

“Girl Power”: Female Participation in Top Management and Firm Performance

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Abstract

Scholars and practitioners have long argued that females exhibit a distinctive and particularly effective managerial style. Yet, less than a third of the largest U.S. corporations have a single female senior executive, raising the question of whether women are in fact effective as senior managers, and, if so, under what circumstances.

We address this issue by studying the relationship between female participation in senior management and firm performance as measured by Tobin’s Q. We find a positive association between firm performance and female participation below the CEO level, even when controlling for unobservable firm heterogeneity, but no positive effects from having a female CEO. We then show that the positive results for female participation are entirely driven by firms pursuing an “innovation intensive” strategy, where creativity and collaboration may be especially important. Our findings thus provide evidence for a “female management style” that enhances firm performance by facilitating teamwork and innovation but is rendered less effective by the leadership attributes of the CEO position.

Given these results, the fact that not all firms have women in senior positions also suggests that an ability to identify, attract, and develop female managerial talent may be a source of competitive advantage.

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I. Introduction

“What the world needs today is not more competition but woman’s native genius for sympathetic co-operation” (Meyer, 1953, pg: 397).

“Man is defined as a human being and a woman as a female - whenever she behaves as a human being she is said to imitate the male” (de Beauvoir, 1952, pg: 51).

The role of women in society has been a major political and academic issue for over a century. As women have continued to make inroads into domains traditionally dominated by men, attention has focused on the relatively small number of women in senior management positions in large corporations. While females account for over a third of managers overall (Bureau of Labor Statistics, 2007), as of 2006, under a third of the top 1,500 U.S. firms reported even a single woman among their top executives, less than 6% reported more than one, and less than 3% had a female chief executive officer (“CEO”). See Table 1.

Even if one leaves aside issues of fairness and equality, the large gender disparity at senior levels of management raises the issue of whether modern U.S. corporations are efficiently identifying and developing managerial talent, which many scholars have identified as an important source of competitive advantage (e.g., Hambrick and Mason, 1984; Barney, 1991; Castanias and Helfat, 1991, 2001; Lado and Wilson, 1994; Finkelstein and Hambrick, 1996). In addition, there is a literature that argues that females are not merely “just as good as men” in an executive capacity. In brief, authors assert that women tend to manage in a less hierarchical and more interactive style than their male counterparts, leading to more teamwork, intrinsic motivation, and ultimately creativity

(Bass, 1985; Helgesen, 1990; Rosener, 1995; Book, 2000).¹ Women also bring a different set of life experiences. The presence of women in a firm's senior management should accordingly increase the management team's range of perspectives, cognitive resources, and problem-solving ability, resulting in better outcomes for the firm (Hambrick, Cho, and Chen, 1996; Eisenhardt, Kahwajy, and Bourgeois, 1997). Both lines of argument suggest that having greater – or at least more equal – female representation in senior management would benefit a firm.

And yet, female participation in senior management may have a downside as well. Females may tend to be less effective in, or simply dislike, competitive environments like those likely to be found in the executive suite of many firms (Gneezy, Nierdle, and Rustichini, 2003; Niederle and Vesterlund, 2007). Also, diversity may lead to diversity of opinion and thus to disagreement and internal conflict, slowing down the decision-making process and potentially hampering performance (Hambrick and Mason, 1984; Hambrick and D'Aveni, 1992; Hambrick et al., 1996). This is especially likely if male managers resist working with women as colleagues (Oakley, 2000). Diversity might also reflect a response to political and social pressure to the detriment of firm operating efficiency. With groups like Catalyst advocating for U.S. firms to hire more women at senior levels and with increasing pressure on companies to behave in a socially

¹ According to one management consultant, women rank higher than men on 28 of 31 measures used in performance evaluations (Sharpe, 2000). A meta-analysis in social psychology also concludes that the leadership attributes where women exceed men relate positively to leaders' effectiveness, whereas those attributes where men exceed women have no or a negative relationship with effectiveness (Eagly, Johannesen-Schmidt, and van Engen, 2003).

responsible manner,² some hiring of females to top management positions may be “tokenism” motivated by political or public relations considerations.

Furthermore, in a fully competitive and efficient labor market, the “right person” should always be in the “right job,” suggesting that female participation in top management would have no observable effect, whatever differences may exist between men and women in the overall population. In particular, any “glass-ceiling” may be in part a result of gender-based differences in preferences and human capital investments that lead to occupational self-selection and discrimination, whereby women are treated differently from men but in ways that do not lead to inefficiency (Altonji and Blank, 1999; Goldin and Rouse, 2000).

Finally, the literature on top management teams and manager effects is vast, dating at least since the famous monograph by Barnard (1938), and economists have also taken a recent interest in the topic (e.g., Bertrand and Schoar, 2003; Bebchuk, Cremers, and Peyer, 2007; Pérez-González, 2006). Yet, academic work focusing on the relationship between female participation in senior management and firm performance is relatively sparse and has led to somewhat contradictory results. Some authors find a positive relationship between female participation at various levels of management and measures of performance, such as post-IPO stock price performance (Welbourne, 1999), various measures of return on investment (Shrader, Blackburn, and Iles, 1997; Krishnan and Park, 2005), and gross margin (Smith, Smith, and Verner, 2006). But these results often disappear in different specifications (Krishnan and Park, 2005; Smith, Smith, and

² Reportedly, corporate social responsibility has become so important that most large multinational corporations now have a senior executive specifically charged with responsibility for the corporation’s activity in that domain (The Economist, 2005).

Verner, 2006) or when different levels of management are considered (Shrader, Blackburn, and Iles, 1997). Other authors obtain different results in similar empirical contexts. For example, using data on S&P 1,500 firms from 1992 to 2004, Wolfers (2006) finds no differences in long-term stock returns between female- and male- headed companies; and using survey data from 535 banks and a broad definition of top management, Dwyer, Richard and Chadwick (2003) and Richard, Barnett, Dwyer, and Chadwick (2004) find that female participation in management by itself does not have a statistically significant effect on productivity or performance, although gender interacted with measures of entrepreneurial and risk-taking behavior do. Thus, the relationship between female participation in top management and firm performance remains very much an open question.³

Even if female managers add value by fostering teamwork and creativity – or for some other reason – it does not necessarily follow that the “female management style” would be conducive to success at the CEO level, given that position’s symbolic and real role as “top dog.” Women may be – or may be considered – insufficiently aggressive and dominant to adopt the “preferred leadership style,” which is typically associated with male leaders (Oakley, 2000). CEOs are overwhelmingly male, and evidence from psychology suggests that, *ceteris paribus*, men tend to be more favorably evaluated in roles occupied mainly by men (Eagly, Makhijani, and Klonsky, 1992) and that women

³ There is a related practitioner-oriented literature. See Adler (2001), who uses survey data and a scoring system to rank Fortune 500 firms based on their “record for promoting women to the executive suite” and finds that the firms that score highest tend to be more profitable. See also the Catalyst (2004) report, which uses a sample of 353 Fortune 500 companies over 1996-2000, and finds that the companies ranked in the top quartile based on the gender diversity of their top management teams outperform companies in the bottom quartile in terms of equity returns to shareholders. In addition, there is an emerging literature on the association between gender diversity in the boardroom and the quality of corporate governance and firm performance. See, for example, Carter, Simkins, and Simpson (2003) and Adams and Ferreira (2007), as well as the report by Catalyst (2007).

have less scope to deviate from “masculine” behavior when occupying such roles (Eagly and Johnson, 1990). There is also evidence that the stock market reacts unfavorably to the hiring of a female CEO (Lee and James, 2007). Thus, what holds for female participation in top management below the CEO level may not hold for female CEOs.

In this paper, we investigate these issues using a panel sample of large U.S. public companies. A virtue of the large sample is its empirical relevance. At the same time, it is understood that we do not have the same power to distinguish among competing hypotheses that we might have in a controlled laboratory setting, where direct manipulation and observation of subjects is feasible.

Our strategy is to start with a basic test of the association between female participation in senior management and firm performance. Specifically, we use data on the top 1,500 U.S. firms from 1992 to 2006, to study the relationship between (a) firm performance as measured by Tobin’s Q ,⁴ and (b) female participation in senior management below the CEO level and in the CEO position. We find that there is a strong positive association between firm performance and having a senior female executive below the CEO level. We dub this phenomenon the “female participation effect.” In contrast, having a female CEO is not systematically related to firm performance, suggesting that there may be something special about the CEO position that interferes with the effectiveness of female managers.⁵

⁴ Tobin’s Q , or the ratio of the market value of a firm’s assets to their replacement value, is widely used as a holistic measure of firm performance (e.g., Wernerfelt and Montgomery, 1988; Lang and Stulz, 1994; Berger and Ofek, 1995; King and Lennox, 2001; Durnev, Morck, and Yeung, 2004).

⁵ We also consider other measures of firm performance and find that the female participation effect generally continues to obtain, while having a female CEO actually has a negative relationship using some measures.

We then conduct a follow-on analysis to investigate the origins of the female participation effect. First, we ask whether the effect is a result of firm heterogeneity, but the effect persists even in the presence of time-invariant firm effects. We then examine reciprocal causality, finding that the female participation effect persists in the presence of lagged values of performance, and, conversely, that the probability of having a female senior manager is positively associated with performance even when controlling for the presence of a female senior manager in the prior year. These results together have two implications: (a) female managers improve the performance of their firms, as suggested by the advocates of the female management style; and (b) better performing firms are also better at identifying, attracting, and developing female managers, whether through a distinctive, inimitable culture (Barney, 1986a), formal, yet causally ambiguous, human resources policies (Lado and Wilson, 1994), or for other reasons, such as a good overall reputation (Weigelt and Camerer, 1988; Dierickx and Cool, 1989). Thus, female friendliness would seem to be – or to be linked to – a valuable resource that gives rise to superior financial performance (Penrose, 1959; Wernerfelt, 1984; Barney, 1991).

Lastly, to address whether a female management style is truly driving the female participation effect, we turn to the literature on fostering innovation. As we will discuss in more detail later, with due regard to contextual nuances, there is broad agreement in the social psychology and organizational behavior literature that participatory, collaborative management practices tend to foster – while dictatorial, controlling management practices tend to stifle – employee creativity and innovation (e.g., Kanter, 1983; Deci and Ryan, 1987; Oldham and Cummings, 1996). It follows that if the female participation effect is a result of a greater tendency of female managers to foster

collaboration and creativity, the effect should be strongest in firms that have adopted an “innovation intensive” strategy, where the female management style would be more relevant to the activities of the top management team (Ginsberg, 1994). If, by contrast, the female participation effect simply reflects the better identification, attraction, and development of managerial talent, innovation intensity should not matter. Using a firm’s disclosure of R&D expenditures as a proxy for having an innovation intensive strategy, we find that it is *only* firms pursuing such a strategy that benefit from the female participation effect. This result not only provides evidence for a female management style but also suggests that female participation in senior management is an organizational attribute the value of which is contingent on a firm’s strategic goals, as suggested by management theory (Chandler, 1962; Barney and Zajac, 1994). In other words, female participation and an innovation intensive strategy may be a good fit between managerial characteristics and firm strategy (Lado and Wilson, 1994) and thus represent an ideal “strategy configuration” (Miller, 1986).

To our knowledge, this paper is the first large-sample empirical study on female participation in senior management to provide evidence on the direction of causality or to make a link with the female management style as described in the literature. The remainder of the paper is organized as follows. Section II describes the data and variables, Section III presents the empirical analysis, and Section IV concludes.

II. Data and Variables

We use S&P’s ExecuComp database for 1992-2006 to study the relationship between female participation in top management and firm performance. ExecuComp

reports information on the top management of firms in the S&P 1,500, including age, title, and compensation.⁶

We construct two measures of female participation, one for female participation below the CEO level and one for the CEO position, to reflect that position's unique leadership attributes. Moreover, as shown in Table 2, having a female senior executive below the CEO level is only modestly associated with having a female CEO.⁷ Although, in principle, women could account for any percentage of the senior executives in a given firm, Table 1 shows (a) that the fraction of firms with even a single female senior executive below the CEO never reaches a third in any year and is usually substantially lower and (b) that the number of firms with more than one female senior executive below the CEO never even reaches 8%. We accordingly operationalize female participation in senior management using two dummy variables: (i) FEMSUBCEO, which takes the value 1 (0) if any (none) of the executives reported in ExecuComp for a given firm in a given year is female, *excluding* executives identified as the CEO⁸; and (ii) FEMCEO, which takes the value 1 (0) if, for a given firm in a given year, the executive identified as the CEO is female (male). Since a firm would usually have many layers of management below the one reported in ExecuComp, one could also interpret FEMSUBCEO as a proxy for the degree to which women have penetrated the upper echelons of a firm's management, not just the senior management team itself.

⁶ We take the executives reported by ExecuComp to be a firm's senior management team. For most firms, the senior management team is between five and nine executives, although ExecuComp reports information for as few as one and as many as 15 executives for some firms. In 1992 and 1993, ExecuComp covers a smaller set of firms, which more or less corresponds to the S&P 500 at that time.

⁷ The correlation is only 0.09 and is not statistically significant.

⁸ ExecuComp contains a field called "ceoann," which contains the text "CEO" if the executive is the chief executive officer.

In Table 3, we use the 48 Fama-French industries (Fama and French, 1997) to tabulate the percentage of firm-year observations where the firm has at least one female executive below the CEO level or a female CEO. The level of female participation in top management varies considerably by industry. Generally speaking, consumer-oriented industries (e.g., Apparel and Printing & Publishing), the financial services sector (Banking and Insurance), and the “new economy” (Pharmaceutical Products and Telecommunications) have the highest rates of female participation. “Traditional” industries like Agriculture, Petroleum & Natural Gas, and Shipping Containers have the lowest.

Female participation levels also increase over the sample period. As shown in Table 1, only 0.2% of firms had a female CEO in 1992, but 2.5% did in 2006. Similarly, only 6.0% of firms had at least one female senior executive below the CEO level in 1992. This figure rises steadily to a peak of 31.1% in 2001 but subsequently levels off.⁹

We use CompuStat as a source of financial information about the firms in our sample and CRSP as a source of stock trading information. We relate female participation in senior management to Tobin’s Q, a standard measure of firm performance, defined as the ratio of the market value of a firm’s assets to their replacement value.¹⁰ We also consider other common indicators of firm performance in a follow-on analysis: (i) Return on Assets, or operating income divided by book assets from the prior year, (ii) Return on

⁹ The figures for 1992 and 1993 may be misleadingly small, since ExecuComp does not cover the entire S&P 1,500 in those years, instead focusing on the larger firms.

¹⁰ Tobin’s Q is calculated as follows from CompuStat data: $(\text{data6} + \text{data28} * \text{data199} - \text{data60} - \text{data74}) / \text{data6}$.

Equity, or net income before extraordinary items divided by book equity from the prior year, and (iii) year-on-year sales growth in percent.¹¹

We use control variables commonly found in recent papers on manager effects: (i) LNASSETS, a proxy for firm size defined as the natural log of book assets from the prior year, (ii) FIRMAGE, or the firm age in years with firm “birth” determined by the earlier of the firm’s first year in CompuStat or CRSP, (iii) BOOKLEV, or the ratio of debt to assets, (iv) RDINT, or the intensity of R&D activities defined as the ratio of R&D expense to assets, and (v) NUMEXEC, or the number of executives reported in ExecuComp, as larger senior management teams may be more likely to have a female executive simply by dint of their size and may also have different social dynamics. Many firms do not report R&D expense as a separate item. For those firms, RDINT is set to zero, as firms with “material” R&D expense are required to disclose it. In the spirit of Pérez-González (2006), we make use of this materiality condition by classifying firms that report R&D expense as pursuing an “innovation intensive” strategy. We return to this issue in detail below.

Table 4 provides descriptive statistics for the variables used in the study. The low means of FEMSUBCEO and FEMCEO reflect the large number of firms without any female participation in senior management. The majority of firms are less than 30 years old, although a small number are significantly older. Tobin’s Q (like Return on Assets, Return on Equity, and Sales Growth) is a ratio. The result is that Tobin’s Q has outlying observations with values many standard deviations from the mean. In the regression

¹¹ These firm performance variables are calculated as follows from CompuStat data. Return on Assets: data13/data6(prior period); Return on Equity: data18/data60(prior period); and Sales Growth: data12/data12(prior period)-1.

analysis, we accordingly follow other work on managerial effects and exclude observations where the value of the dependent variable is more than three standard deviations greater or less than the mean (e.g., Huson, Malatesta and Parrino, 2004).

We use a number of different empirical specifications and detail them as we present the results.

III. Empirical Analysis

Base Case Analysis

Table 5, Column (1) reports a regression of Tobin's Q on FEMSUBCEO, the control variables, year fixed effects, and industry fixed effects for a firm's 4-digit primary SIC code. Female participation is strongly associated with higher Tobin's Q. Roughly speaking, firms with at least one female in senior management have, *ceteris paribus*, a Tobin's Q about 3% higher than other firms.¹² This female participation effect is consistent with arguments in the social-psychology and organizational behavior literature that female participation in senior management is beneficial for firm performance. The control variables are highly significant, although much of their explanatory power is absorbed by the industry fixed effects, as one would expect. Intriguingly, the coefficient on NUMEXEC is negative and highly significant. More diversified firms may tend to have larger senior management teams as each separate business line would normally have its own chief executive within the larger corporation. It is well known that diversified firms tend to have lower Tobin's Q (Wernerfelt and Montgomery, 1988; Lang and Stulz, 1994; Berger and Ofek, 1995).

¹² The coefficient on FEMSUBCEO is 0.0625 versus a mean Tobin's Q of 2.085.

Column (2) adds FEMCEO, which is not close to significant and does not meaningfully affect the coefficients on the other variables. One explanation for the lack of significance is simply that the number of female CEOs in the data is too low to make an accurate estimation of the effects of gender in the CEO position. However, we will have reason to doubt this benign explanation when we consider other firm performance measures below.

Firm Heterogeneity

One possible explanation for the female participation effect is that the firms with female senior managers are a priori heterogeneous in some way not captured by industry controls. If so, one would expect the positive association to disappear in the presence of firm effects. As industries are composed of firms, Table 6 accordingly repeats the analysis in Table 5, Column (1) but replaces (higher-level) industry fixed effects with (lower-level) random and fixed effects for each firm.¹³ The results are very similar. The coefficient on FEMSUBCEO is positive, is of similar magnitude, and is statistically significant. The significance of the coefficient on FEMSUBCEO drops to the 5% level (p-value of 0.028) in the fixed effects regression, but this is unsurprising given the implicit addition of over 2,000 variables vis-à-vis the regression with industry controls. Interestingly, the coefficient on FIRMAGE is insignificant in the random effects regression and significant and positive in the fixed effects regression. FIRMAGE increases by one every year. Once firm heterogeneity is controlled for, then, FIRMAGE may reflect a trend in the data not captured by the year fixed effects.

¹³ The number of observations increases by 20 vis-à-vis Table 5, because a small number of firms included in Table 6 are missing data on their primary SIC code and are therefore excluded from the regressions in Table 5.

Reciprocal Influence of Firm Performance & Female Participation

Table 1 shows an upward trend in female participation in senior management, albeit with some leveling off near the end. A natural question is whether women are making their firms better or whether better firms have been pioneers in promoting women to senior positions. The voluminous literature advocating that U.S. firms hire more female managers would suggest two hypotheses: (a) women do indeed make their firms better, and (b) there are obstacles to the implementation of fully gender-neutral human resources practices, such that only better-performing firms are able to make full use of their female human capital. If these hypotheses obtain, the causation should run in both directions and be reflected longitudinally in the data.

To test these ideas, we run two regressions in Table 7. The first repeats the analysis of Table 5, Column (1) but adds the lagged value of Tobin's Q, and the second is a logistic regression of FEMSUBCEO on its lagged value, the other control variables, and the current value of Tobin's Q. In the first column in Table 7, we see that including the lagged value of Tobin's Q modestly reduces the size of the coefficient on FEMSUBCEO and has a somewhat larger effect on some of the controls, but the results are qualitatively similar; indeed, every variable has the same sign and is statistically significant at the 1% or 5% level.

In the logistic regression, the coefficient on Tobin's Q is significant and positive at the 5% level, even with the inclusion of the lagged value of FEMSUBCEO. Most of the controls in the logistic regression are not significant in the presence of industry fixed effects, although the results do show that older firms are less likely to have a female senior manager, and firms with larger senior management teams are more likely to have

one; the latter result probably reflects the statistical fact that any event is more likely to occur the greater the number of draws.

Together, the results of these two regressions are consistent with reciprocal causation over time.

Interpreting the Results

So far, we have found that female participation in top management is strongly associated with firm performance, even after controlling for observable and unobservable, time-invariant firm characteristics and prior levels of firm performance. What remains to explain is the underlying mechanism behind this association.

One explanation is that because of various forms of discrimination, women need to be “that much better” relative to men in order to make it to top executive positions (Eagly and Johannessen-Schmidt, 2007). Consequently, our results could be reflective of skill and talent differentials rather than a management style. However, if so, we would expect to find a particularly strong positive association between having a female CEO and firm performance. In fact, we find that the positive association disappears at the CEO level.

Alternatively, many studies in psychology and finance document that men exhibit a larger degree of overconfidence than women, particularly with regard to so-called “masculine” tasks, which are usually said to include those involving financial matters.¹⁴ Moreover, empirical evidence shows that behavior associated with overconfidence hurts performance (Hayward and Hambrick, 1997; Barber and Odean, 2001; Malmendier and

¹⁴ See Barber and Odean (2001) and the references cited therein.

Tate, 2005, forthcoming). Consequently, the presence of female senior managers might have a positive impact on firm performance simply by reducing the degree of overconfidence of the top management team. Again, however, we would expect the gender effect to be strongest for the CEO position, and we find precisely the opposite.

Higher firm performance could also reflect the lower wages women are said to receive compared to their male counterparts (Becker, 1971). We consider it unlikely, however, that any savings in wages so derived would be enough to have a meaningful influence on firm performance as measured by Tobin's Q. Moreover, Bertrand and Hallock (2001) provide evidence that there may be little or no gender-based disparity in the wages of the senior managers of U.S. firms once other factors such as firm size and managerial position are accounted for.

Finally, CEOs with positive, private information about their firms' prospects might, for some unspecified reason, be more likely to hire senior female executives. This, and all of the other foregoing explanations are general in that they apply to all firms. In contrast, if, as argued in the practitioner-oriented and social psychology literatures, female participation in senior management leads to better firm performance because of a female management style that encourages collaboration and fosters creativity, then the female participation effect should be particularly significant when collaboration and creativity are especially important and thus more relevant to the activities of the top management team (Ginsberg, 1994). We now test this idea.

Generally speaking, innovation success is said to be a product of "bargaining and negotiation" to "accumulate information," not "domination of others" and to rely, *inter alia*, on "coalition building" (Kanter, 1983, 1988). "Supportive" management behavior

bolsters feelings of self-determination and personal initiative and thereby increases intrinsic motivation. In contrast, controlling supervisory behavior undermines intrinsic motivation. Intrinsic motivation is in turn a key determinant of employee creativity (Oldham and Cummings, 1996).

There is a wealth of empirical evidence supporting these claims. In an R&D context, for instance, both Andrews and Farris (1967) and Amabile (1988) find that “freedom” for employees is positively associated with innovation. Oldham and Cummings (1996) obtain similar results among technical teams in manufacturing facilities. Scott and Bruce (1994) show that the degree to which interactions between a supervisor and subordinate are characterized by “trust, mutual liking, and respect” is positively related to the subordinate’s innovative behavior.

With regard to the underlying social and psychological mechanisms, Deci and Ryan (1987) review the literature on employee autonomy, concluding that autonomy support leads to, *inter alia*, more intrinsic motivation, more creativity, and better conceptual learning. It has been demonstrated experimentally that “informational verbal rewards” increase intrinsic motivation while “controlling verbal rewards” do not (Pittman, Davey, Alafat, Wetherhill, and Kramer, 1980; Ryan, Mims, and Koestner, 1983). Participatory leadership styles have also been linked to more sharing of information in group discussions (Larson, Foster-Fishman, and Franz, 1998).

Thus, we hypothesize that the positive relationship between firm performance and female participation applies specifically when a firm is pursuing an “innovation intensive” strategy and would accordingly benefit most from the female management style; in other circumstances, the female management style might be irrelevant for the

performance measures we consider, and female participation might even be detrimental. To test this idea, we follow Pérez-González (2006) in classifying firms into two groups, depending on whether the firm separately reports R&D expense on its income statement. We consider firms that report R&D expense to be pursuing an “innovation intensive” strategy. The idea is that, as per U.S. Generally Accepted Accounting Principles, a firm must disclose its R&D expense whenever it is “material,” with such materiality not a purely mechanical function of accounting ratios (the relevance of which would vary from firm to firm) but with regard to the firm’s overall business situation as determined by a third-party, the firm’s auditor. 48.2% of the firms in our sample report R&D expense.

We use this classification to conduct a Chow test as follows (Greene, 2003: pg. 130). We partition FEMSUBCEO into two variables, FEMSUBCEO/RD, which assumes the value of FEMSUBCEO if the firm reports R&D expense and is otherwise zero, and FEMSUBCEO/NoRD, which is the corresponding variable for firms that do not report R&D expense. FEMSUBCEO/RD applies to the innovation intensive subsample of the data, and FEMSUBCEO/NoRD applies to the remainder. If the female participation effect is being driven by a female management style as described in the literature, the coefficient on FEMSUBCEO/RD should be positive and significant while the coefficient on FEMSUBCEO/NoRD should be statistically indistinguishable from zero. Note that we are not testing whether innovation intensity “moderates” the female participation effect; rather, we are testing whether the female participation effect only applies to firms pursuing an innovation intensive strategy.

We then rerun the regression from Table 5, Column (2) in Table 8, Column (1), finding that (a) the coefficient on FEMSUBCEO/RD is positive, significant, and more

than double the size of the coefficient on the unpartitioned variable in Table 5, (b) the coefficient on FEMSUBCEO/NoRD is insignificant, and (c) the two coefficients on the partitioned variable are statistically different from each other at the 1% level. Thus, the female participation effect is entirely driven by the subset of firms pursuing an innovation intensive strategy. Otherwise, the coefficients on the control variables are immaterially different from those in Table 5. The result suggests that the positive association between female participation in senior management and firm performance is likely to be a consequence of the different managerial attributes of female senior executives.

Other Performance Measures

We have used Tobin's Q as a holistic measure of firm performance, but, as such, Tobin's Q does not provide guidance on how exactly firms with female participation in senior management are financially outperforming others. Does female participation lead to faster growth? Better returns?

To address these questions, we repeat the analysis of Table 8, Column (1) in Columns (2)-(4) using Return on Assets, Return on Equity, and Sales Growth as the dependent variables. The coefficient on the /RD version of FEMSUBCEO is positive and significant at the 1% and 5% level for, respectively, Return on Assets and Return on Equity. The coefficient on the /NoRD version of FEMSUBCEO is negative and significant at the 5% level for Return on Assets and at the 10% level for Sales Growth. These results are broadly consistent with our primary regressions on Tobin's Q, suggesting that the positive effects of female participation primarily accrue to firms pursuing an innovation intensive strategy, where the benefits of fostering collaboration and creativity are particularly important. The results also suggest that, on some

dimensions, firms not pursuing an innovation intensive strategy do worse with higher levels of female participation, perhaps for the reasons mentioned before.

Moreover, the coefficient on FEMCEO is large, negative and significant at the 10% level and 5% level for, respectively, Return on Equity and Sales Growth. There are a number of possible explanations. If the virtue of the female management style lies in fostering collaboration among peers, the benefits may be lost in the position of CEO, which, one could argue, has no peer. Gender typecasting and male resistance to working for female superiors might also “cancel” the benefits of the female management style that are nonetheless present. Regardless, the results suggest that the absence of a positive coefficient on FEMCEO in the Tobin’s Q regressions may not be merely a result of low statistical power but instead reflect something unique about the CEO position.¹⁵

IV. Conclusion

This paper documents that female participation in senior management below the CEO level has a strong positive association with firm performance but that having a female CEO has a neutral or negative effect.

In addition, the paper demonstrates that the positive effects of female participation are entirely driven by innovation intensive firms. Given the strong link between collaborative management practices and intrinsic motivation on one hand, and firm innovation on the other, our results are consistent with the proposition that female

¹⁵ These results may also be indicative of conservatism, i.e., that female CEOs prefer a low-return, low risk strategy. A large literature in psychology and sociology documents the widely-held belief that women are more risk-averse than men. [See Byrnes, Miller, and Schafer (1999) and Croson and Gneezy (2004) for detailed reviews.] More specific to our study, the literature that focuses on attitudes towards financial risk also finds that women are more risk-averse than men. For instance, by studying investment behavior, Jianakoplos and Bernasek (1998) find that women tend to hold a smaller percentage of their wealth in risky assets.

managers add value by fostering teamwork and creativity but that females may be unable or unwilling to achieve similar results as CEOs or that such positive results are unobservable in the data because of countervailing factors.

Our results thus have implications for the “case for gender diversity” and the empirical question of whether the U.S. labor market for managerial talent is fully efficient. We also believe that the results give rise to interesting questions. Why, for example, are more firms not able to take advantage of the female participation effect? There is no formal obstacle to the hiring and promotion of women. In an extreme case, a firm could simply impose an internal quota. However, not every senior executive or board member may have the same expectations or be aware of the potential value of female participation – some may even believe that women are unsuited to leadership roles – making an appreciation of female participation the kind of unique knowledge that can lead to sustained superior performance (Barney, 1986b; Makadok and Barney, 2001).

In addition, despite the best of intentions by all concerned, there may be a number of obstacles to the identification, attraction, and development of female managerial talent. These could take the form of an aversion among females to competitive environments (Niederle and Vesterlund, 2007), resistance among men to working with women (Oakley, 2000), conflicts between the “masculine” behaviors associated with leadership and the “feminine” behaviors expected of women socially (Eagly et al., 1992; Eagly and Johannessen-Schmidt, 2007), and a failure of a firm’s formal human resources policies to accommodate females’ personal commitments (Bloom, Kretschmer and van Reenen, forthcoming).

It would be interesting to tease apart precisely which of these many factors separate the “female-friendly” firms from the rest. If the differences largely lie in formal policies, imitation should be easy across time. Yet, as shown in Table 1, female participation in senior management has leveled off in recent years, suggesting that differences in female friendliness may lie in socially-complex and inimitable firm attributes like culture (Barney, 1986a) and routines (Nelson and Winter, 1982). If so, a competence at identifying, attracting, and developing female managerial talent could be a valuable resource that gives rise to a sustained competitive advantage.

In a related vein, research suggests that new practices are initially adopted by firms seeking to benefit from the practices’ overt purpose but that later adopters are more interested in gaining social legitimacy (Zucker, 1983). It would therefore be interesting to examine whether the female participation effect will persist even if, at some future time, there is greater gender equality in the upper echelons of U.S. corporations. It would also be interesting to see whether, at that future date, men have acquired proficiency at the behaviors associated with the female management style. These and other questions must await future research.

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Table 1
Distribution of Female Executives by Year

The second (third) column reports, for each year in the sample, the percentage of firms with at least one (two) female executive(s) listed in EXECUCOMP, excluding CEOs. The fourth column reports the percentage of firms with a female CEO.

Year	% with <u>One</u> or More Female Senior Executives below CEO	% with <u>Two</u> or More Female Senior Executives below CEO	% with Female CEO
1992	6.0%	0.0%	0.2%
1993	9.1%	0.9%	0.3%
1994	13.6%	1.8%	0.5%
1995	15.8%	2.4%	0.6%
1996	17.8%	2.9%	0.7%
1997	21.3%	3.5%	0.7%
1998	23.3%	3.9%	1.0%
1999	25.8%	5.0%	1.2%
2000	28.7%	5.3%	1.5%
2001	31.1%	5.9%	1.7%
2002	31.0%	7.3%	1.9%
2003	31.0%	7.7%	2.0%
2004	30.9%	6.7%	1.8%
2005	28.5%	5.4%	2.3%
2006	29.2%	5.7%	2.5%

Table 2
Relationship between Female Participation in Top Management and Having a Female CEO

The percentage figures are calculated with respect to the total number of firm-years listed in EXECUCOMP for which data are available.

Has <u>One</u> or More Female Senior Executives below CEO	Has Female CEO?	
	No	Yes
No	75.3%	0.6%
Yes	23.4%	0.8%

Table 3
Distribution of Female Executives by Industry

The second column reports, for each Fama-French industry, the percentage of firms with at least one female executive listed in EXECUCOMP, excluding CEOs. The third column repeats the exercise for CEOs alone. Each year a firm appears in the database is treated as a separate observation.

Fama French Industry	% with <u>One</u> or More Female Senior Executives below CEO	% with Female CEO
Apparel	38.9%	5.9%
Printing & Publishing	36.8%	2.6%
Personal Services	36.0%	5.1%
Consumer Goods	35.9%	6.7%
Banking	34.1%	1.3%
Restaurants, Hotel, Motel	34.1%	0.4%
Wholesale	33.7%	2.6%
Pharmaceutical Products	32.1%	2.7%
Fabricated Products	31.8%	3.0%
Business Services	31.4%	3.2%
Telecommunications	29.1%	1.0%
Recreational Products	28.7%	3.1%
Trading	28.5%	0.9%
Utilities	27.4%	0.8%
Miscellaneous	27.2%	4.9%
Healthcare	27.0%	1.1%
Tobacco Products	26.8%	4.9%
Insurance	26.5%	0.1%
Medical Equipment	26.4%	1.0%
Computers	23.6%	1.6%
Candy & Soda	22.2%	0.0%
Food Products	21.1%	0.4%
Measuring & Control Equipment	19.3%	0.0%
Alcoholic Beverages	19.1%	0.0%
Defense	18.8%	0.0%
Chemicals	17.7%	0.0%
Business Supplies	17.7%	0.0%
Nonmetallic Mining	17.5%	0.0%
Entertainment	17.5%	0.0%
Construction	16.6%	0.0%
Transportation	16.1%	0.0%
Construction Materials	15.4%	0.0%
Electrical Equipment	14.3%	0.0%
Aircraft	14.2%	0.0%
Textiles	14.0%	1.7%
Electronic Equipment	13.7%	0.3%
Petroleum & Natural Gas	12.6%	0.0%
Machinery	12.6%	0.6%
Shipping Containers	12.1%	0.0%
Precious Metals	11.8%	0.0%
Steel Works, etc.	11.6%	0.0%
Rubber & Plastic Products	10.3%	0.0%
Automobiles & Trucks	7.4%	2.2%
Coal	4.5%	0.0%
Agriculture	0.0%	0.0%
Real Estate	0.0%	0.0%
Shipbuilding, Railroad Equipment	0.0%	0.0%

Table 4
Descriptive Statistics

FEMSUBCEO is a dummy variable taking the value 1 if a given firm in a given year has a female executive below the CEO level reported in EXECUCOMP. FEMCEO is a dummy variable taking the value 1 if a given firm in a given year has a female CEO. LNASSETS is the natural log of a firm's book assets. FIRMAGE is the age of the firm, with firm "birth" determined by the firm's first appearance in COMPUSTAT or CRSP. BOOKLEV is book leverage. RDINT is the ratio of the firm's R&D expense to assets, with a value of zero imputed if R&D expense is not reported. NUMEXEC is the total number of executives reported in EXECUCOMP for a given firm in a given year. Tobin's Q is the ratio of market value to book value. Return on Assets is the ratio of operating income before depreciation to prior year assets. Return on Equity is the ratio of income before extraordinary items to prior year book equity. Sales Growth is the year-on-year percentage change in sales.

	Observations	Mean	Standard Deviation
FEMSUBCEO	23,047	0.241	0.428
FEMCEO	23,047	0.013	0.115
LNASSETS	23,015	7.321	1.800
FIRMAGE	23,047	26.114	19.394
BOOKLEV	22,928	0.236	0.242
RDINT	23,047	0.034	0.086
NUMEXEC	23,047	6.123	1.379
Tobin's Q	19,814	2.085	2.465
Return on Assets	22,627	0.147	0.221
Return on Equity	22,990	0.177	6.499
Sales Growth	22,957	0.170	0.737

Table 5
Firm Performance and Female Participation in Top Management

Regressions of Tobin's Q (the ratio of market value to book value) on measures of female participation in top management. FEMSUBCEO is a dummy variable taking the value 1 if a firm has a female executive below the CEO level listed in EXECUCOMP. FEMCEO is a dummy variable taking the value 1 if a firm has a female CEO. FIRMAGE is the age of the firm. BOOKLEV is book leverage. RDINT is the ratio of the firm's R&D expense to assets, with a value of zero imputed if R&D expense is not reported. NUMEXEC is the total number of executives listed in EXECUCOMP. Regressions include fixed effects for the year and industry at the 4-digit SIC code level. Observations where the value of Tobin's Q is more than 3 standard deviations away from the mean are excluded. All standard errors are robust to heteroskedasticity and arbitrary within-firm serial correlation. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.

	(1)		(2)	
FEMSUBCEO	0.0625	***	0.0625	***
FEMCEO			-0.0004	
LNASSETS	-0.0269	***	-0.0269	***
FIRMAGE	-0.0023	***	-0.0023	***
BOOKLEV	-0.8794	***	-0.8795	***
RDINT	3.2998	***	3.2998	***
NUMEXEC	-0.0225	***	-0.0225	***
Observations	19,509		19,509	
R ²	0.36		0.36	

Table 6
Firm Heterogeneity

Regressions of Tobin's Q (the ratio of market value to book value) on female participation in top management below the CEO level, with random and fixed effects at the firm level. FEMSUBCEO is a dummy variable taking the value 1 if a firm has a female executive below the CEO level listed in EXECUCOMP. FEMCEO is a dummy variable taking the value 1 if a firm has a female CEO. FIRMAGE is the age of the firm. BOOKLEV is book leverage. RDINT is the ratio of the firm's R&D expense to assets, with a value of zero imputed if R&D expense is not reported. NUMEXEC is the total number of executives listed in EXECUCOMP. Regressions include fixed effects for the year. Observations where the value of Tobin's Q is more than 3 standard deviations away from the mean are excluded. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.

	Random Effects		Fixed Effects	
FEMSUBCEO	0.0557	***	0.0434	**
LNASSETS	-0.2796	***	-0.4400	***
FIRMAGE	-0.0008		0.0290	***
BOOKLEV	-0.6483	***	-0.5641	***
RDINT	2.6847	***	1.911	***
NUMEXEC	-0.0139	***	-0.0088	*
Observations	19,529		19,529	
R ²	0.70		0.71	

Table 7
Analysis of Lagged Dependent Variables

This table contains two regressions. The first repeats the analysis of Table 5 but adds the lagged value of Tobin's Q, and the second is a logistic regression with FEMSUBCEO as the dependent variable and Tobin's Q and the lagged value of FEMSUBCEO included among the controls. Regressions include fixed effects for the year and industry at the 4-digit SIC code level. Observations where the value of Tobin's Q is more than 3 standard deviations away from the mean are excluded. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.

	Tobin's Q OLS		FEMSUBCEO Logit	
FEMSUBCEO	0.0518	***		
FEMSUBCEO [N-1]			4.7754	***
Tobin's Q			0.0610	**
Tobin's Q [N-1]	0.2082	***		
LNASSETS	-0.0244	***	-0.0210	
FIRMAGE	-0.0011	**	-0.0492	**
BOOKLEV	-0.6786	***	-0.2698	
RDINT	1.2095	**	0.4181	
NUMEXEC	-0.0192	***	0.4334	***
Observations	19,134		17,854	
R ² /PseudoR ²	0.46		0.58	

Table 8**Firm Performance and Female Participation as a Function of Innovation Intensity**

The first regression Repeats the analysis of Table 5, Column (2), replacing FEMSUBCEO with FEMSUBCEO/RD (FEMSUBCEO/NoRD), where /RD (No/RD) equals FEMSUBCEO if the firm reports (does not report) R&D expense. The other regressions use other measures of firm performance: Return on Assets is the ratio of operating income before depreciation to prior year assets. Return on Equity is the ratio of income before extraordinary items to prior year book equity. Sales Growth is the year-on-year percentage change in sales. Observations where the value of the dependent variable is more than 3 standard deviations away from the mean are excluded. All standard errors are robust to heteroskedasticity and arbitrary within-firm serial correlation. *, **, *** denote significance at the 10%, 5%, and 1% levels respectively.

	Tobin's Q		Return on Assets		Return on Equity		Sales Growth	
FEMSUBCEO/RD	0.1403	***	0.0081	***	0.0417	*	-0.0044	
FEMSUBCEO/NoRD	-0.0307		-0.0050	**	0.0160		-0.0115	*
FEMCEO	-0.0146		-0.0083		-0.1355	*	-0.0383	**
LNASSETS	-0.0268	***	0.0025	***	0.0123	***	-0.0095	***
FIRMAGE	-0.0023	***	-0.0003	***	0.0007	*	-0.0020	***
BOOKLEV	-0.8813	***	-0.1113	***	-0.0949		-0.0346	***
RDINT	3.2692	***	-0.1269	***	-1.3283	***	0.5262	***
NUMEXEC	-0.0224	***	-0.0047	***	-0.0152	***	-0.0075	***
Observations	19,509		21,321		21,809		21,669	
R ²	0.36		0.22		0.05		0.12	