to production workers in a given industry.
- As in Antras (2003), data on the ratio of research and development spending to sales are from the 1977 U.S. Federal Trade Commission (FTC) Line of Business Survey.
- To control for variations in the importance of relationship specific investments, we use the index developed by Nunn (2007) based on the Rauch (1999) classification.
- In the spirit of Yeaple (2006), we use Compustat data to construct the coefficient of variation of sales by firms within an industry, to control for productivity dispersion.
- Finally, we follow Bernard, Jensen, Redding, and Schott (2008) and use the weighted average of retail and wholesale employment shares of importing firms in an industry as a control for intermediation.

Correlations of sector characteristics

	rtne	ln(K/L)	ln(S/L)	ln(RD)	spcfcty	intrmd	dsprsn
routine	1						
ln(K/L)	-0.390	1					
ln(S/L)	-0.581	0.427	1				
ln(R&D)	-0.553	0.195	0.466	1			
specificity	-0.126	-0.409	0.178	0.415	1		
intermediation	0.495	-0.485	-0.447	-0.485	-0.036	1	
dispersion	-0.183	0.470	0.279	0.194	0.0669	-0.250	1

Sign tests

- For any pair of sectors, if one is less routine than the other, then exporter by exporter, it should have a higher share of intrafirm trade.
- Out of the 141,419 possible comparisons in our data for 2006 (pair sectors*countries), 81,116 have the right signs. In other words, in 57% of all cases, the less routine sector has a higher share of intrafirm trade.
- Overall, we view this first look at the data as surprisingly encouraging. Recall that Proposition 1 assumes away any other determinant of the boundary of U.S. multinationals!

Technological differences or fragmentation do not seem to affect the results

- We also break down the results of our sign tests by countries and sectors in 2006.
- There is a substantial amount of variation across countries. Success rates of the sign tests range from 38% in Cambodia to 68% in Singapore.
- Based on these preliminary results, there is little evidence that technological differences, or fragmentation, are a major issue for our approach. The success rates of sign tests in China, India, and Mexico are all above average, at 67%, 64%, and 59%, respectively.
- There is also is a substantial amount of variation across sectors. Success rates range from 30% for "crowns, closures, seals, and other packing accessories" to 80% for "meat products and meat packaging products."
- Again, there is little evidence that fragmentation affects our results in any systematic manner. For example, success rates are equal to 49% for "Aerospace products and parts" but 64% for "Electrical equipment and components, nesoi," two sectors for which we would expect fragmentation to occur in practice.

Cross-sector regressions

We consider linear regressions of the form

$$\chi_{ct}^{s} = \alpha_{ct} + \beta\mu^{s} + \gamma Z^{s} + \varepsilon_{ct}^{s} \quad (9)$$

where

- α_{ct} is a country-year fixed effect
- μ^{s} is the average routineness of sector *s*
- Z^{s} is a vector of controls.

We should observe $\beta < 0$.

Baseline estimates

- The next table presents the OLS estimates of Equation (9) for the set of 4-digit NAICS manufacturing industries for all years in our sample, with standard errors clustered by industry.
- In order to allow for comparison across right-hand-side variables, we report beta coefficients, which have been standardized to represent the change in the intrafirm import share that results from a one standard deviation change in each independent variable.
- In all specifications, the OLS estimate of β is negative and statistically significant, implying that less routine sectors have a higher share of intrafirm imports.

Routineness has strongest impact after R&D

Model :	1	2	3	4	5
N:	29645	29645	29645	29645	29645
Dependent variable is the share of intrafirm imports					
routine	-0.183***	-0.082**	-0.086**	-0.090***	-0.083**
	(-6.75)	(-2.21)	(-2.47)	(-2.59)	(-2.48)
ln(K/L)		0.012	0.058*	0.07*	0.064*
		(0.38)	(1.66)	(1.75)	(1.65)
ln(S/L)		0.016	0.003	0.005	-0.024
		(0.42)	(0.08)	(0.13)	(-0.67)
ln(R&D)		0.165***	0.127***	0.136***	0.111***
		(4.22)	(2.88)	(3.06)	(2.70)
specificity			0.082**	0.084**	0.067
			(2.17)	(2.13)	(1.63)
intermediation				0.032	0.015
				(0.88)	(0.41)
dispersion					0.073*
					(1.92)
fixed effects	ctry-year	ctry-year	ctry-year	ctry-year	ctry-year
R-sq	0.261	0.281	0.285	0.285	0.292

Standardized beta coefficients reported for pooled data from 2000 to 2006.
*,** and *** indicate significance at the 10, 5 and 1 percent levels.
Standard errors are clustered by industry.
T-statistics are in parentheses.

Relative magnitudes of the coefficients

- The impact of routineness is larger than that of capital intensity, specificity, intermediation, and dispersion in all specifications reported in the table.
- However, it is about twice as small as the impact of R&D intensity, which is hypothesized to affect the boundary of multinational firms in both “knowledge capital” and “property rights” models.
- Using the specification with the smallest coefficient on routineness as a lower bound, we find that a one standard deviation decrease in the routineness level of a sector leads to a 0.08 standard deviation increase in the share of intrafirm imports, or an additional 2% of total imports that are within firm.
- We view these results as strongly supportive of the main hypothesis of our paper: adaptation is an important determinant of the boundary of multinational firms.

Robustness check for technological differences or fragmentation

- In the simple model guiding our empirical analysis, we have assumed that all tasks were aggregated using the same technology, F^S, in all countries.
- We have also assumed that there was no task intensity reversal, thereby allowing us to use only U.S. data in order to rank our sectors in terms of routineness. As mentioned previously, this assumption is a strong one in the present context since it rules out situations in which different countries specialize in different tasks through the fragmentation of the production process.
- In order to investigate whether our empirical results are sensitive to this assumption, we reran our regressions on two subsamples of countries, "high income OECD countries" and "all other countries." We interpret "high income OECD" as a proxy for "same technology as in the United States."
- Accordingly, we expect our results to be stronger in the first subsample of countries since the U.S. ranking of sectors in terms of routineness should be a better proxy for their rankings abroad.
- The next two tables are broadly consistent with that expectation. Although the coefficients on routineness are negative and significant for both subsets of countries, the magnitudes of these coefficients are greater for high income OECD countries.

Regressions for high-income OECD countries

Model :	1	2	3	4	5
N:	10779	10779	10779	10779	10779
Dependent variable is the share of intrafirm imports					
routine	-0.239***	-0.124**	-0.127***	-0.127***	-0.125**
	(-6.22)	(-2.37)	(-2.61)	(-2.60)	(-2.47)
ln(K/L)		0.051	0.108*	0.107	0.099
		(0.93)	(1.66)	(1.52)	(1.39)
ln(S/L)		-0.018	-0.035	-0.035	-0.066
		(-0.29)	(-0.59)	(-0.59)	(-1.09)
ln(R&D)		0.2***	0.154***	0.153***	0.126**
		(3.82)	(2.72)	(2.58)	(2.16)
specificity			0.100	0.100	0.092
			(1.58)	(1.59)	(1.32)
intermediation				-0.002	-0.018
				(-0.03)	(-0.30)
dispersion					0.064
					(1.32)
fixed effects	ctry-year	ctry-year	ctry-year	ctry-year	ctry-year
R-sq	0.15	0.18	0.185	0.185	0.185

Standardized beta coefficients reported for pooled data from 2000 to 2006.
*,** and *** indicate significance at the 10, 5 and 1 percent levels.
Standard errors are clustered by industry.
T-statistics are in parentheses.

Regressions for all other countries

Model :	1	2	3	4	5
N:	18866	18866	18866	18866	18866
Dependent variable is the share of intrafirm imports					
routine	-0.167***	-0.066	-0.069*	-0.077**	-0.065*
	(-5.24)	(-1.62)	(-1.79)	(-2.00)	(-1.92)
ln(K/L)		-0.011	0.033	0.055	0.05
		(-0.41)	(0.85)	(1.28)	(1.24)
ln(S/L)		0.038	0.026	0.029	-0.001
		(1.03)	(0.71)	(0.80)	(-0.04)
ln(R&D)		0.159***	0.123**	0.138**	0.112**
		(3.58)	(2.50)	(2.79)	(2.37)
specificity			0.078*	0.082*	0.059
			(1.91)	(1.92)	(1.30)
intermediation				0.056	0.037
				(1.57)	(0.94)
dispersion					0.086
					(1.35)
fixed effects	ctry-year	ctry-year	ctry-year	ctry-year	ctry-year
R-sq	0.261	0.203	0.206	0.208	0.217

Standardized beta coefficients reported for pooled data from 2000 to 2006.
*,** and *** indicate significance at the 10, 5 and 1 percent levels.
Standard errors are clustered by industry.
T-statistics are in parentheses.