Women As Drivers Of Japanese Firms' Success: The Effect Of Women Managers And Gender Diversity On Firm Performance

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ABSTRACT

While various theoretical arguments have been constructed that imply that a firm would see improved financial performance by increasing the proportion of women managers, previous studies on the issue, in Japan and elsewhere, have shown mixed results. Using data from Toyo Keizai and Nikkei NEEDS on 745 Japanese-listed companies, the authors investigate the impact of women's managerial participation and, more generally, overall workplace and managerial gender diversity on corporate performance. They find a robust significant positive relationship between firm performance and both female manager ratio and gender diversity, after controlling for industry, firm size, capital structure, corporate governance, and compensation policy. This relationship also exhibits substantial nonlinearity, with the benefit decreasing as the proportion of women managers or managerial gender diversity increases.

Keywords: Workplace Diversity; Managerial Gender Diversity; Women Managers; Firm Performance

INTRODUCTION

In the World Economic Forum's Gender Gap Index of 2012, Japan ranked 101st out of 135 countries. The weakest indicator for Japan was its low ratio of women managers in firms (Hausmann, Tyson, & Zahidi, 2012). The gender gap is significantly greater in Japan than in any other advanced OECD country.

While there are several arguments that suggest firms could improve their performance by more actively employing women in managerial roles, empirical studies have yielded mixed results. In both American and Japanese research, women managers have been shown, in some cases, to be beneficial to the bottom line of companies. However, those studies in the United States have tended to emphasize the benefits of gender diversity rather than women managers, specifically, whereas those in Japan have focused more on the effects of gender discrimination, in particular, statistical discrimination and wage differentials. Although gender diversity and the proportion of women managers are closely related and highly correlated at the low levels of female managerial participation witnessed in Japanese firms, they are not identical, with differing predictions of their connections to firm performance; so in this study, both are examined.

The purpose of this analysis is to explore whether, and to what extent, women managers boost Japanese firm performance. The research is unique because it presents empirical evidence to test, with a robustness check to eliminate the possibility of reverse causation, whether both greater gender diversity and women's managerial participation are associated with improved firm performance for Japanese-listed companies after controlling for size, industry, and various corporate accounting and governance measures, while separating out effects due to women managers from those due to women employees in general. Moreover, the curvature of these relationships is examined to estimate how they are modified, or even reversed, at higher levels of such participation and diversity.

THEORETICAL FRAMEWORK

Positive Effects of Increasing Gender Diversity and Female Managerial Representation

Researchers have proposed various reasons for why there should be a positive relation between female managerial representation and firm performance, at least for low levels of such representation. Perhaps the most frequently considered justification is the beneficial effect of gender diversity, which generally increases in line with the proportion of women managers since they are in the minority in almost all firms. Laboratory studies of cultural diversity, including gender diversity, have generally yielded that the effectiveness of workgroups is enhanced by group-member diversity (Cox & Blake, 1991). More heterogeneous groups tend to have broader knowledge and experience, analyze issues from a wider range of perspectives, and thus consider and debate a larger set of proposals, producing higher-quality and more innovative solutions (Hoffman & Maier, 1961; DiTomaso, Post, & Parks-Yancy, 2007). Gender diversity, in particular, has been found to enhance employees' overall creativity and innovation because of the combination of different skills, perspectives, and backgrounds that men and women tend to possess (Egan, 2005; Rogelberg & Rumery, 1996). Herring (2009) points out that diversity provides a competitive advantage through social complexity at the firm level as well, because businesses that draw on more inclusive talent pools can be more successful. Moreover, women may provide more insight into the needs of female customers (Daily, Certo, & Dalton, 1999; Nkomo & Cox, 1996). These benefits of improved problem-solving, creativity, innovation, and market insight are valuable, rare, inimitable, and non-substitutable resources (Robinson & Dechant, 1997) and thus, according to the resource-based view of the firm (Barney, 1991), can produce a sustained corporate competitive advantage. At the individual level, tokenism may impede the performance of members of a minority group when they are relatively few in number (Kanter, 1977). Empirical studies conducted by Frink, Robinson, Reithel, Arthur, Ammeter, Ferris, Kaplan, and Morrisette (2003) have supported these positive views of diversity, even going so far as to suggest that an organization's optimal performance is achieved at maximum gender diversity (50% women). While these effects of diversity may be present throughout an organization, they are more likely to be significant at the managerial level, where most decision-making occurs.

As these arguments relate to gender diversity specifically, the authors propose the following narrow hypothesis:

Hypothesis 1: Organizational gender diversity is positively related to firm performance.

In addition to these diversity-based arguments, those primarily derived from human capital theory have also been advanced. These gender-asymmetric arguments provide reasons for why human capital may be higher at firms that employ more women managers in contrast to the manager fungibility assumption implicit in the preceding hypothesis. Such explanations can be divided into those based on discrimination and those based on motivation.

Gender discrimination is pervasive in Japanese companies and society, in general, to a far greater degree than that found in developed Western nations (Barrett, 2004; Marikkar, 2007; Siegel & Kodama, 2011; OECD, 2012). To the extent that this would cause firms to underutilize women's resources relative to their capabilities, increasing their employment should raise a firm's performance. A "taste for discrimination," although attributable to personal prejudice, if widely held, could lead to a systematic undervaluation of female labor, and managerial ability in particular, throughout the economy on which more "enlightened" firms could capitalize by increasing women's (managerial) participation (Becker, 1971). Arrow (1973), however, doubted whether such inefficient behavior could survive long term in highly competitive markets, proposing instead an alternative explanation for discrimination - a form of so-called statistical discrimination - first described by Phelps (1972), which can lead to inequitable but, on average, efficient personnel decisions. However, it is debatable, and ultimately an empirical question, whether companies really operate in such unforgiving environments - the persistence of firm performance differences being an indication that they don't.

A number of different versions of statistical discrimination have been put forth, having differing implications for the connection between women managers and corporate performance. In the original model of Phelps (1972), discriminatory behavior is efficient, so that failing to discriminate, and thus hiring more women or paying them higher salaries while ignoring the additional informational content of their gender, would lead to worse outcomes. Simple

modifications of the model's details could reverse this conclusion, such as in that of Aigner and Cain (1977) where women with equal productivity to that of men could be penalized by risk-averse employers if the informativeness of their qualifications was considered to be less reliable. Alternatively, if the assumption by Phelps is that employers accurately know that the average relative capabilities of men and women are relaxed, then an unconscious bias against women in the estimation of these averages, when combined with statistical discrimination, would produce the same exploitable inefficiency implied by taste-based discrimination.

Theories of statistical discrimination based on coordination failure, such as that due to Arrow (1973, pp. 23-32), also make varying predictions concerning the impact of increased female managerial participation and corporate performance. In these models, there is a self-fulfilling prophesy whereby lower expectations of women's competence or productivity lead to lower expected benefits to investment in improving their human capital, which discourages the undertaking of such efforts whence ultimately justifying the lower expectations. In the case where the investment is done by the worker prior to entering employment, such as with education, one would not expect to see any gain to those firms that fail to discriminate, as any benefit that would follow from such increased incentive for women to acquire more skills would accrue to all firms. By contrast, in models where the cost is borne by the firm; for example, in the form of training, a firm that offered more professional career-track opportunities to women could shift the firm to a new equilibrium whereby women's increased productivity would warrant the increased investment in them. Yamaguchi (2008, 2011) has proposed precisely this form of statistical discrimination (in contradistinction to earlier Japanese researchers, such as Koike (1991) and Yashiro (1980) who tended to favor Phelps-type theories) as the main reason for the low rates of women managerial participation in Japan where there is much societal pressure on women to exit the labor force after childbirth, leading to higher turnover and costs associated with women employees. However, the translation of increased female participation into higher productivity is, according to him, due to the role model/motivational effect to be discussed below (Yamaguchi, 2012).

Note that the extent of any job-placement discrimination (i.e., discrimination in hiring, promotion, or job assignment), as distinguished from wage discrimination, is determined by a company's "culture" (Barney, 1986b) and thus one would not expect to see any sizable effects from such discrimination in longitudinal studies, which control for differences among firms (Dezso & Ross, 2012). In cross-sectional studies such as the present one, by contrast, the impact should be observable and may be larger than that due to other causes, such as gender diversity.

A popular variant of the discrimination explanation for a possible association between female managerial representation and firm performance is the persistent wage differential between men and women, observed globally but larger in Japan than most other OECD countries. Although this would not be a factor in those studies focusing on top management or corporate boards, where only a few individuals are involved for each company (Carter, Simkins, & Simpson, 2003), it could be when analyzing the entire workforce or even just middle managers only. In Kawaguchi's well-known finding (Kawaguchi, 2007) that excess profits were earned by Japanese companies in the 1990s from employing more women, 5% of the effect was attributable to wage discrimination. Furthermore, it has been suggested that the perceived benefit to employing more women is actually due to the fact that they tend to constitute a large proportion of temporary or contract workers, the utilization of which has been linked to higher corporate performance (Kodama, Odaki, & Takahashi, 2005), although this would not explain an association with a higher ratio of female managers as opposed to employees. This is to be contrasted with Thurow's (1975, p. 177) argument that "statistical discrimination plays a much larger and more enduring role in the job-competition model than it does in the wage-competition model" because employers in hiring and promotion tend to select who they perceive to be the best qualified candidate, rather than a less qualified one at a lower salary, and the effect would be more pronounced for women managers than for all women employees. Distinction between the manifestation of gender discrimination in wage differentials and that in the form of underutilization of female talent (i.e., job-placement discrimination) is less significant than it may at first appear, as either case requires sustainable market inefficiency and implies a positive relationship between women's employment and firm performance. However, there is a notable divergence in their predicted effects – the efficiency boost from employing cheaper female labor should be linear, whereas that from hiring and promoting an undervalued group should show diminishing returns to increasing utilization (cf. below).

Another major category of ways in which employing more female managers may increase firm performance is the effect it may have on the productivity of the employees, both men and women. Such female managers may act as role models for other female employees, inspiring them to commit more to the company and their careers, which leads

to lower absenteeism and turnover, while also motivating them to increase productivity in an effort to further their careers (Cox & Blake, 1991; Rosen, Miguel, & Peirce, 1989; Trost, 1989). In particular, this may counteract the strong tendency of Japanese women to leave the labor force after marriage or childbirth. Employing more women managers may also serve to attract - from outside the firm - better-qualified women candidates for open positions for whom a company with more opportunities for advancement would be more appealing, thus raising the average quality of women managers. In addition, there could be productivity gains among male managers as well, who would have to adjust to a more competitive environment for promotion.

There is substantial literature on how women's managerial style differs from - and in some ways, may be superior to - that of men. Women tend to employ an inclusive and interactive leadership style, relying more on cooperation and collaboration with and among subordinates rather than competition or control (Rosener, 1995; Book, 2000; Eagly & Johnson, 1990). Other authors (Daily & Dalton, 2003; Zhang & Bartol, 2010; Larson, Foster-Fisherman, & Franz, 1998) have found that this collaborative and supportive managerial behavior encourages information sharing and motivates lower-level employees, amplifying the effects of gender diversity, particularly with respect to creativity and innovation, and providing yet another justification for a positive relation between women's managerial representation and firm performance.

Finally, Kodama, Odaki, and Takahashi (2009) have proposed that increasing female managers, per se, does not produce better firm performance but, rather, both greater managerial diversity and higher corporate performance are consequences of "firm-specific factors," such as human resources management (HRM). Possible HRM measures that increased women's length of service and career motivation; hence, managerial representation, while also impacting firm performance - perhaps through higher female productivity - are family-friendly policies designed to allow employees to fulfill their familial responsibilities and gender-equality policies designed to narrow the gender gap in hiring, training, and pay (Wakisaka, 2001). In other research unique to Japan, Wakisaka (2007) has demonstrated that equal-employment policies and family-friendly policies strongly influence firm performance and workplace productivity, using data from a Japanese survey of policies to facilitate work-life balance, while Kawaguchi (2009) found that the discipline of managers by investors, in addition to improving firm performance, also creates an environment in which it is easier for women to be active, and thereby produces more women managers in Japan.

All these arguments act to further strengthen that of Hypothesis 1 in the situation where women do not constitute a majority of managers:

Hypothesis 2: Female managerial representation is positively related to firm performance.

Moreover, the relationship in Hypothesis 2 is expected to be stronger than that in Hypothesis 1.

Nonlinear Effects of Increasing Gender Diversity and Female Managerial Representation

In addition to these positive effects, there are also possible negative effects. Moreover, the above positive associations are not necessarily linear – most effects may have diminishing returns where the additional profit from higher female managerial representation is smaller with increasing representation. Therefore, the relation between gender diversity - or female managerial representation - and firm performance should theoretically be curvilinear, specifically concave (i.e., an inverted U-shape), with positive slope at low levels of gender diversity - or female managerial representation - and smaller positive - or even negative - slope as gender diversity - or female managerial representation - approaches its maximum.

Social identity, self-categorization, and similarity-attraction theories imply that diversity can be disadvantageous for organizations. According to these theories, individuals tend to be attracted to others whom they perceive to fall within the same social categories (Tajfel & Turner, 1986; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987; Ashforth & Mael, 1989; Mannix & Neale, 2005), with gender being a prominent component of self-categorization. Moreover, they usually perceive their group to be superior to others. Hence, diverse groups may fragment into smaller gender-homogeneous groups with concomitant inter-group communication and cooperation difficulties, tensions, and even outright conflicts (Kravitz, 2003; Chatman & Flynn, 2001; Pelled, 1996). Empirical

studies (e.g., Jehn, Northcraft, & Neale, 1999; Earley & Mosakowski, 2000; Shapcott, Carron, Burke, Bradshaw, & Estabrooks, 2006) have demonstrated these drawbacks as well. Not surprisingly, these negative effects have a deleterious impact on group and individual performance (Richard, McMillan, Chadwick, & Dwyer, 2003).

This impairment is considerably stronger at higher levels of gender diversity, as the two groups approach each other in size, leading to potential power struggles (Blalock, 1967). Meanwhile, the advantages of diversity, being primarily generated by the introduction of new perspectives and backgrounds, would tend to increase more slowly as the number of members in the minority group increase, the additional contribution to the group from minority-specific novelty having already been largely captured by the earliest minority members. The combination of these two assertions yields a relationship between changes in gender diversity and organizational performance that is initially positive but then decreases and turns negative at high levels of diversity, which has been observed in previous studies (Richard, Kochan, & McMillan-Capehart, 2002; Knouse & Dansby, 1999; Ali, Kulik, & Metz, 2011). This can be restated as the following extension of Hypothesis 1:

Hypothesis 3: Organizational gender diversity has a concave curvilinear relationship to firm performance.

Similarly, for almost all of the effects of female managerial representation on firm performance that are not attributable to gender diversity itself, theory would predict diminishing, and in some cases negative, impacts of them with higher representation. Obviously, job-placement discrimination, whether it be statistical or taste-based, is less in evidence as the utilization rate of female managerial labor approaches that of their relative (versus male managers) true ability, and the posited effect between this ratio and firm performance reverses as it exceeds their true ability (as under conditions of "reverse discrimination"). At the level of female manager ratio in which the marginal productivity of female managers equals that of male managers, there would be no gain to substituting female for male managers, whereas at higher ratios, productivity would actually decrease with more women managers.

As with the beneficial effects of gender diversity, the role-model effect also decreases with increasing numbers of role models, for identical reasons. Moreover, higher levels of gender diversity may have a de-motivating effect on men, leading to move absenteeism and higher turnover (Tsui, Egan, & O'Reilly, 1991). Taken together, these results imply that the net effect on employee productivity may become negative at high levels of female managerial representation.

By contrast, the improved firm performance due to the wage gap is the only effect considered above that would be expected to be linear, even at high levels of female representation. Thus, if the observed relation between the female manager ratio and corporate performance is attributable solely to this factor, one would not expect to find significant curvature in the relationship.

So long as any of the above effects of gender diversity, job-placement discrimination, or role models are significant, the shape of the relationship to firm performance for female managerial representation will, similarly to that for gender diversity, be concave. This is summarized as:

Hypothesis 4: Female managerial representation has a concave curvilinear relationship to firm performance.

Again, the relationship in Hypothesis 4 is expected to be stronger than that of Hypothesis 3. Further, note that even if none of the direct nonlinear effects of increasing female managers are in evidence, the utilized measure of managerial gender diversity (specified below) is already quadratic in the female manager ratio, so Hypothesis 1 would imply Hypothesis 4.

RESEARCH DESIGN

Sample and Data

The sample comprises 745 Japanese-listed companies contained in the CSR data of Toyo Keizai for both 2007 and 2013. These databases, on employment and HR policies, cover the period 2005-2006 for 1,082 firms and the period 2011-2012 for 1,127 firms for the data published in 2007 and 2013, respectively. This source provides data on

the numbers of regular employees, regular female employees, and female and male managers; service years of men and women; the average age of men and women; in-house daycare facilities; intra-company diversity promotion organizations; and performance incentive pay policies.

In addition, data on corporate governance and firm performance variables for 3,387 Japanese-listed companies are obtained from NEEDS (Nikkei Economic Electronic Databank System), published in 2013 as of the year 2012. The data consist of ranks from 1 to 5 for various variables, rather than the underlying raw data. From this collection have been selected (the rank of) Tobin's q[1] which is the measure of firm performance, 3-year average ROA (operating profit/total asset), operating cash flow, excess liabilities, debt coverage ratio, 3-year average equity volatility, extent of stock option system, director's shareholdings, and external board membership.

The average fractions of revenue from domestic sources during 2008-2012 are calculated from data downloaded from Bloomberg, the world's leading source of corporate accounting information. Industry and industrial sector codes and classifications for all 745 companies are also derived from Bloomberg. The UN Global Compact [2] membership list is available on their website.

Of the 745 companies found in Toyo Keizai's databases for both 2007 and 2013, only 663 are also present in the NEEDS database. Moreover, some of those 745 firms lack data for fields such as the number of women managers, and detailed revenue data could only be found for 561 of the companies on Bloomberg. As a result, the number of observations for the regressions performed ranges between 379 and 464.

A separate set of lagged regressions was run, replacing the percentage of women managers employed, the difference of male and female service years, and a dummy variable for the existence of a diversity committee in 2012 with the corresponding data for 2006. The purpose of these models is to test the long-term effect of the presence of women managers on firm performance.

Variables

Firm Performance Variable (Dependent Variable)

In keeping with common practice in corporate governance research, Tobin's q is utilized as the performance measure. Specifically, the variable is the rank (on a scale of 1 to 5) of the average value of Tobin's q over the 3-year period 2010-12, as calculated by and obtained from Nikkei NEEDS for 2013.

Independent Variables

The explanatory variables related to women's participation in management that are used here are the female manager ratio in 2012 (henceforth referred to as the female manager ratio), the same ratio for 2006, and the ratio of the female management ratio and the female employee ratio in 2012, which is called the female manager relative ratio.[3] The ratio from 2006 is also tested because of the possibility that there might be a time lag, of several years, in the effect of changes in the structure of management and the impact on firm performance. The reason for the inclusion of the relative ratio is to test the effect of women managers independently of that of women employees, as the respective ratios are strongly correlated in Japan (~ 60%; cf. Table 1).

[1]Tobin's q, the ratio of the market value of the firm to the replacement value of the firm's assets, is "widely viewed as the best measure of a firm's market value" (Dobbin & Jung, 2011). See Deszo and Ross (2012) for a thorough discussion justifying the use of Tobin's q in preference to backward-looking accounting-based performance measures such as ROA.

[2]Companies "commit to issue an annual Communication on Progress (COP), a public disclosure to stakeholders (e.g., investors, consumers, civil society, governments, etc.) on progress made in implementing the10 principals of the UN Global Compact and in supporting broader UN development goals. The COP is frequently the most visible expression of a participant's commitment to the Global Compact and its principles. Violations of the COP policy (e.g., failure to issue a COP) will change a participant's status to non-communicating and can eventually lead to the expulsion of the participant" (UN Global Compact, 2013).

[3] Wakisaka (2007) uses a similar ratio, which he calls the "female managerial ratio" and defines as the ratio (female managers/male managers)/(female employees/male employees). Wakisaka prefers to use this quantity to the ordinary female manager ratio, the most common indicator in the research, in order to separate out promotion and hiring HRM policy effects.

As a measure of gender diversity generally, various metrics have been used in the literature, but the most common is the Blau index (Blau, 1977):

$$1 - \sum_{i=1}^{n} p_i,$$

where n is the number of groups into which the sample is divided and p_i is the proportion of the total sample in group i. If the whole population is contained within a single group, then there is no heterogeneity and the index is equal to zero. For the case of gender diversity, the Blau index can be expressed as $2x(1 – x)$, where x is the proportion of women. In this case, the Blau index has a maximum value of 1/2 when the proportions of men and women are each 50%. In this paper, the Blau index of gender for managers (the "manager gender Blau index") and for employees (the "employee gender Blau index"), with data from 2012 only, are used as the explanatory variables for gender diversity.

Control Variables

Following research in corporate governance and human resource economics, controls are provided for a number of variables that previous studies have found to impact individual firm performance. These include accounting- and market-based data such as leverage (represented by the variables excess liabilities and debt coverage ratio), globalization (incorporated through its opposite, the domestic revenue ratio), ROA, operational cash flow, and equity volatility. The ROA and equity volatility are 3-year averages, covering the same 3-year period as the Tobin's q data. With the exception of the domestic revenue ratio, which was derived from annual financial reports available via Bloomberg, all the aforementioned control variables are - similarly to Tobin's q - expressed as ranks from 1 to 5, calculated by NEEDS. To these were added two corporate governance measures (the proportion of external board members and the amount of shares held by directors, both also ranks derived from NEEDS) and two variables related to employee incentive schemes (a dummy for the existence of a performance pay system and the rank of the extent of any stock option system). A control for firm size, defined as the natural logarithm of the total number of employees, was also incorporated.

All regressions included dummy control variables for industry (or, more precisely, industrial sector), using the most broad categories corresponding to nine major industrial groups (1-digit codes) in the US-based Standard Industrial Classification.

Instrumental Variables

For the 2-stage least squares analysis, one or more exogenous variables that are significantly associated with the corresponding measure of female representation or diversity, but not significantly associated with firm performance in the ordinary regressions, are required as instruments for the first-stage regression. For such instrumental variables were chosen the difference of male and female age, a dummy variable for the existence of an intracompany organization for promoting diversity (a so-called diversity committee), a dummy variable for UN Global Compact membership, and a dummy variable for the existence of in-house daycare facilities. All of these variables have been found to be significantly associated with the female manager ratio. In the models in which the measure of women's managerial representation is the female manager ratio from 2006, the corresponding data from 2006 are used when available.

Methodology and Models

Cross-Sectional OLS Regression Models

These models are used in this study to explain how and to what extent firm financial performance is affected by gender diversity in management, after accounting for the effect of various control variables. The fundamental models tested via ordinary least squares (OLS) regression are of the following form:

$$Performance = \beta_0 + \sum \beta_i x_i + \varepsilon \quad \text{(A)},$$

$$Performance = \beta_0 + \beta_1 Diversity + \sum \beta_i x_i + \varepsilon \quad \text{(B)},$$

$$Performance = \beta_0 + \beta_1 Diversity + \beta_2 (Diversity)^2 + \sum \beta_i x_i + \varepsilon \quad \text{(C)},$$

where x_i are the control variables listed above, which are the same for every model and submodel, and *Performance* is Tobin's q.

Each equation is tested for five different choices of explanatory variable *Diversity* - female manager ratio (Model 1), female manager relative ratio (Model 2), female manager ratio 2006 (Model 3), manager gender Blau index (Model 4), and employee gender Blau index (Model 5). Equation B (used for Submodels 1B-5B) corresponds to the basic proposition that higher levels of gender diversity should lead to better firm performance - Hypotheses 1 and 2 - while Equation C corresponds to the hypothesized inverted U-shaped relationship - Hypotheses 3 and 4. Equation A, which lacks any of the explanatory variables and is the same for all Submodels 1A-5A, is included for comparison with the other submodels. Incremental F-tests are performed for the differences of the R^2 between Submodels A and B and B and C.

White's general heteroscedasticy (Gujarati & Porter, 2009, pp. 386-388) test standard errors were also calculated for these regressions, but the significance of the coefficients using them was the same as with the OLS errors, with the exception of the constant term and the excess liabilities control variable, whose significance increased using White errors. Only the OLS errors are reported in the results.

Two-Stage Least Squares Regression Analysis (2SLS)

Some of the above OLS regressions (Submodel B) are supplemented here with 2-stage least squares regression analysis (2SLS), developed independently by Theil (1953) and Bassmann (1957). As the name indicates, the method involves successive applications of OLS, which are straightforward to estimate, first regressing the endogenous variable(s) on the remaining independent variables (in this case, the controls) and instruments and then regressing the original dependent variable (Tobin's q) on the control variables and the values of the explanatory variable(s) predicted by the first regression equation. Generally, 2SLS is used to control for the possibility of endogeneity, such as would arise, for example, in the situation where not only could the female manager ratio affect Tobin's q, but also Tobin's q could affect the female manager ratio. If this is the case, estimation of Equation B using OLS can produce biased coefficient estimates. The following system of equation was estimated using 2SLS:

$$Performance = \alpha_0 + \alpha_1 Diversity + \sum \alpha_i x_i + \varepsilon \quad (1),$$

$$Diversity = \delta_0 + \delta_1 Firm\ Value + \sum \delta_i x_i + \sum \gamma_i z_i + \mu \quad (2),$$

where *x* and *z* are vectors of control and instrumental variables, respectively. As before, *Performance* is Tobin's q, while *Diversity* could be any of the explanatory variables listed above. Vector *x* is identical to that in Equations A–D, including control variables for firm size, firm leverage, globalization, cash flow, ROA, equity volatility, external board membership, directors' shareholdings, stock option system, performance bonus incentive system, and industry dummies. The instruments – difference of male and female service years, existence of diversity committee, UN Global Compact membership, and existence of in-house daycare facilities – constitute vector *z*.

RESULTS

Descriptive statistics and correlations between the variables are reported in Tables 1 and 2. The very low level of women's representation in managerial positions is striking, averaging below 4%, even in 2012. Even when adjusting for the low levels of women's employment overall (the "relative ratio"), the proportion of women in management is, on average, 1/6 that of their proportion in the workforce. Not surprisingly, the correlations among the various measures of female manager representation are high (typically over 70%), but what is noteworthy is that the

correlations of these ratios with the female employee ratio are also sizable, except for that of the relative ratio, justifying its use as a predictor to separate out the impact of women managers from that of women employees. Note also that over 70% of all firms belong to the Industrial and Consumer Cyclicals and Non-Cyclicals industries. (As mentioned earlier, these "industries" are actually industrial sectors; that is, collections of related industries, with one of the sectors labeled "Industrial.")

Table 1: Descriptive Statistics

Variable	Mean	Standard Deviation	Number of Firms
Female manager ratio	0.036	0.065	601
Female manager relative ratio	0.162	0.166	579
Female manager ratio, 2006	0.032	0.063	665
Manager gender Blau index	0.062	0.078	601
Employee gender Blau index	0.285	0.114	622
Natural logarithm of number of employees	7.110	1.385	745
Female employee ratio	0.202	0.138	622
Domestic revenue %, avg 2008-12	0.774	0.259	561
Has performance incentive pay system (dummy)	0.824	0.381	733
Stock option system rank (1 - 5)	3.591	0.913	663
External directors rank (1 - 5)	2.551	1.775	663
Directors holdings rank (1 - 5)	2.795	1.465	663
Operating cashflow rank (1 - 5)	2.974	1.397	663
ROA, 3yr avg, rank (1 - 5)	2.839	1.360	663
Excess liabilities rank (1 - 5)	2.997	0.078	663
Debt coverage ratio rank (1 - 5)	2.685	0.663	663
Equity volatility, 3yr avg, rank (1 - 5)	3.032	1.406	663
Diff. of avg. male and female service years, 2006	4.044	3.228	624
Diff. of avg. male and female service years	3.583	3.280	576
Has diversity committee, 2006 (dummy)	0.197	0.398	692
Has diversity committee (dummy)	0.263	0.441	730
Has in-house daycare center (dummy)	0.066	0.248	745
Is UN Global Compact member (dummy)	0.054	0.226	745
Tobin Q, 3-yr avg., rank (1 - 5)	2.955	1.390	663
Industry - Basic Materials (dummy)	0.073	0.260	745
Industry - Communications (dummy)	0.035	0.184	745
Industry - Consumer, Cyclical (dummy)	0.259	0.438	745
Industry - Consumer, Non-cyclical (dummy)	0.150	0.358	745
Industry - Energy (dummy)	0.004	0.063	745
Industry - Financial (dummy)	0.090	0.286	745
Industry - Industrial (dummy)	0.310	0.463	745
Industry - Technology (dummy)	0.066	0.248	745
Industry - Utilities (dummy)	0.013	0.115	745

Notes: All data are from 2012, unless otherwise indicated. Means for dummy variables are the proportion of firms with the given characteristic.

Table 2: Correlation Matrix of all Variables

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	Female manager ratio												
2	Female manager relative ratio	0.716***											
3	Female manager ratio 2006	0.865***	0.593***										
4	Manager gender Blau index	0.858***	0.788***	0.800***									
5	Employee gender Blau index	0.363***	0.127***	0.380***	0.499***								
6	Log number of employees	-0.038	0.003	-0.100***	-0.052	-0.167***							
7	Female employee ratio	0.597***	0.195***	0.590***	0.622***	0.792***	-0.029						
8	Domestic revenue %, avg 2008-12	0.183***	0.090*	0.200***	0.220***	0.246***	-0.278***	0.268***					
9	Performance incentive pay policy	-0.195***	-0.096**	-0.152***	-0.148***	-0.163***	0.222***	-0.194***	-0.130***				
10	Stock option system rank	0.032	0.042	0.047	0.078*	0.045	0.159***	0.033	-0.207***	0.132***			
11	External directors rank	0.038	0.109**	0.047	0.109**	0.068	0.182***	0.035	-0.160***	0.058	0.160***		
12	Directors holdings rank	0.134***	-0.012	0.143***	0.107**	0.231***	-0.550***	0.252***	0.246***	-0.172***	-0.106***	-0.254***	
13	Operating CF rank	0.050	0.042	0.022	0.037	-0.058	0.202***	-0.026	-0.117***	0.088**	0.194***	0.121***	-0.152***
14	ROA 3yr avg rank	0.181***	0.130***	0.170***	0.199***	0.199***	-0.009	0.202***	0.047	0.030	0.116***	0.054	0.018
15	Excess liabilities rank	0.023	0.042	0.020	0.034	0.078*	0.047	0.052	-0.009	0.087**	0.025	-0.054	-0.032
16	Debt coverage ratio rank	0.080*	0.094**	0.069*	0.093**	0.021	0.126***	0.030	-0.078*	0.027	0.109***	0.068*	-0.025
17	Equity volitility 3yr avg rank	-0.089**	-0.129***	-0.059	-0.178***	-0.208***	-0.042	-0.167***	-0.363***	0.028	0.056	0.025	-0.017
18	Diff. service yrs. M-F 2006	-0.165***	-0.211***	-0.187***	-0.180***	-0.100**	0.031	-0.036	0.100**	-0.019	-0.064	-0.106**	0.022
19	Diff. service yrs. M-F	-0.088**	-0.129***	-0.132***	-0.093**	-0.070*	0.030	0.005	0.197***	-0.007	-0.084*	-0.133***	0.101**
20	Diversity committee 2006	0.054	0.075*	0.015	0.096**	0.099**	0.427***	0.116***	-0.127***	0.089**	0.103**	0.185***	-0.221***
21	Diversity committee	0.022	0.103**	-0.030	0.077*	0.048	0.524***	0.056	-0.244***	0.140***	0.208***	0.165***	-0.330***
22	In-house daycare center	0.045	0.109***	0.024	0.072*	-0.020	0.335***	-0.020	-0.214***	0.081**	0.193***	0.123***	-0.212***
23	UN Global Compact	0.014	0.114***	-0.017	0.039	-0.002	0.258***	-0.026	-0.238***	0.078**	0.107***	0.211***	-0.235***
24	Tobin's q, 3yr avg. rank	0.104**	0.112**	0.072*	0.135***	0.068	0.378***	0.065	-0.272***	0.077**	0.207***	0.215***	-0.341***

Table 2 cont.

	Variable	13	14	15	16	17	18	19	20	21	22	23
1	Female manager ratio											
2	Female manager relative ratio											
3	Female manager ratio 2006											
4	Manager gender Blau index											
5	Employee gender Blau index											
6	Log number of employees											
7	Female employee ratio											
8	Domestic revenue %, avg 2008-12											
9	Performance incentive pay policy											
10	Stock option system rank											
11	External directors rank											
12	Directors holdings rank											
13	Operating CF rank											
14	ROA 3yr avg rank	0.389***										
15	Excess liabilities rank	-0.001	0.053									
16	Debt coverage ratio rank	0.506***	0.294***	0.040								
17	Equity volitility 3yr avg rank	-0.054	-0.317***	-0.055	-0.156***							
18	Diff. service yrs. M-F 2006	-0.102**	-0.096**	0.029	-0.037	-0.130***						
19	Diff. service yrs. M-F	-0.116***	-0.045	-0.011	-0.041	-0.193***	0.851***					
20	Diversity committee 2006	0.043	-0.061	0.019	0.051	0.007	0.050	0.041				
21	Diversity committee	0.097**	0.000	0.023	0.073*	-0.009	-0.011	-0.018	0.641***			
22	In-house daycare center	0.117***	0.010	0.011	0.065*	-0.006	-0.033	0.049	0.228***	0.300***		
23	UN Global Compact	0.019	-0.089**	0.009	0.004	0.070*	-0.082**	-0.082**	0.267***	0.294***	0.225***	
24	Tobin's q, 3yr avg. rank	0.323***	0.301***	-0.029	0.035	0.046	-0.156***	-0.147***	0.139***	0.257***	0.216***	0.156***

Notes: All data are from 2012 unless otherwise indicated. * indicates $p < 0.10$; ** indicates $p < 0.05$; *** indicates $p < 0.01$.

Cross-Sectional Regression Analysis

Tables 3-7 report the cross-sectional regression analysis testing all four hypotheses. For each of the Models 1-5 mentioned above, Submodels A–C were calculated, where A includes no variable for female representation or gender diversity, B has an additional term linear in such variable, and C also incorporates a quadratic term in the same variable.

Every regression has an F-statistic significant at the 0.01 level, with an adjusted R^2 of at least 0.375. Moreover, the addition of variables related to female managerial representation or gender diversity always increases the adjusted R^2 with an incremental F-test (of Submodel B vs. A) that is significant at least the 0.10 level (and 0.05 level for 4 out of 5 models). All three female manager ratio variables are significantly ($p < 0.05$) positively linearly associated with higher values of Tobin's q, while gender diversity, as represented by Blau's index, is positively linearly associated with higher values of Tobin's q at even more significant levels ($p < 0.01$), providing strong support for Hypothesis 1 and, to a lesser extent, Hypothesis 2. The regressions with the 6-year lagged female manager ratio have the lowest levels of significance (as measured by F-statistic, adjusted R^2, and incremental F-test, as well as the t-test of the predictor coefficient), failing to provide support for the notion that changes in women's representation should take several years to fully impact firm performance. Regressions using the female manager relative ratio (vs. the female employee ratio) have similar results to those using the ordinary ratio, implying that the positive effect on firm performance of higher female managerial participation may not be solely attributable to the effect of higher female employment, generally.

Almost all of the control variables involving accounting or market data; namely, ROA, operating cash flow, debt coverage, equity volatility, domestic revenue proportion, and firm size, are very significant ($p < 0.01$), whereas those involving ownership structure or compensation systems tend not to be significant (at even the 0.1 level), except in the regressions involving a lagged female manager ratio. Having more directors from outside the company is also positively associated with higher Tobin's q, but the p-values for this coefficient range from less than 1% in one regression to more than 10% in another, with the significance tending to decline with increasing complexity of the model.

The addition of a quadratic term in Submodel C causes the analysis to exhibit the inverted U shape predicted by theory, as all such quadratic terms have negative coefficients, significantly different from zero for four out of five models. The p-values for the quadratic terms tend to be somewhat higher than those for the linear terms, with the coefficients for the linear predictors increasing in significance with the addition of the quadratic terms for those same four models, and the incremental F-test is significant at the 0.1 level, or better, for these models as well. All of these observations imply that the relation of female manager ratio or manager gender diversity to Tobin's q is actually curvilinear rather than just linear, which is Hypothesis 4 and part of Hypothesis 3. The addition of the quadratic terms in female manager ratio has a much more significant impact on Tobin's q than such terms involving Blau's index, perhaps because a gender diversity Blau index is already quadratic in the female representation ratio, so a linear Blau index term would correspond to a combination of a linear and quadratic term, with opposite signs, in the female representation ratio, while a quadratic Blau index term would correspond to a quartic polynomial in the female representation ratio. Also notable is the fact that linear and quadratic coefficients in Model 2C are of approximately equal size, as it would correspond to a purely linear term in Blau's index - Model 4B - implying that the primary cause of higher Tobin's q, with increasing women's managerial representation, may perhaps, in fact, be due solely to greater gender diversity. However, this effect can also be observed in Model 1C, where it cannot be as easily interpreted, while in Model 3C, the quadratic term is approximately twice the size of the linear term. The quadratic model for employee gender diversity (Model 5C) is the only one that was not a significant improvement over the linear version, contradicting the remaining part of Hypothesis 3. This suggests that the negative effects of "excessive" levels of gender diversity may be stronger for managerial positions than for lower-level employees.

None of the pairs of independent variables in the regressions exhibit high correlations, all variance inflation factors are less than 2, and for every regression, multiple variables are highly significant in addition to the overall F-statistic, indicating that multicollinearity does not appear to be a concern.

Table 3: Cross-Sectional Regression (OLS) Estimate of the Relationship between the Current Female Manager Ratio and Firm Performance (Tobin's Q)

	Model		
Variable	**1A**	**1B**	**1C**
Constant	3.156*	3.445**	3.447**
	(1.748)	(1.746)	(1.728)
Female manager ratio		1.788**	6.795***
		(0.841)	(1.820)
Female manager ratio squared			-8.425***
			(2.724)
Domestic revenue %, avg 2008-12	-0.861***	-0.920***	-0.952***
	(0.247)	(0.247)	(0.245)
Performance incentive pay policy	-0.161	-0.093	-0.114
	(0.157)	(0.157)	(0.158)
Stock option system rank	0.069	0.066	0.048
	(0.059)	(0.059)	(0.058)
External directors rank	0.077**	0.071**	0.054*
	(0.032)	(0.032)	(0.032)
Directors holdings rank	-0.042	-0.056	-0.050
	(0.048)	(0.048)	(0.047)
Operating CF rank	0.181***	0.182***	0.189***
	(0.050)	(0.050)	(0.049)
ROA 3yr avg rank	0.283***	0.270***	0.269***
	(0.046)	(0.047)	(0.046)
Excess liabilities rank	-0.762	-0.809	-0.838
	(0.537)	(0.535)	(0.529)
Debt coverage ratio rank	-0.389***	-0.396***	-0.403***
	(0.095)	(0.095)	(0.094)
Equity volatility 3yr avg rank	0.104**	0.097**	0.123**
	(0.048)	(0.048)	(0.048)
Log number employees	0.344***	0.333***	0.344***
	(0.050)	(0.050)	(0.050)
N	424	424	424
Adjusted R^2	0.393	0.398	0.411
F-Statistic	15.40***	15.00***	15.00***
ΔR^2		0.006	0.013
Incremental F-Statistic		4.469**	9.342***

Notes: The change in R^2 and incremental F-test reported for Models B and C correspond to the differences between Models A and B and B and C, respectively. Dummy variables were also included for 1-digit SIC industry. The measure of firm performance is the ranking from 1 to 5, by Nikkei NEEDS, of the mean value over three years of Tobin's q. All data are from 2012, unless otherwise indicated. Standard errors are reported in parentheses, beneath the parameter estimates. Probability values are based on a t-statistic for a two-tailed test of significance. * indicates $p < 0.10$; ** indicates $p < 0.05$; *** indicates $p < 0.01$.

Table 4: Cross-Sectional Regression (OLS) Estimate of the Relationship between the Current Female Manager Relative Ratio and Firm Performance (Tobin's Q)

	Model		
Variable	**2A**	**2B**	**2C**
Constant	3.265*	3.427**	3.406*
	(1.747)	(1.739)	(1.733)
Female manager relative ratio		0.765**	2.153***
		(0.336)	(0.810)
Female manager relative ratio squared			-2.165*
			(1.150)
Domestic revenue %, avg 2008-12	-0.983***	-1.020***	-1.036***
	(0.253)	(0.252)	(0.251)
Performance incentive pay policy	-0.184	-0.155	-0.186
	(0.158)	(0.158)	(0.158)

Table 4 cont.

Stock option system rank	0.086	0.079	0.065
	(0.059)	(0.059)	(0.059)
External directors rank	0.078**	0.069**	0.064**
	(0.033)	(0.033)	(0.033)
Directors holdings rank	-0.025	-0.025	-0.018
	(0.049)	(0.049)	(0.049)
Operating CF rank	0.161***	0.164***	0.170***
	(0.051)	(0.051)	(0.051)
ROA 3yr avg rank	0.297***	0.293***	0.292***
	(0.047)	(0.047)	(0.047)
Excess liabilities rank	-0.747	-0.798	-0.815
	(0.535)	(0.532)	(0.531)
Debt coverage ratio rank	-0.377***	-0.382***	-0.375***
	(0.098)	(0.097)	(0.097)
Equity volatility 3yr avg rank	0.117**	0.124**	0.133***
	(0.049)	(0.049)	(0.049)
Log number employees	0.334***	0.324***	0.319***
	(0.051)	(0.051)	(0.051)
N	407	407	407
Adjusted R^2	0.397	0.404	0.408
F-Statistic	15.10***	14.70***	14.30***
ΔR^2		0.008	0.005
Incremental F-Statistic		5.118**	3.509*

Notes: The change in R^2 and incremental F-test reported for Models B and C correspond to the differences between Models A and B and B and C, respectively. Dummy variables were also included for 1-digit SIC industry. The measure of firm performance is the ranking from 1 to 5, by Nikkei NEEDS, of the mean value over three years of Tobin's q. All data are from 2012, unless otherwise indicated. Standard errors are reported in parentheses, beneath the parameter estimates. Probability values are based on a t-statistic for a two-tailed test of significance. * indicates $p < 0.10$; ** indicates $p < 0.05$; *** indicates $p < 0.01$.

Table 5: Cross-Sectional Regression (OLS) Estimate of the Relationship between the Lagged Female Manager Ratio and Firm Performance (Tobin's Q)

	Model		
Variable	**3A**	**3B**	**3C**
Constant	3.642**	3.810**	3.731**
	(1.795)	(1.791)	(1.784)
Female manager ratio 2006		1.977**	5.969***
		(1.003)	(2.151)
Female manager ratio 2006 squared			-11.614**
			(5.540)
Domestic revenue %, avg 2008-12	-0.923***	-0.973***	-0.978***
	(0.243)	(0.244)	(0.243)
Performance incentive pay policy	-0.307**	-0.263*	-0.299**
	(0.148)	(0.149)	(0.149)
Stock option system rank	0.043	0.038	0.034
	(0.060)	(0.059)	(0.059)
External directors rank	0.074**	0.069**	0.064**
	(0.031)	(0.031)	(0.031)
Directors holdings rank	-0.099**	-0.109**	-0.108**
	(0.046)	(0.046)	(0.046)
Operating CF rank	0.186***	0.192***	0.197***
	(0.048)	(0.048)	(0.048)
ROA 3yr avg rank	0.300***	0.286***	0.291***
	(0.046)	(0.046)	(0.046)
Excess liabilities rank	-0.694	-0.729	-0.732
	(0.552)	(0.550)	(0.548)
Debt coverage ratio rank	-0.401***	-0.408***	-0.410***
	(0.093)	(0.093)	(0.093)

Table 5 cont.

Equity volatility 3yr avg rank	0.105**	0.099**	0.116**
	(0.048)	(0.048)	(0.048)
Log number employees	0.304***	0.302***	0.308***
	(0.048)	(0.048)	(0.048)
N	464	464	464
Adjusted R^2	0.375	0.379	0.384
F-Statistic	15.60***	15.10***	14.70***
ΔR^2		0.005	0.006
Incremental F-Statistic		3.849*	4.353**

Notes: The change in R^2 and incremental F-test reported for Models B and C correspond to the differences between Models A and B and B and C, respectively. Dummy variables were also included for 1-digit SIC industry. The measure of firm performance is the ranking from 1 to 5, by Nikkei NEEDS, of the mean value over three years of Tobin's q. All data are from 2012, unless otherwise indicated. Standard errors are reported in parentheses, beneath the parameter estimates. Probability values are based on a t-statistic for a two-tailed test of significance. * indicates $p < 0.10$; ** indicates $p < 0.05$; *** indicates $p < 0.01$.

Table 6: Cross-Sectional Regression (OLS) Estimate of the Relationship between the Manager Gender Blau Index and Firm Performance (Tobin's Q)

	Model		
Variable	**4A**	**4B**	**4C**
Constant	3.156*	3.542**	3.460**
	(1.748)	(1.727)	(1.721)
Manager gender Blau index		2.931***	6.491***
		(0.820)	(2.010)
Mgr gender Blau index squared			-12.331*
			(6.362)
Domestic revenue %, avg 2008-12	-0.861***	-0.962***	-0.965***
	(0.247)	(0.245)	(0.244)
Performance incentive pay policy	-0.161	-0.085	-0.120
	(0.157)	(0.156)	(0.157)
Stock option system rank	0.069	0.052	0.046
	(0.059)	(0.058)	(0.058)
External directors rank	0.077**	0.058*	0.053*
	(0.032)	(0.032)	(0.032)
Directors holdings rank	-0.042	-0.056	-0.046
	(0.048)	(0.047)	(0.047)
Operating CF rank	0.181***	0.187***	0.193***
	(0.050)	(0.049)	(0.049)
ROA 3yr avg rank	0.283***	0.265***	0.266***
	(0.046)	(0.046)	(0.046)
Excess liabilities rank	-0.762	-0.845	-0.859
	(0.537)	(0.529)	(0.528)
Debt coverage ratio rank	-0.389***	-0.403***	-0.400***
	(0.095)	(0.094)	(0.094)
Equity volatility 3yr avg rank	0.104**	0.113**	0.129***
	(0.048)	(0.047)	(0.048)
Log number employees	0.344***	0.337***	0.340***
	(0.050)	(0.049)	(0.049)
N	424	424	424
Adjusted R^2	0.393	0.41	0.414
F-Statistic	15.40***	15.70***	15.20***
ΔR^2		0.018	0.005
Incremental F-Statistic		12.387***	3.722*

Notes: The change in R^2 and incremental F-test reported for Models B and C correspond to the differences between Models A and B and B and C, respectively. Dummy variables were also included for 1-digit SIC industry. The measure of firm performance is the ranking from 1 to 5, by Nikkei NEEDS, of the mean value over three years of Tobin's q. All data are from 2012, unless otherwise indicated. Standard errors are reported in parentheses, beneath the parameter estimates. Probability values are based on a t-statistic for a two-tailed test of significance. * indicates $p < 0.10$; ** indicates $p < 0.05$; *** indicates $p < 0.01$.

Table 7: Cross-Sectional Regression (OLS) Estimate of the Relationship between Employee Gender Blau Index and Firm Performance (Tobin's Q)

	Model		
Variable	**5A**	**5B**	**5C**
Constant	3.216*	3.387**	3.199*
	(1.745)	(1.703)	(1.709)
Employee gender Blau index		2.650***	5.570**
		(0.570)	(2.532)
Empl gender Blau index squared			-5.213
			(4.404)
Domestic revenue %, avg 2008-12	-0.888***	-0.912***	-0.866***
	(0.246)	(0.240)	(0.243)
Performance incentive pay policy	-0.228	-0.113	-0.141
	(0.154)	(0.152)	(0.154)
Stock option system rank	0.074	0.059	0.061
	(0.059)	(0.057)	(0.057)
External directors rank	0.087***	0.061*	0.062*
	(0.032)	(0.032)	(0.032)
Directors holdings rank	-0.049	-0.075	-0.074
	(0.048)	(0.047)	(0.047)
Operating CF rank	0.163***	0.195***	0.195***
	(0.050)	(0.049)	(0.049)
ROA 3yr avg rank	0.294***	0.257***	0.260***
	(0.046)	(0.046)	(0.046)
Excess liabilities rank	-0.719	-0.986*	-1.054**
	(0.537)	(0.527)	(0.530)
Debt coverage ratio rank	-0.322***	-0.344***	-0.348***
	(0.095)	(0.093)	(0.093)
Equity volatility 3yr avg rank	0.133***	0.160***	0.162***
	(0.049)	(0.048)	(0.048)
Log number employees	0.329***	0.352***	0.354***
	(0.050)	(0.049)	(0.049)
N	428	428	428
Adjusted R^2	0.406	0.434	0.435
F-Statistic	16.30***	17.40***	16.60***
ΔR^2		0.029	0.002
Incremental F-Statistic		20.509***	1.397

Notes: The change in R^2 and incremental F-test reported for Models B and C correspond to the differences between Models A and B and B and C, respectively. Dummy variables are also included for 1-digit SIC industry. The measure of firm performance is the ranking from 1 to 5, by Nikkei NEEDS, of the mean value over three years of Tobin's q. All data are from 2012, unless otherwise indicated. Standard errors are reported in parentheses, beneath the parameter estimates. Probability values are based on a t-statistic for a two-tailed test of significance. * indicates $p < 0.10$; ** indicates $p < 0.05$; *** indicates $p < 0.01$.

2SLS Regression Analysis

Table 8 provides the results for the 2SLS models. The F-statistic for each model is significant at the 0.01 level. After controlling for the same firm-level and industry effects as before, the women's managerial participation - or gender diversity variable - is positively associated to Tobin's q in all models at significance levels of $p < 0.05$. R^2 - or adjusted R^2 - are not reported for either stage of the regressions as they are not meaningful in 2SLS. Similar p-values were observed for all the control variables as with the OLS regressions presented in Submodel B.

This analysis reaffirms the previous results supporting Hypotheses 1 and 2, even in the possible presence of endogeneity in the predictor variables. In particular, the hypothesis that the association between Tobin's q and women's participation variables is due solely to reverse causality; that is, to higher values of Tobin's q leading to higher female ratios, is rejected. Thus, one can be more confident that the preceding OLS coefficient estimates were not unduly biased. Simply, the 2SLS analysis provides strong support for the posited links between firm performance and both female manager ratio and gender diversity.

Table 8: 2SLS Regression Estimate of the Relationship between Firm Performance (Tobin's Q) and Various Measures of Female Managerial Representation and Gender Diversity

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	4.567**	3.951**	4.623**	4.335**	3.923**
	(1.900)	(1.806)	(1.987)	(1.787)	(1.785)
Female manager ratio	9.719**				
	(4.777)				
Female manager relative ratio		2.735**			
		(1.388)			
Female manager ratio 2006			11.506**		
			(5.610)		
Manager gender Blau index				6.890**	
				(3.198)	
Employee gender Blau index					5.951**
					(2.851)
Domestic revenue %, avg 2008-12	-1.298***	-1.129***	-1.387***	-1.246***	-1.072***
	(0.313)	(0.279)	(0.319)	(0.287)	(0.273)
Performance incentive pay policy	0.135	-0.081	-0.147	0.032	0.036
	(0.219)	(0.172)	(0.201)	(0.183)	(0.212)
Stock option system rank	0.063	0.073	-0.010	0.053	0.050
	(0.067)	(0.065)	(0.074)	(0.066)	(0.066)
External directors rank	0.012	0.016	0.056	0.003	0.005
	(0.041)	(0.039)	(0.038)	(0.042)	(0.043)
Directors holdings rank	-0.072	-0.028	-0.141**	-0.060	-0.107*
	(0.055)	(0.053)	(0.057)	(0.051)	(0.055)
Operating CF rank	0.174***	0.168***	0.226***	0.180***	0.246***
	(0.055)	(0.054)	(0.060)	(0.053)	(0.065)
ROA 3yr avg rank	0.238***	0.302***	0.222***	0.264***	0.223***
	(0.063)	(0.051)	(0.068)	(0.054)	(0.063)
Excess liabilities rank	-1.039*	-0.982*	-0.801	-1.003*	-1.371**
	(0.570)	(0.554)	(0.600)	(0.541)	(0.613)
Debt coverage ratio rank	-0.462***	-0.456***	-0.418***	-0.458***	-0.443***
	(0.107)	(0.104)	(0.108)	(0.101)	(0.103)
Equity volatility 3yr avg rank	0.097*	0.161***	0.090	0.145***	0.185***
	(0.056)	(0.055)	(0.057)	(0.052)	(0.057)
Log number employees	0.333***	0.320***	0.279***	0.334***	0.390***
	(0.057)	(0.056)	(0.057)	(0.055)	(0.060)
N	381	379	404	381	393
F-Statistic	13.04***	13.55***	11.62***	14.33***	15.01***

Notes: Dummy variables are also included for 1-digit SIC industry. The measure of firm performance is the ranking from 1 to 5, by Nikkei NEEDS, of the mean value over three years of Tobin's q. All data are from 2012, unless otherwise indicated. Standard errors are reported in parentheses, beneath the parameter estimates. Probability values are based on a t-statistic for a two-tailed test of significance. * indicates $p < 0.10$; ** indicates $p < 0.05$; *** indicates $p < 0.01$.

CONCLUSION

Studies of, the impact on firm performance of higher utilization of women have produced mixed results, but most of these have focused on women directors, senior executives, or employees, or have been conducted in countries with much higher rates of female managerial participation than in Japan. They also have tended not to examine higher-order terms in the relationship between such participation rates and firm valuation. This research is meant to address these gaps, both by testing specifically the female manager ratio's association with firm performance, in a robust way, and also by more fully mapping out the contours of this complex relationship.

After controlling for size, industry, and various accounting, capital structure, compensation policy, and corporate governance indicators, the authors find statistically significant positive relationships between firm

performance and both the percentage of managers who are women and, more broadly, gender diversity, in both management and total workforce. The effect due to female managers appears to be independent of the proportion of women among all employees, with no evidence that a long lag (in excess of three years) is required for it to be realized. Moreover, the significance of this effect remained even when performing analyses that correct for possible endogeneity, making the possibility that the results are due to reverse causation unlikely.

Furthermore, this analysis yields, in the case of managers, that these relationships exhibit negative curvature, with diminishing returns to higher proportions of women and greater gender diversity, although such a negative effect for high levels of diversity is not found for the only case considered involving all employees. Hence, these results in this regard resemble those of Richard, Barnett, Dwyer, and Chadwick (2004) for the United States but not Ali et al. (2011) for Australia. One question that this study raises, but cannot answer, is whether the positive effect of a higher female manager ratio can be attributed solely to the positive effect of more gender diversity, but in two out of three analyses involving women managers, this appears to be a strong possibility. A possible direction for future research would be to conduct analyses capable of testing against one another the various hypothesized mechanisms by which higher women's managerial participation leads to better firm performance.

Another line of inquiry that could be fruitful to pursue in subsequent studies would be to seek variables that may moderate these relationships between firm performance and female managerial representation. The aforementioned study of Ali et al., as well as that of Siegel and Kodama (2011), used a dichotomous classification of companies as manufacturing or services. However, when a similar analysis is performed on the data set of this study, using the same industry typing as Ali et al., no significant difference in these relationships is observed when manufacturing and services firms are analyzed separately, nor are the effects of the (non-significant) differences consistent across analyses involving different measures of women's managerial participation. It may be that the categories "manufacturing" and "services" are too broad and not sufficiently distinct to derive meaningful comparisons between them. In subsequent investigations, the authors intend to focus on other axes along which companies may lie that do moderate this relationship; for example, the degree of innovation (similarly utilized by Richard et al. (2004) and Deszo and Ross, (2012)) or the degree to which a company follows traditional Japanese HRM practices that may fulfill this role.

Among the limitations of this study is that it is cross-sectional, relying on only firm performance data for one period. In addition, only approximately 40% of the more than 1,000 companies in the database have a complete set of data to perform any of the analyses. Another major qualification is that for most companies the proportion of women managers was so low, averaging under 4%, that extrapolating to very high female manager ratios, where the negative quadratic effects become significant, is difficult. Furthermore, at these low levels of this ratio, the difference between the ratio itself and the Blau index for manager gender diversity becomes negligible, making it difficult to distinguish benefits accruing to more women managers from those deriving from more gender diversity in general.

Nonetheless, these results offer new, robust evidence for a link between Japanese firm performance and women's managerial participation. Japanese firms would be wise to avail themselves of this readily accessible source of competitive advantage.

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