

Supplemental Materials for Anita M. McGahan, "The Performance of U.S. Corporations: 1981-1994," *The Journal of Industrial Economics* 47 (4), December 1999, pp. 373-398

#### Appendix A: Analysis on Only Diversified Corporations

This appendix reports the results when the equation (1) is estimated on a dataset that includes only diversified companies. The purpose is to test whether the corporate-focus effect becomes significant when the analysis excludes the two-thirds of corporations that participate in a single segment. The results must be interpreted cautiously because the omission of single-segment businesses significantly distorts the industry and firm effects. The industry effects, for example, are based on the average performance of only the *diversified* incumbents. In an industry like airline transportation, for example, almost all of the participants are excluded. Thus, the industry effect for airline transportation would reflect the average for the few airline companies that report profits separately on their computer-reservation-system businesses. When only a few incumbents remain after the screening of single-segment participants, the industry effects capture influence that would be partly attributed to firm effects if the industry effects were calculated from multiple incumbents.

Even the corporate-focus effect is partly distorted by the omission of single-segment companies. The corporate-focus effect may capture some of the true industry influence because diversified firms do not participate in a representative cross section of industries, and because diversified firms do not typically perform at the average for their industries. The direction and extent of this distortion is difficult to assess *a priori* because it depends on detailed patterns of diversification. As a result, the analysis must be narrowly interpreted as only suggestive of the true corporate-focus effect for diversified firms.

Table A: Contribution to Adjusted  $R^2$  of the Various Effects

Model	Tobin's q	Acctg. Profit	Return on Repl'm't Assets
(a) Only Diversified Corporations			
Year	.018	.030	.061
Perm. Industry	.635	.278	.164
Perm. Focus	.015	.002	.001
Perm. Firm	.040	.078	.192
Trans. Industry	n/a	n/a	n/a
Trans. Focus	n/a	n/a	n/a
Model	.708	.388	.418
(b) All Corporations			
Year	.021	.017	.033
Perm. Industry	.279	.107	.140
Perm. Focus	n/a	n/a	n/a
Perm. Firm	.371	.237	.270
Trans. Industry	n/a	n/a	n/a
Trans. Focus	.001	n/a	n/a
Model	.672	.361	.443

Panel (a) of Table A shows the analysis when only diversified firms are included. Panel (b) replicates the basic results from the text for ease of comparison. The results show that permanent focus effects arise among the diversified firms in panel (a) for all of the performance measures. The quality and robustness of this finding is questionable, however, in light of the significant differences in industry and firm effects across panel (a) and (b). In panel (a), both permanent and transient industry effects are higher than in the analysis on all corporations in panel (b). The omission of single-segment companies may significantly distort the industry estimates and spuriously impute focus effects to the remaining diversified firms that would not exist if industries were accurately represented.

Despite these problems, the results support the idea that the main results may obscure the influence of corporate focus among diversified firms. This idea is further explored in Appendix B, which compares the results to Wernerfelt and Montgomery [1988].

## Appendix B: Comparison with Wernerfelt and Montgomery [1988]

This appendix isolates the importance of years covered and of sectoral coverage to differences with Wernerfelt and Montgomery [1988] on Tobin's  $q$ . The first column of Table B shows Wernerfelt's and Montgomery's result that industry, market-share, and corporate-focus effects explain 17.32%, 2.07%, and 2.62%, respectively, of variance in Tobin's  $q$  among 247 manufacturers in 1976. Because Wernerfelt and Montgomery [1988] covered a single year, the analysis could not distinguish permanent and transient components of the effects. The industry and focus effects reported by Wernerfelt and Montgomery [1988] are comparable in theory to the total of the permanent and transient components in the current analysis.

The second column in Table B is an auxiliary ANOVA on Tobin's  $q$  among manufacturers in the Compustat data from 1981 to 1994. The entries for "industry" and "focus" include the sum of the permanent and transient components for comparability with the Wernerfelt and Montgomery [1988] study. The analysis in column (2) differs from Wernerfelt and Montgomery in years covered, and probably in the breadth of coverage across manufacturers. Wernerfelt and Montgomery were limited to study the 247 corporations for which Lindenberg and Ross [1981] had calculated Tobin's  $q$ . The analysis in column (2) covers 1,370 corporations.

Table B: Comparison with Wernerfelt and Montgomery [1988]

	(1) Wernerfelt & Montgomery (as reported)	(2)	(3)
Unit of Analysis	Corporation	Corporation	Corporation
Performance Measure	Tobin's $q$	Tobin's $q$	Tobin's $q$
Sectoral Coverage	Manufacturers	Manufacturers	All Sectors
Years Covered	1976	1981-1994	1981-1994
No. of Observations	247	9,230	31,601
Data Source	various	Compustat	Compustat
Total Explained Variance	.2200	.592	.672
Year <sup>a</sup>	N/A	.023	.021
Industry <sup>b</sup>	.1732 <sup>c</sup>	.216	.279
Market Share	.0207 <sup>f</sup>		
Focus <sup>c</sup>	.0262 <sup>g</sup>	.000	.001
Firm <sup>d</sup>		.353	.371

<sup>a</sup> Adjusted  $R^2$  in model of year effects

<sup>b</sup> Increment to adjusted  $R^2$  due to permanent and transient industry effects

<sup>c</sup> Increment to adjusted  $R^2$  due to permanent and transient corporate-focus effects

<sup>d</sup> Increment to adjusted  $R^2$  due to permanent firm effects

<sup>e</sup> Increment to adjusted  $R^2$  over the null model as implied by Wernerfelt and Montgomery [1988], Fig. 1

<sup>f</sup> Increment to adjusted  $R^2$  over the model of industry effects as implied by Wernerfelt and Montgomery [1988], Fig. 1

<sup>g</sup> Increment to adjusted  $R^2$  over the model of industry and market-share effects as implied by Wernerfelt and Montgomery [1988], Fig. 1

<sup>h</sup> Adjusted  $R^2$  in the model of industry, market-share, and focus effects as reported by Wernerfelt and Montgomery [1988], Fig. 1

The results in column (2) are somewhat different than those of Wernerfelt and Montgomery [1988] in column (1). Among Compustat manufacturers from 1981 to 1994, industry and firm effects account for 21.6% and 35.3%, respectively, of variance in Tobin's  $q$ . All else equal, the longer period covered in column (2) would tend to decrease industry effects compared to column (1). The greater importance of industry may be attributable either to greater breadth of coverage within manufacturing in the Compustat data, or to an underlying shift in assessments about the prospective value of manufacturing assets. As in the principal analysis, the firm effects are more important to variation in Tobin's  $q$  than to either industry or corporate focus among manufacturers from 1981 to 1994.

Column (3) replicates the basic results on Tobin's  $q$  among corporations in all sectors for 1981 to 1994. A comparison across columns (2) and (3) indicates that industry is more important for the broad cross section of firms than for manufacturers. Firm effects are about equally important to variance in all sectors as in manufacturing.

In sum, the results in Table A indicate that both the years covered and the sectoral coverage are important to differences in Tobin's  $q$  with Wernerfelt and Montgomery [1988]. The differences in results with Schmalensee [1985], which are described in Appendix D, also suggests that the performance measure is important despite the apparent similarity of industry influence in Schmalensee [1985] and Wernerfelt and Montgomery [1988].

## Appendix C: Tests for Error in Estimation

This appendix contains supplementary analyses to test for error in estimation of the basic model. The first test involves using the Cochrane-Orcutt procedure to correct for serial correlation in the residuals and is reported in panel (a) of Table C. Panel (b) reports a second test of the models on a balanced panel that includes just those corporations for which an entire series is available. Panel (c) is a replication of the basic results for ease of comparison.

The major disadvantage of the model in panel (a) has to do with the fact that an estimated rate of serial correlation is incorporated in the model as data. As a result, the ordinary  $R^2$  and adjusted  $R^2$  in each model are not strictly restricted to lie between zero and one. Nonetheless, the results are useful as a benchmark for verifying the importance of the various effects. The results in panel (a) are similar to those in the basic analysis reproduced in panel (c). There are just a few important differences. First, the small transient focus effect for Tobin's  $q$  does not arise in the models corrected for serial correlation. Second, estimates of the permanent industry and permanent firm effects are generally a bit higher (with two exceptions), but relationships in their relative magnitudes are largely preserved. Thus, the test in panel (a) largely confirms the original analysis.

Table C: Contribution to Adjusted  $R^2$  of the Various Effects

Model	-----Ratios-----		
	Tobin's q	Acctg. Profit	Return on Repl'm't Assets
(a) Models Corrected for Serial Correlation			
Year	.015	.010	.018
Perm. Industry	.235	.116	.153
Perm. Focus	n/a	n/a	n/a
Perm. Firm	.298	.240	.280
Trans. Industry	n/a	n/a	n/a
Trans. Focus	n/a	n/a	n/a
Model	.548	.366	.451
(b) Models on a Balanced Panel			
Year	.006	.032	.052
Perm. Industry	.559	.283	.238
Perm. Focus	n/a	.028	.027
Perm. Firm	.083	.041	.173
Trans. Industry	n/a	n/a	n/a
Trans. Focus	n/a	n/a	n/a
Model	.648	.384	.490
(c) Basic OLS Results			
Year	.021	.017	.033
Perm. Industry	.279	.107	.140

Perm. Focus	n/a	n/a	n/a
Perm. Firm	.371	.237	.270
Trans. Industry	n/a	n/a	n/a
Trans. Focus	.001	n/a	n/a
Model	.672	.361	.443

Panel (b) of Table C shows the results on a balanced panel. The panel consists of all corporations for which a 14-year series is available. After screening for single-member industries, a total of 553 firms with 1,612 segments in 155 industries are included.

Because the included corporations tend to be relatively large and to perform closer to the norm than others, the estimated influence of industry is large compared to the basic models. Indeed, the analysis on the balanced panel suffers from some of the same biases as the diversified-firm analysis in Appendix A. The exclusion of data on firms with less than a full series leaves many industries with just a few incumbents. As a result, the industry effects capture variance that would be ascribed to firm effects if all firms were included. Industry influence is biased upward and firm effects are biased downward. Focus effects arise in some cases, probably because of relationships between industries that arise spuriously with the exclusion of firms with less than a full series. The firm effects in panel (b) contribute significantly to explanatory power despite the bias against them. In sum, panel (b) also confirms the main results, especially in light of the distortions associated with the exclusion.

#### Appendix D: Comparison with Schmalensee [1985]

This appendix offers analysis for distinguishing the importance of years covered, unit of analysis, and sectoral coverage to differences with Schmalensee [1985].

The first column of Table D shows Schmalensee's result that industry, market-share, and firm effects explain 18.84%, 0.62%, and none, respectively, of the variance in the business-unit profits of the manufacturing firms covered in the FTC Line-of-Business Reports for 1975. Schmalensee's "firm" effects capture only the common tendencies in performance of business units that belong to the same corporate parent. The firm effects in Schmalensee's study therefore represent the influence of the corporation on its member businesses, but not the effects of competitive differences between rivals within the same industry. Schmalensee's market-share measure is exogenous data that partially reflects competitive advantages. As a result, Schmalensee's market-share effects should be compared to the firm effects in this study.

The second column is an auxiliary analysis on the Compustat Business-Segment data for manufacturers from 1981 to 1994 that is modeled from equation (2), which partitions profit at the *business-segment* level rather than the *business-unit* level used by Schmalensee. Business-segment returns are substantially disaggregated from corporate returns and are the least aggregated data available in Compustat. Except for the difference in unit of analysis between the business unit and the business segment, differences in columns (1) and (2) are primarily attributable to the years covered. All else equal, the expansion of coverage from a single year to multiple years diminishes the industry and firm effects. This modeling characteristic may partly explain why industry effects account for 7.6% of the variance in accounting profits of manufacturers from 1981 to 1994 but 18.84% of the variance in Schmalensee's analysis. Firm effects explain a higher portion of variance than industry at 37.0%, and substantially more than the 0.62% of variance captured in Schmalensee's market-share effect. Market share appears to be a poor proxy for the full range of distinctiveness in firm effects. Firm effects may have increased in importance during the 1980s as corporations redeployed assets between manufacturing industries. Thus, the years of coverage are important to differences with Schmalensee [1985].

Table D: Comparison with Schmalensee [1985]

	(1) Schmalensee (as reported)	(2)	(3)	(4)
Unit of Analysis	Bus. Unit	Bus. Seg.	Corp'n	Corp'n
Performance Measure	Acc.Prof. <sup>h</sup>	Acc.Prof. <sup>h</sup>	Acc.Prof. <sup>i</sup>	Acc.Prof. <sup>i</sup>
Sectoral Coverage	Manuf.	Manuf.	Manuf.	All Sectors
Years Covered	1975	1981-1994	1981-1994	1981-1994
No. of Observations	1,775	13,919	9,487	31,601
Data Source	FTC	Compustat	Compustat	Compustat
Total Explained Variance <sup>f</sup>	.1946 <sup>g</sup>	.459	.255	.672
Year <sup>a</sup>	N/A	.012	.021	.021
Industry <sup>b</sup>	.1884	.076	.086	.279
Market Share	.0062 <sup>c</sup>			
Focus <sup>d</sup>			.000	.001
Firm <sup>e</sup>	N/A	.370	.148	.371

<sup>a</sup> Adjusted  $R^2$  in model of year effects

<sup>b</sup> Increment to adjusted  $R^2$  due to permanent and transient industry effects

<sup>c</sup> Increment to adjusted  $R^2$  over model of industry effects as reported in Schmalensee [1985], Fig. 1

<sup>d</sup> Increment to adjusted  $R^2$  of permanent and transient corporate-focus effects

<sup>e</sup> Increment to adjusted  $R^2$  of permanent and transient firm effects

<sup>f</sup> Adjusted  $R^2$  in model with year, industry, corporate focus and firm effects, except for Schmalensee

<sup>g</sup> Adjusted  $R^2$  reported for model with industry and share effects in Schmalensee [1985], Fig. 1

<sup>h</sup> Ratio of operating income to identifiable assets for corporation k in industry i at time t

<sup>i</sup> Ratio of earnings before interest and taxes to the book value of assets for the corporation

The third column of Table D is an auxiliary analysis on the Compustat data for manufacturers from 1981 to 1994 in which the dependent variable is corporate accounting profit. The principal difference between columns (2) and (3) is in unit of analysis. The results in column (2) are based on equation (2), which takes exogenously available information on business-specific performance as the dependent variable. The results in column (3) are based on equation (1), which apportions corporate accounting profit across segments based on the distribution of assets. The analysis in column (2) is therefore based on more precise information about business-specific profit.

The results show that aggregation to the corporate level diminishes total variation in accounting profit. The aggregation is accompanied by a significant decrease in the influence of firm effects, which suggests the offsetting of the true distinctiveness of a corporation's profitability within specific businesses. Perhaps the most striking difference is that corporate focus does not account for any of the variance in column (3). This occurs because the corporate-focus effect in column (3) does not identify whether corporations tend to perform similarly across



industries. Instead, it reveals whether related diversifiers perform differently from unrelated diversifiers. Thus, the change in unit of analysis (and in specification) is important to differences with Schmalensee [1985].

The fourth column replicates the basic results from the text on accounting profits. The only difference between columns (3) and (4) is in sectoral coverage. This change is also important. Broader sectoral coverage is associated with the slightly greater importance of industry effects, perhaps because of economically significant differences in industry structure across sectors.<sup>1</sup> Firm effects explain more of accounting-profit variance in the broader variety of sectors than in manufacturing.<sup>2</sup>

## ENDNOTES

---

<sup>1</sup> McGahan and Porter [1997a] contains a components-of-variance analysis by economic sector on the business-segment accounting profits reported in the Compustat Business-Segment data for 1982-1994. The analysis shows that the ANOVA on manufacturing profit is not broadly representative.

<sup>2</sup> McGahan and Porter [1998] further decomposes firm effects into components associated with the corporate-parent and the specific business. The results indicate that the business-specific components account for about two-thirds of the total firm effects when the analysis covers all economic sectors.