Online Appendix to

"Empire-Building or Bridge-Building? Evidence from New CEOs' Internal Capital Allocation Decisions"[*]

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This appendix to "Empire-Building or Bridge-Building? Evidence from New CEOs' Internal Capital Allocation Decisions" is organized in two sections. The first section reports the results of robustness checks. The second section discusses the tests for alternative explanations.

1. Robustness Checks

This section reports the results of the robustness checks described in Section 2.2 of the paper. I change various aspects of the specification in equation (1) in the paper, including the following: the definition of specialists and generalists; the scaling of capital expenditures in the investment ratios; the time frame around turnover; and the composition of the sample.

Table A1 reports the robustness results, focusing on the regression specification used in Column V of Table 3 in the paper. Specifically, I use the industry-adjusted investment ratio as the dependent variable, and include segment *Q* and segment cash flow as control variables. Using the unadjusted ratio as the dependent variable and adding in more control variables produce similar results. The regression estimates from Column V of Table 3 are reproduced in Column I of Table A1 for reference. The key coefficient of interest is β_5, the coefficient on *Specialist*Out-group*After*, which captures the difference in the average change in capital expenditures around turnover between the out-group and the in-group.

Column II replicates the results of Column I using the full sample where specialists include both inside and outside specialist CEOs, and generalists include both inside and outside generalist CEOs based on the broader definitions of specialists and generalists discussed in the paper. The coefficients and their significance levels are virtually unchanged. In Column III, I include only the newly identified *outside* specialists and *outside* generalists. As can be expected from the small sample size of outside specialist CEOs, all estimates for specialists are very noisy. Nevertheless, it is reassuring that the key coefficient, β_5, is positive and even greater in magnitude compared with the previous estimates,[1] indicating that, on average, the out-group segments under

[1] The coefficient for β_5 in regressions using the segment investment ratio as the independent variable is of the same sign and magnitude, and is statistically significant at the 5% level.

an outside specialist also witness a more positive change in capital expenditures than the in-group segments.

In Column IV, I include only the CEOs that meet the following stricter definitions of specialists and generalists: a CEO is classified as a specialist only if fewer than half of all segments in the firm are in-group segments and as a generalist if she has always worked in a general role. Regression results in Column IV indicate that my results are robust with the cleaner and narrower set of CEO specialists and generalists.

In Column V, I scale capital expenditures in the industry-adjusted investment ratio by beginning-of-period assets, defined as end-of-period assets minus capital expenditures plus depreciation.[2] The results are not affected. Scaling by sales instead of assets (unreported) also yields similar estimates.[3]

Since capital expenditures reported by firms do not include net assets of acquired businesses, large asset additions not included in capital expenditures could bias the results. In particular, if the in-group segments have large asset additions not accounted for by capital expenditures while the out-group segments have large asset disposals, my results based on differential changes in investment ratios will be inflated. This scenario, however, is unlikely, as the asset growth rate for the in-group segments is similar to that for the out-group segments around turnover. To further alleviate this concern, I rank observations by their asset growth rate for segments in the in-group and in the out-group separately. Column VI contains the regression results after eliminating the top 10% in-group segments and the bottom 10% out-group segments ranked by asset growth rate.[4] The results show robustness to dropping observations where asset disposals and acquisitions are likely to be large and cause bias.

In Column VII, I use a longer time frame around CEO turnover. Specifically, I include in the regression segment data from two years before to two years after CEO turnover, excluding the

[2] This definition of beginning-of-period assets follows Rajan, Servaes, and Zingales (2000).
[3] Rajan, Servaes, and Zingales (2000) choose to scale capital expenditures by assets, arguing that firms engaging in strategic reporting manipulate earnings and sales numbers rather than assets.
[4] Alternatively, I remove all observations in the top 5% and bottom 5% ranked by growth rate or observations with an annual asset growth rate greater than 25% or less than –25%. The results are robust to these adjustments.

year of the turnover. Accordingly, *After* takes on the value one for the two years before turnover and zero otherwise. Lengthening the time frame around turnover in the analysis again yields very similar results.

In 1997, the Financial Accounting Standards Board issued new standards for disclosures about segment information.[5] Berger and Hann (2003) find that the new rules induce firms to provide more disaggregated segment information and report more segments. To check whether the change in segment reporting has an effect on my results, I separate the sample into two groups by turnover year. Columns VIII and IX focus on the pre-1998 and the post-1998 subsamples, respectively. The results hold for both time periods, although somewhat noisier due to the reduced sample size in each.

2. Alternative Explanations

In this section, I discuss in detail the tests for alternative explanations described in Section 2.4 of the paper.

2.1 Endogeneity

To discriminate against the type of endogeneity story in which the CEO is chosen to grow the segments in the out-group or to reduce investments in the in-group, leading to the relative increase in the capital expenditures of the out-group segments observed in the data, I try to identify weak divisions in the firm based on segment cash flow and segment *Q* and examine if there is any difference in the pattern of capital allocation changes for these divisions compared with strong divisions in the same firm. The idea is that the increase in capital expenditures should most likely flow first to the stronger segments with higher return on assets and better investment opportunities. Similarly, the weak segments in the out-group should have no priority over the more profitable segments in the in-group with better investment opportunities, unless the board

[5] Prior to 1998, the Statement of Financial Accounting Standards (SFAS) 14 defines firm segments as major lines of business representing 10% or more of the firm's combined assets, sales, or earnings. Starting from 1998, SFAS 131 requires firms to define segments as operating segments, reflecting the actual organizational structure of the company.

irrationally decides to give preference to the out-group segments over the in-group segments unconditionally.

I divide the in-group and the out-group segments based on the pre-turnover segment cash flow where a high (low) cash flow segment is defined as one with an industry-adjusted cash flow ratio above (below) the asset-weighted mean industry-adjusted cash flow ratio for the firm before CEO turnover. Segment cash flow measures have consistently been shown to be positively correlated with segment investment in the literature, as they capture the operating performance, resources, as well as investment opportunities for the segments (e.g., Scharfstein, 1998).[6]

Panel A of Table A2 reports the difference in the change in industry-adjusted segment investment ratios between these groups of segments around CEO turnover. The consistent difference-in-differences estimates across all groups in Panel A indicate that the in-group and the out-group segments receive differential capital allocation regardless of segment performance. In fact, the difference in capital expenditure remains similar even when one compares the *high* performance segments in the *in-group* with the *low* performance segments in the *out-group*. In addition, the high performance segments in the in-group undergo a relative decrease in capital expenditures just as large as the low performance ones. Splitting the sample based on segment *Q* produces comparable results (unreported). The out-group segments receive an increase in capital expenditures relative to the in-group segments independent of segment operating performance and segment investment opportunities, inconsistent with what the endogeneity story might suggest.

More generally, the endogeneity concern arises as CEO selection is not a random event, and, therefore, whether a segment is in the in-group or in the out-group might be endogenously determined, making the OLS estimator biased. One way to control for such endogenous selection is to employ propensity score matching methods, which have been used by several recent studies in corporate finance (e.g., Villalonga, 2004).

[6] Billet and Mauer (2003) argue that, given all the problems with imputed *Q* as a measure for segment investment opportunities in conglomerates, cash flow-based measures can be a more desirable proxy.

The propensity score matching difference-in-difference estimator is achieved in two stages (Dehejia and Wahba, 1999, 2002). The first stage is to estimate the probability of assignment to treatment conditional on observables, which, in this case, is to estimate a segment's propensity to be a member of the out-group.[7] The propensity scores, defined as the predicted probabilities from the first stage, are then used as a summary measure to match the treated group (the out-group segments) and the control group (the in-group segments). Using the matched sample to correct for any endogenous selection, the second stage then estimates the effect of treatment (membership in the out-group) on outcome (change in capital allocation around CEO turnover). The propensity score matching estimators assume selection on observables, and the use of the difference-in-difference estimators allows for time-invariant unobservable differences between the treated and the control groups (Dehejia and Wahba, 1999, 2002; Villalonga, 2004).

I compute the propensity score matching difference-in-difference estimator using the sample of all segments under specialists' CEOs.[8] I first run a probit regression of estimating the probability of a segment's membership in the out-group. The dependent variable *Out-group* is a dummy variable that equals one for segments in the out-group and zero otherwise. The independent variables include segment size, cash flow, investment ratio, imputed *Q*, and sales growth. Larger segments are shown to be less likely to be in the out-group, and the segment characteristics jointly have significant predictive power for membership in the out-group.[9]

I then follow Dehejia and Wahba (1999) to match the in-group and out-group segments by block (i.e., the stratification algorithm). The optimal number of blocks is identified to ensure that the mean propensity score for the in-group and out-group segments in each block is not different. The mean of each segment characteristic also does not differ significantly within the block. The region of common support includes 236 segments consisting of 103 in-group

[7] Alternatively, treatment in the first stage can be defined as membership in the in-group, and the results remain the same. I choose to use the out-group to be consistent with the earlier estimations in the paper.
[8] The tables are not reported, but are available upon request.
[9] The log likelihood chi-square statistic for the model is 13, and the corresponding *p*-value from the log likelihood test is 0.02.

segments whose propensity scores are greater than the minimum propensity score of the out-group segments plus 133 out-group segments.[10]

The last step is to compute the propensity score matching difference-in-difference estimator using the matched sample of in-group and out-group segments. The outcome variable is the change in industry-adjusted segment investment ratio around CEO turnover.[11] The effect of being in the out-group on the change in industry-adjusted segment investment ratio (the "average treatment effect of the treated") is calculated following Becker and Ichino (2002) as the weighted average of the mean difference in capital allocation change between the out-group and in-group segments within each block, with the weight of each block given by the block's share of out-group segments in the matched sample. The propensity score matching difference-in-difference estimator indicates that the average change in industry-adjusted investment ratio after a specialist CEO takes office is 0.015 higher for the out-group segments than the in-group segment, significant at the 5% level. The magnitude and significance level of the estimator are consistent with the OLS estimates in Table 3 of the paper and in Table A1.

2.2 Mean Reversion in Capital Expenditures

If the in-group segments on average have higher capital expenditures than the out-group segments before the turnover, then mean reversion might cause allocation changes in the same pattern, as observed in the data. In particular, if a higher percentage of segments in the in-group are overinvesting before turnover compared with the out-group segments, a downward investment adjustment in overinvesting segments after turnover would result in a relative decline in capital expenditures in the in-group.

This explanation can be tested by examining the pre-turnover capital expenditures in the in-group and in the out-group. The investment ratios of the in-group and the out-group segments

[10] The region of common support is [0.34, 0.92], and the final number of blocks is 5.
[11] Using change in segment investment ratio as the outcome variable produces qualitatively similar results.

are not significantly different from each other prior to the succession.[12] Pre-turnover segment capital expenditures also do not have predictive power for membership in the in-group or the out-group. Moreover, following the literature (e.g., Dittmar and Shivdasani, 2003), I define a segment to be overinvesting if its pre-turnover industry-adjusted investment ratio is positive. Of the 128 in-group segments, 79 (62%) are overinvesting relative to the industry before the turnover. The percentage is actually higher for the out-group segments, although not statistically different: 94 (69%) of the 159 out-group segments are overinvesting. These results suggest that segments in the in-group are no more likely to be overinvesting than those in the out-group before CEO turnover.

A direct examination of the overinvesting segments in both groups provides further evidence against the mean reversion explanation. Panel B of Table A2 shows that, unlike overinvesting in-group segments, overinvesting out-group segments with comparable pre-turnover investment ratios do not see a reduction in capital expenditures after the turnover. The difference in capital allocation change around turnover between the two overinvesting groups is statistically significant at the 1% level.

2.3 Diversification

To distinguish the diversification hypothesis from the bridge-building hypothesis, I divide the in-group and the out-group segments according to their size. Specifically, I examine the out-group segments with a relative size of more than 50% of their firm's assets. The diversification argument would predict that these biggest out-group segments should see a decrease or no change in capital expenditures after CEO turnover, or at least see less increase compared with the smaller out-group segments and the smaller in-group segments.

Panel C of Table A2 shows that the out-group segments that are the biggest segments in the firm still witness an increase in capital expenditures after CEO turnover, even when compared with the smaller in-group segments. Moreover, the increase in capital expenditures for the

[12] The average pre-turnover segment investment ratios for the in-group and the out-group segments are 0.063 and 0.060, respectively. The average pre-turnover industry-adjusted segment investment ratios for the in-group and the out-

biggest out-group segments is significantly larger in magnitude than the increase for the other out-group segments. These results are inconsistent with the prediction of the diversification hypothesis but instead are consistent with the bridge-building hypothesis, if one believes that managers from the bigger out-group segments are more powerful within the firm and thus might hold more bargaining power against the CEO in the capital allocation process.

group segments are 0.015 and 0.010, respectively. Both differences are not statistically different from zero.

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Table A1

Change in Segment Capital Allocation around CEO Turnover: Robustness

This table reports the robustness results using the regression specification in Column V of Table 3 in the paper. The dependent variable is industry-adjusted segment investment ratio. Industry-adjusted segment investment ratio is computed by subtracting from segment investment ratio the corresponding industry median ratio. Segment investment ratio is defined as segment capital expenditures divided by segment assets (except in Column V when I change the scaling). *After* takes the value zero in the year before turnover and one in the year after turnover. *Specialist* equals one if the new CEO of the firm is a specialist and zero if she is a generalist. *Out-group* is equal to one if the segment is an out-group segment and zero otherwise. Segment *Q* is the median Tobin's *Q* of single-segment firms that operate in the same industry of the segment. Segment cash flow is segment operating income before depreciation divided by segment assets, industry-adjusted. Column I reproduces the regression estimates from Column V of Table 3 in the paper for reference. In Column II, I include the full sample where specialists include both inside and outside specialist CEOs and generalists include both inside and outside generalist CEOs. In Column III, I include only outside specialists and outside generalists. In Column IV, I include only the CEOs that meet the following stricter definitions of specialists and generalists: a CEO is classified as a specialist only if fewer than half of all segments in the firm are in-group segments, and as a generalist only if she has always worked in a general role. In Column V, I scale capital expenditures in the industry-adjusted investment ratio by beginning-of-period assets, defined as end-of-period assets minus capital expenditures plus depreciation. In Column VI, I drop the top 10% in-group segments and the bottom 10% out-group segments ranked by asset growth rate. In Column VII, I include in the regression segment data from two years before to two years after CEO turnover, excluding the year of the turnover. In Columns VIII and IX, I split the sample into the pre-1998 and the post-1998 subsamples. The regressions include year dummy variables and firm fixed effects. Robust standard errors (clustered by firm) are in parentheses. Asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	Dependent Variable: Industry-Adjusted Segment Investment Ratio								
Independent Variables	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)
After	-0.001	-0.003	0.021	-0.014**	-0.004	-0.002	-0.001	0.026	-0.017*
	(0.005)	(0.004)	(0.018)	(0.007)	(0.006)	(0.005)	(0.005)	(0.020)	(0.010)
Specialist	0.017*	0.011	-0.040**	0.017	0.020*	0.015	0.007	0.018***	0.011
	(0.009)	(0.007)	(0.018)	(0.014)	(0.011)	(0.009)	(0.008)	(0.006)	(0.014)
Specialist * After	0.007	0.004	-0.047	0.019**	0.010	0.006	0.004	0.002	0.012
	(0.007)	(0.006)	(0.035)	(0.009)	(0.008)	(0.007)	(0.006)	(0.010)	(0.010)
Specialist * Out-group	-0.007	-0.008	-0.015	-0.008	-0.007	-0.006	-0.006	-0.009	-0.005
	(0.005)	(0.005)	(0.017)	(0.006)	(0.006)	(0.006)	(0.004)	(0.007)	(0.007)
Specialist * Out-group * After	0.013**	0.015**	0.046	0.014*	0.015**	0.013*	0.011**	0.012	0.013*
	(0.006)	(0.007)	(0.032)	(0.007)	(0.007)	(0.007)	(0.005)	(0.010)	(0.008)
Segment *Q*	-0.003	-0.004	-0.008	-0.003	-0.005	-0.002	-0.001	-1E-04	-0.002
	(0.003)	(0.003)	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.008)	(0.004)
Segment cash flow	0.042**	0.048***	0.055*	0.054**	0.063***	0.040**	0.035**	0.074***	0.020
	(0.018)	(0.017)	(0.031)	(0.021)	(0.021)	(0.019)	(0.015)	(0.025)	(0.025)
No. of observations	993	1337	344	750	991	937	1577	492	501
No. of firms	172	220	64	137	172	172	168	90	93
R^2	0.37	0.34	0.35	0.42	0.37	0.38	0.30	0.44	0.34

Table A2

Change in Segment Capital Allocation around CEO Turnover: Alternative Explanations

This table reports the difference-in-differences estimates for the industry-adjusted segment investment ratio of segments in specialists' firms. Industry-adjusted segment investment ratio is computed by subtracting from segment investment ratio the corresponding industry median ratio. Segment investment ratio is defined as segment capital expenditures divided by segment assets. Column I and II contain the average industry-adjusted segment investment ratios one year before and one year after the CEO turnover, respectively. Column III contains the change in average industry-adjusted segment investment ratio around turnover. Column IV reports the number of segments. Panel A breaks out the segments by pre-turnover industry-adjusted segment cash flow. A high (low) cash flow segment is defined as one whose industry-adjusted segment cash flow ratio is above (below) the asset-weighted mean cash flow ratio for the firm before turnover. Panel B examines only the overinvesting segments. A segment is considered overinvesting if its pre-turnover industry-adjusted investment ratio is positive. Panel C breaks out the segments by segment size. A segment is considered among the biggest if the segment's assets are equal to or more than 50% of its firm's total assets. Robust standard errors (clustered by firm) are in parentheses. Asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	Industry-Adjusted Segment Investment Ratio			
	One Year Before	One Year After	**Difference After - Before**	Number of Segments
	(I)	(II)	(III) = (II) - (I)	(IV)
Panel A: In-group vs. Out-group (by industry-adjusted segment cash flow)				
Specialist CEO				
In-group (high cash flow only)	0.020	0.017	-0.003	66
	(0.005)	(0.004)	(0.006)	
In-group (low cash flow only)	0.010	0.007	-0.003	58
	(0.005)	(0.005)	(0.005)	
Out-group (high cash flow only)	0.014	0.024	0.010**	75
	(0.004)	(0.005)	(0.005)	
Out-group (low cash flow only)	0.007	0.017	0.010**	78
	(0.005)	(0.007)	(0.005)	
Between Group Differences			**Diff-in-Diffs**	
High CF In-group - High CF Out-group	0.006	-0.007	**-0.013***	
	(0.007)	(0.006)	**(0.008)**	
Low CF In-group - Low CF Out-group	0.004	-0.010	**-0.014****	
	(0.008)	(0.009)	**(0.007)**	
High CF In-group - Low CF Out-group	0.014*	0.000	**-0.014***	
	(0.008)	(0.009)	**(0.008)**	
Low CF In-group - High CF Out-group	-0.004	-0.017**	**-0.013****	
	(0.006)	(0.007)	**(0.006)**	

Table A2 (Continued)

	Industry-Adjusted Segment Investment Ratio			
	One Year Before	One Year After	**Difference After - Before**	Number of Segments
	(I)	(II)	(III) = (II) - (I)	(IV)
Panel B: Overinvesting In-group vs. Overinvesting Out-group				
Specialist CEO				
In-group (overinvesting only)	0.036	0.019	-0.017***	79
	(0.004)	(0.005)	(0.006)	
Out-group (overinvesting only)	0.031	0.038	0.006	94
	(0.004)	(0.005)	(0.005)	
Between Group Differences			**Diff-in-Diffs**	
Overinvesting In-group - Overinvesting Out-group	0.005	-0.018**	**-0.023*****	
	(0.006)	(0.008)	**(0.007)**	
Panel C: In-group vs. Out-group (by segment size)				
Specialist CEO				
In-group (biggest)	0.011	0.006	-0.005	41
	(0.007)	(0.004)	(0.008)	
In-group (the rest)	0.017	0.015	-0.003	87
	(0.004)	(0.004)	(0.006)	
Out-group (biggest)	0.011	0.043	0.031**	14
	(0.010)	(0.016)	(0.013)	
Out-group (the rest)	0.010	0.018	0.009**	145
	(0.003)	(0.004)	(0.004)	
Between Group Differences			**Diff-in-Diffs**	
Biggest In-group - Biggest Out-group	-4.6E-05	-0.036**	**-0.036****	
	(0.001)	(0.016)	**(0.015)**	
Biggest In-group - The rest of Out-group	0.002	-0.012*	**-0.014**	
	(0.008)	(0.007)	**(0.009)**	
The rest of In-group - Biggest Out-group	0.006	-0.028*	**-0.034****	
	(0.010)	(0.015)	**(0.013)**	
The rest of In-group - The rest of Out-group	0.008	-0.004	**-0.011***	
	(0.005)	(0.007)	**(0.006)**	