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Do women managers keep firms out of trouble? Evidence from corporate litigation and policies☆

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ABSTRACT

We find that firms where women have more power in the top management team, measured by female executives' plurality and pay slice, face fewer operations-related lawsuits. This effect is robust to several treatments of endogeneity and does not appear to be driven by female executives' greater willingness to settle the cases. Evidence from a simultaneous equations approach suggests that firms where women executives have more power avoid lawsuits partly by avoiding some risky but value-increasing firm policies, such as more aggressive R&D, intensive advertising, and policies inimical to other parties.

1. Introduction

Companies are frequently sued by various parties. For example, Walmart faces about five thousand small and large lawsuits every year by parties such as employees, customers, suppliers and competitors.[1] Similarly, Apple fights numerous lawsuits over technology patent infringements every year. Companies spend considerable resources to avoid and defend themselves against lawsuits.[2] This paper investigates a potential economic rationale for firms to adopt policies that subject them to lawsuits. The pursuit of profitable opportunities obviously requires firms to assume risk, including litigation risk. So there is likely an optimal level of lawsuits reflecting risky, but value-increasing, underlying firm policies. Accordingly, we examine whether some lawsuits arise because certain firm policies aimed at increasing shareholder wealth upset other groups such as customers, employees, suppliers, competitors, government and the community.

Specifically, we analyze the effect of top executives' personal risk preferences on the adoption of risky firm policies, future

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[1] See Forbes story, 'Wal-Mart Stands Up To Wave Of Lawsuits' at http://www.forbes.com/2005/11/09/wal-mart-lawsuits-cx_tvr_1109walmart.html.

[2] An estimate by John B. Henry in the Metropolitan Corporate Counsel (February 2008, p. 28) suggests that the annual direct litigation cost of Fortune 500 companies was a whopping $210 billion in 2006, i.e., about one-third of their after-tax profits that year.

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lawsuits against their firms, and firm valuation. We expect that having more risk-averse executives will lead to less risky firm policies and fewer future lawsuits. But reducing lawsuits may not be value enhancing. One problem with testing these hypotheses is that executives' risk-preference is an innate personality trait, which is largely unobservable. One observable proxy for their risk preference is their gender. Numerous studies have shown that female investors and executives are more risk-averse than their male counterparts. Female investors tend to invest more conservatively (see, e.g., Hudgens and Fatkin, 1985; Johnson and Powell, 1994; Sundén and Surette, 1998; and Bernasek and Shwiff, 2001), and female executives adopt safer corporate policies (see, e.g., Faccio et al., 2016; and Francis et al., 2015). Similarly, prior studies find that women also exhibit less overconfidence in decision-making (see, e.g., Estes and Hosseini, 1988) and less hubris about their abilities (e.g., Furnham et al., 2002). Moreover, women tend to be more trustworthy and more compliant with rules and regulations (see, e.g., Baldry, 1987; Barnett et al., 1994; Bernardi and Arnold, 1997; Fallan, 1999; and Beu et al., 2003). Therefore, we hypothesize that firms where women have more power in the top management team should adopt more conservative policies and consequently face fewer lawsuits in the future.

We measure women's power in management by two variables. The first is the presence of two or more women in the top management team. This variable draws on the critical mass theory (e.g., Granovetter, 1978; Kanter, 1977a,b) and empirical evidence on it (e.g., Torchia et al., 2011), which suggests that the ability to form alliances and coalitions should give women more power to pursue their preferences. The second is the sum of the pay slices of all female managers out of the group of top five managers in a firm. Motivated by Bebchuk et al. (2011), the pay slice measures the power and influence of women in the top management team.[3] Using data on the filing dates of lawsuits disclosed to the SEC in 10K filings as material pending litigation, we examine all types of newly-filed lawsuits against S&P 1500 firms each year during 2002 to 2011.

We ask two questions: what do companies do that leads to their being sued, and why? The existing literature that examines these questions mostly focuses on securities class action lawsuits (see e.g., Gande and Lewis, 2009; Kim and Skinner, 2012), which are mostly brought by shareholders and represent a small subset (about 10%) of all material lawsuits filed against firms. Most lawsuits against companies are brought by other stakeholders or competitors. One of our unique contributions is that we analyze non-securities lawsuits, which have been the subject of scant research, and study them separately from securities lawsuits. While the latter are brought mostly by shareholders and mainly concern financial and disclosure decisions, the former are brought by other parties and mainly concern operating decisions (henceforth, we refer to them as 'operating lawsuits'). As one of the first studies focused on operating lawsuits, our study is largely exploratory.

Consistent with our hypothesis, our baseline regressions find that firms where women have more power in the top management team face fewer operating lawsuits the following year.[4] This result holds with both our measures of women's power in management. This finding is robust to the inclusion of a number of firm-specific and executive-specific control variables and year and industry or firm fixed effects, and is supported by an analysis of changes to women's power in management. The results also hold when we use a matching method to estimate the treatment effect in year $t + 1$ of multiple women executives compared to a control sample of firms matched in year t that have similar characteristics important for risk and litigation but do not have multiple women executives. Finally, we provide some evidence of both a selection effect of women choosing to work for firms with a lower risk-taking culture and a treatment effect of women choosing lower-risk policies that invite fewer operating lawsuits. We do not find any significant relation between women's power in management and future securities lawsuits. However, we find a negative relation between the presence of women on the board and future securities lawsuits, a result also found by Cumming et al. (2015) using Chinese data.

The negative relation between women's power in management and future lawsuits can arise from two non-mutually exclusive mechanisms: (1) female executives adopt less risky and less litigation-prone corporate policies, and (2) female executives settle out of court more frequently and for larger settlement amounts. Our evidence supports the first mechanism and casts some doubt on the second. First, as discussed below, we identify three risky and litigation-prone firm policies and find that women's power negatively predicts their use. Second, both in terms of the number of settlements and their dollar values, post-filing settlements are unrelated to women's power in management in regressions of levels, and are negatively related to it in regressions of changes. While there is no data on settlements that occur before lawsuit filing, given the degree of risk-aversion of a defendant, the tendency to settle should be similar before and after lawsuit filing. But to the extent that the nature of pre- and post-filing settlements differs (e.g., pre-filing settlement may be more likely when lawsuit filing would be embarrassing for the defendant), our findings based on post-litigation settlements do not resolve this issue completely.

Finally, we attempt to uncover the underlying policies through which women's power in management affects lawsuits against firms. Specifically, using a simultaneous equations framework, we ask three questions: (1) Which policies make a firm more susceptible to lawsuits? (2) How does women's power in management affect such policies? and (3) How do these policies contribute to firm valuation? We focus on three policies: aggressive R&D, more intensive advertising and promotion, and policies that may benefit shareholders but create negative externalities for other parties. Estimates of our simultaneous equations system suggest that these three policies predict both more lawsuits against firms and higher firm valuation in the cross-section. Our evidence suggests that by avoiding such policies, firms with multiple women in the top management team face about 0.19 fewer operating lawsuits the

[3] Both measures rely on data reported in proxy statements on the compensation of the five highest-paid executives in a firm. To the extent that women executives are paid less than men, all else equal, these measures understate the role of women executives in a firm.

[4] Our tests focus on the lawsuit filing date rather than the dispute incidence date because data on the latter date is not available. However, as discussed in Section 3.5 below, most lawsuits tend to be filed fairly soon, usually within six months to a year after a party feels that it has suffered harm. Therefore, in our baseline tests, variables measuring female executives' power are lagged by one year relative to the lawsuit filing year. Our results are similar when we lag them by two or three years instead.

following year, but also forgo about 7% of firm valuation as measured by Tobin's Q. These results suggest that some lawsuits are a natural byproduct of value-increasing firm policies. Thus, fewer lawsuits against firms where women have more power suggest that women executives forego some risky and litigation-prone firm policies that are value-increasing.

Our results raise two important questions. First, what prompts some firms to hire multiple women executives? Second, why do firms hire female executives if they shy away from risky policies that may invite more lawsuits, but would benefit shareholders? The first question is important because firms may hire more female executives specifically to reduce lawsuits, or for other reasons that eventually contribute to fewer lawsuits and lower firm value. We do not find that changes in lawsuits lead to future changes in the number of female executives. In fact, our change regressions do not find changes in any firm level variable to strongly predict future increases in female executives. This result is perhaps not surprising because large changes in female leadership are likely a slow process and are infrequent. We experiment with level regressions and find some evidence that variation in the number of female managers is likely due to long-term and gradual changes caused by industry and location-level factors. While the lack of obvious short-term 'trigger events' (as opposed to potential long-term trends) is somewhat reassuring in that our results do not appear to be driven by the selection of women executives to deal with lawsuit-related events, we cannot rule out the possibility of such events. Lack of this knowledge limits our ability to claim that female executives *cause* policy changes responsible for fewer lawsuits against firms and decreases in firm value.

We now turn to the second question of why firms hire female executives if they avoid lawsuits at the cost of firm value. First, note that our findings do not imply that female executives' power is either good or bad for *overall* firm value. Analyzing the effect of female executives on all firm policies is riddled with formidable endogeneity issues and is beyond the scope of this paper. Our analysis is limited to a few specific firm policies that are both value-relevant and prone to lawsuits. In fact, our simultaneous equations suggest that female executives per se do not have a *direct* effect on value; all the effect comes from three policies that we analyze. If anything, the direct effect of multiple women executives is weakly positive. Moreover, several previous studies have uncovered positive aspects of female leadership in other specific situations. For example, Huang and Kisgen (2013) find that female executives adopt less risky but more sensible financing and investment policies. The market values their acquisition and debt issuance decisions more positively. Likewise, Faccio et al. (2016) find that firms with female top executives have higher survival rates and more stable profits. Therefore, our results likely point to an unintended consequence or a cost of hiring female executives.

2. Data and variables

2.1. Sample and data

We collect data for our analyses from several sources. The data on lawsuit filings comes from *Legal Cases* and *Legal Parties* modules of the Audit Analytics database. *Legal Cases* feed provides case data on civil litigation filed in a federal district court (except New Mexico) on matters filed in January 2000 or later involving public companies, disclosed to the SEC as material pending litigation. These cases are supplemented with securities class actions and SEC actions filed over the same time period. One advantage of our dataset is that we avoid the difficulty involved in separating significant lawsuits that are value-relevant from hordes of frivolous lawsuits. We broadly classify all lawsuits into securities and operating lawsuits. We collect data on newly filed cases during each year using filing dates reported in the feed. *Legal Parties* feed provides party data, such as party name, party status (i.e., plaintiff or defendant) and party's legal representation, for these cases.

We supplement this database with MSCI (formerly KLD and GMI) database on firms' ratings on various aspects of corporate social responsibility. Company financials and stock price-related variables come from CRSP-Compustat merged database. Data on the firms' executives, their personal characteristics, and compensation etc. come from Execucomp database, which reports this data for the five highest paid executives of S&P 1500 firms. Data on board members come from the Institutional Shareholder Services (ISS, formerly RiskMetrics) database. We obtain product market concentration and product similarity data, based on the product description sections of firms' 10-K filings, from Hoberg and Phillips (2016) data library. Complete coverage in *Legal Cases* and *Legal Parties* databases begins in 2002, so our sample period begins in 2002 and ends in 2011.

2.2. Main variables in the baseline analysis

Our main dependent variable of interest is lawsuits filed in which a firm is mentioned as a defendant in a given year. Audit Analytics classifies lawsuits into about 100 different types. One lawsuit can be classified into more than one type. We first count the number of lawsuits filed against a firm in a given year based on the date when the lawsuit was filed (*All Lawsuits*). We then separate the lawsuits into two broad categories: (1) lawsuits related to securities laws, *Securities Lawsuits,* indicated in Audit Analytics by the variable *IS_CATEGORY_TYPE_41*, and (2) lawsuits not related to securities laws, *Operating Lawsuits*, which are all other lawsuits.

Our main explanatory variable of interest is the lagged women's power in the top executive team. Based on the list of top executives reported for a firm in ExecuComp, we measure this variable in two different ways. The first proxy for women's power in management is the presence of two or more women in the top executive team (*Female Execs* ≥ 2), which is our measure of plurality. Our second proxy for women's power in management is the sum of all female executives' pay slice (*Female Exec. Pay Slice*), defined as the sum of the total compensation (TDC2) of all female executives scaled by the total compensation of all top executives. We also consider the effect of women's presence on the board, via an indicator variable for whether a firm has a female independent director in last year (*Female Indep. Dir. Indicator*).

Our main list of control variables includes firm size (Ln(Total Assets)) because larger firms face more lawsuits on average; firm age

because knowledge of various input and output markets gained from years of experience can affect lawsuits; stock returns and ROA[5] because lawsuits are often caused by poor financial performance, which can force the firm to dishonor its implicit and explicit contracts with other stakeholders; cash holding because firms with deep pockets are more likely to be targets of lawsuits; stock volatility and financial leverage because they measure risk-taking by a firm and because leverage limits discretionary cash holdings that can affect the incentives of potential plaintiffs to sue the firm. Finally, we control for board independence based on Malm and Mobbs (2016), who find that firms with more independent boards face fewer lawsuits of different kinds. All explanatory variables are lagged by a year relative to the lawsuit filing dates. Where applicable we control for year fixed effects to account for any time-trend in lawsuits, and industry fixed effects using Fama and French (1993) 48 industries to account for differences in litigation risk across industries. Other control variables used in our subsequent analysis are described in later sections.

3. Empirical analysis

3.1. Descriptive statistics

Table 1 presents frequency distributions of female executives, directors and lawsuits in our sample. We have data on the number of female executives and the number and type of lawsuits for 8388 firm-years in our sample. Of these, 5922 firm-years have no female executive, and the remaining 2466 have one or more women executives. Of the latter, 1918 firm-years have one woman executive and 548 have two or more. Similarly, 5823 of the firm-years have no lawsuits filed during the year, while the remaining 2565 have one or more lawsuit filings. In the latter group, 1471 firm-years have one lawsuit filing, 527 have two, and the remaining 567 have three or more. At least one operating (securities) lawsuit is filed in 2390 (368) firm-years. Altogether, 4888 (539) operating (securities) lawsuits were filed against our sample firms during the sample period.

We also have data on the number of female directors for 7745 firm-years in our sample. Of these, 2869 firm-years have no female director, 3048 have one such director, 1460 have two, and the remaining 368 have three or more.

Panel A of Table 2 shows summary statistics of our main variables of interest. All the variables are defined in the Appendix. The mean number of lawsuits is 0.61 per firm-year, of which 0.55 are operating lawsuits and 0.06 are securities lawsuits. About 29% of the firm-years have one or more female executives among its top five executives and 7% have two or more. The average pay slice of women executives is 0.05. The mean of natural log of Tobin's q in our sample is 0.52.

Panel B presents pairwise correlations between some of our main variables of interest. The correlations that are statistically significant at the 1% level or better are shown in bold. Interestingly, there is no significant correlation between our main lawsuit-related dependent variables and women's power in management. But obviously these bivariate correlations do not control for ‘other things’ and do not take into account the non-normal distributions of the lawsuit variables.

3.2. Are firms where women have more power sued less?

We next examine the relation between female executives and future corporate lawsuits in a regression framework. Our main dependent variable of interest, the number of lawsuits filed against a firm in a given year, is count data. So we first consider a Poisson model. But this variable exhibits greater variability than the Poisson distribution would predict and fails the equi-dispersion test. So we use the negative binomial model, which can be considered a generalization of the Poisson model and allows for over-dispersion in the dependent variable.[6]

Table 3 reports the results from the negative binomial regression model. Panel A presents the results of *All Lawsuits* as the dependent variable. The regression model controls for other potential determinants of corporate litigation in the literature such as firm size, firm age, profitability, stock return, return volatility, leverage and female directors (see, e.g., Hutton et al., 2015; and Malm and Mobbs, 2016). These variables are briefly described in Section 2.2. The Appendix defines all the variables used in the main analysis. All the models include year and Fama and French (1993) 48 industry fixed effects.

Column 1 of Table 3, Panel A reports the results of the regression of *All Lawsuits* in year $t + 1$ on *Female Execs = 1,* which indicates the presence of one woman in the top executive team, and *Female Execs ≥ 2*, which indicates the presence of two or more female executives. The presence of just one woman in the top executive team is unlikely to give her much sway over corporate policies. But the presence of multiple women in the team allows them to form coalitions and gives them greater power and influence over firm policies. Consistent with this idea, in column 1, *Female Execs = 1* has no effect on lawsuits, but *Female Execs ≥ 2* predicts the number of lawsuits next year negatively and significantly.[7]

The nature of securities lawsuits is quite different from operating lawsuits. As discussed in the introduction, the former are mostly brought by shareholders and usually concern stock price declines and disclosure issues, while the latter involve operating decisions

[5] Our subsequent results are similar if we use the ratio of OIBD/Sales, instead of ROA, to measure financial performance. OIBD is operating income before depreciation and ROA is return on assets. While the latter is affected by a firm's choice of leverage, the former is not.

[6] Nevertheless, our results are qualitatively similar when we use a Poisson model, instead.

[7] In an untabulated test, we replace the two indicator variables for *Female Execs* in this regression by a *Female Executive Indicator (0/1)* variable. The coefficient on the latter indicator variable is negative but statistically insignificant. This result suggests that merely having *a* woman in the top management team does not predict the number of lawsuits against a firm. As shown in Table 1, firm-years with non-zero women executives have mostly just one woman, which swamps the effect of multiple women that we see in the regression in column (1).

Table 1
Distribution of female executives and directors.

Executives No. of Female Execs	Freq.
0	5922
1	1918
2	446
3	84
4	14
5	4

Female Execs = 1	Freq.
0	6470
1	1918

Female Execs ≥ 2	Freq.
0	7840
1	548

Independent Directors

Female Ind Dir Count	Freq.
0	2869
1	3048
2	1460
3	294
4	67
5	6
6	1

Female Ind Dir = 1	Freq.
0	4697
1	3048

Female Ind Dir ≥ 2	Freq.
0	5917
1	1828

Lawsuits per year All Lawsuits	Freq.	Operating	Freq.	Securities	Freq.
0	5823	0	5998	0	8020
1	1471	1	1396	1	307
2	527	2	487	2	39
3	223	3	204	3	10
4	128	4	113	4	4
5	70	5	64	5	1
6	35	6	30	6	2
7	25	7	24	7	1
8	23	8	21	8	1
9	18	9	15	9	1
≥ 10	45	≥ 10	36	≥ 10	2

and are brought by other parties. So, we next examine in columns 2 and 3 whether a significant presence of female executives has a similar effect on the two types of lawsuits. We find that women's power negatively predicts only operating lawsuits in year $t + 1$; it has no significant effect on securities lawsuits. This is an important finding and is consistent with the notion that managers, who are mainly responsible for company operations, only affect operating lawsuits.[8] In terms of economic significance, the coefficient estimate on *Female Execs ≥ 2* from column 2 suggests that compared to having no woman in the top executive team, having two or more

[8] In another untabulated test, we replace the two indicator variables for *Female Execs* in this regression by three overlapping variables: *Female Execs ≥ 1, Female Execs ≥ 2*, and *Female Execs ≥ 3*. Consistent with our main results, we find that almost all the effect of women's power on operating lawsuits comes from *Female Execs ≥ 2*, whose coefficient remains negative and statistically significant. The incremental effect of *Female Execs ≥ 3* is negative, but smaller in magnitude and statistically insignificant *(−0.190, t = −0.81)*, consistent with diminishing marginal returns. None of the three female executive variables significantly predicts securities lawsuits.

Table 2.
Summary Statistics and correlations.

Panel A of this table presents summary statistics of the variables in our analysis. Panel B presents pairwise Pearson correlations among some key variables of interest. In panel B, all boldfaced coefficients are statistically significant at the 1% level or better.

Panel A: Summary statistics

	N	Mean	SD	P10	P25	Median	P75	P90
All Lawsuits	8341	0.61	1.55	0	0	0	1	2
Securities Lawsuits	8341	0.06	0.45	0	0	0	0	0
Operating Lawsuits	8341	0.55	1.44	0	0	0	1	2
Female Execs ≥ 2	8341	0.07	0.25					
Female Execs = 1	8341	0.23	0.42					
Female Exec. Pay Slice	8341	0.05	0.11	0.00	0.00	0.00	0.06	0.18
Female Indep. Dir. Indicator	8341	0.60	0.49					
Excess R&D	8341	0.00	0.06	−0.04	−0.03	−0.02	0.01	0.06
Excess Capex	8341	0.00	0.05	−0.04	−0.03	−0.01	0.01	0.05
Excess Aquis.	8341	0.00	0.12	−0.04	−0.04	−0.03	−0.01	0.06
Advtg. Intensity	8341	0.01	0.03	0.00	0.00	0.00	0.01	0.04
CSR Concerns	7440	1.78	1.95	0	0	1	2	4
Board Independence	8341	0.71	0.15	0.50	0.63	0.75	0.83	0.89
Ln(Total Assets)	8341	7.48	1.49	5.68	6.42	7.33	8.39	9.57
Firm Age	8341	26.13	16.14	8.00	12.00	21.00	40.00	52.00
Stock Return	8341	0.02	0.45	−0.52	−0.19	0.07	0.29	0.51
Stock Volatility	8341	−7.34	0.89	−8.46	−7.96	−7.40	−6.76	−6.14
ROA	8341	0.03	0.17	−0.05	0.02	0.05	0.09	0.13
Cash to Assets	8341	0.28	0.58	0.01	0.03	0.11	0.31	0.69
Ln(Total Compensation)	8294	8.05	1.17	6.72	7.35	8.09	8.77	9.40
Market Concentration	8300	0.23	0.19	0.07	0.10	0.16	0.29	0.48
Book Leverage	8341	0.20	0.17	0.00	0.04	0.19	0.31	0.42
Managers' Avg. Vega (in $000)	8225	73.56	125.37	4.96	13.33	33.49	80.84	178.38
Managerial Ownership (×1000)	8341	32.89	67.82	0.95	2.74	7.99	23.90	92.73
Ln(Sales)	8341	7.41	1.55	5.54	6.37	7.29	8.38	9.53
Gross Margin	8337	0.40	0.21	0.16	0.25	0.37	0.53	0.70
Product Similarity	8300	2.98	3.17	1.08	1.25	1.81	3.37	5.99
CSR Strengths	7440	1.81	2.65	0	0	1	2	5
Ln(Tobin's Q)	8341	0.52	0.46	0.00	0.18	0.44	0.78	1.14
Ln(Market Share)	8341	−4.80	1.76	−7.06	−6.11	−4.84	−3.52	−2.41
# Business Segments	8341	2.61	1.60	1.00	1.00	2.00	4.00	5.00
# Settlement	2874	0.12	0.37	0	0	0	0	1.00
Ln($ Settlement)	2874	1.74	5.13	0.00	0.00	0.00	0.00	13.74

Panel B: Pearson correlations among key variables of interest

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
All Lawsuits	(1)	1																															
Securities Lawsuits	(2)	**0.38**	1																														
Operating Lawsuits	(3)	**0.96**	**0.09**	1																													
Female Execs ≥ 2	(4)	-0.01	0.00	-0.01	1																												
Female Execs=1	(5)	0.01	0.00	0.01	**-0.15**	1																											
Female Exec. Pay Slice	(6)	0.00	0.00	0.00	**0.65**	**0.38**	1																										
Female Indep. Dir. Indicator	(7)	**0.14**	0.01	**0.14**	**0.08**	**0.04**	**0.07**	1																									
Excess R&D	(8)	**0.06**	0.02	**0.06**	**-0.03**	**-0.03**	**-0.03**	**-0.10**	1																								
Excess Capex	(9)	-0.02	-0.02	-0.02	0.02	**-0.03**	0.00	**-0.04**	**-0.09**	1																							
Excess Aquis	(10)	-0.02	-0.02	-0.01	0.00	0.02	0.01	**-0.04**	**0.07**	0.01	1																						
Advtg. Intensity	(11)	**0.09**	**0.04**	**0.08**	**0.06**	**0.04**	**0.08**	**0.07**	-0.02	-0.01	0.00	1																					
CSR Concerns	(12)	**0.26**	**0.03**	**0.27**	**-0.06**	**-0.03**	**-0.07**	**0.12**	**-0.10**	0.00	**-0.04**	-0.01	1																				
Board Independence	(13)	**0.07**	0.00	**0.08**	-0.01	**0.03**	0.02	**0.29**	**0.03**	**-0.03**	-0.01	-0.03	**0.17**	1																			
Ln(Total Assets)	(14)	**0.35**	**0.07**	**0.35**	**-0.04**	0.02	**-0.05**	**0.38**	**-0.21**	**-0.03**	**-0.06**	**0.04**	**0.54**	**0.18**	1																		
Firm Age	(15)	**0.13**	0.00	**0.14**	**-0.04**	0.01	-0.02	**0.29**	**-0.16**	**-0.07**	**-0.04**	**-0.03**	**0.36**	**0.21**	**0.42**	1																	
Stock Return	(16)	0.00	**-0.03**	0.01	**-0.03**	-0.01	**-0.03**	**0.03**	**-0.04**	**0.09**	**0.06**	-0.01	0.01	-0.01	0.01	**0.03**	1																
Stock Volatility	(17)	**-0.11**	0.00	**-0.12**	0.00	**-0.03**	0.00	**-0.25**	**0.18**	-0.02	**-0.04**	**-0.05**	**-0.13**	**-0.07**	**-0.39**	**-0.27**	**-0.26**	1															
ROA	(18)	**0.04**	0.00	**0.04**	0.02	0.01	0.02	**0.08**	**-0.24**	**0.08**	**0.05**	0.01	-0.01	0.03	**0.14**	**0.08**	**0.29**	**-0.34**	1														
Cash to Assets	(19)	0.00	0.00	0.00	0.01	-0.01	0.01	**-0.14**	**0.40**	**-0.07**	**0.03**	0.02	**-0.11**	-0.01	**-0.25**	**-0.18**	0.01	**0.17**	**-0.12**	1													
Ln(Total Compensation)	(20)	**0.11**	**0.05**	**0.10**	-0.01	0.02	**-0.05**	**0.27**	**-0.05**	-0.01	0.01	**0.05**	**0.29**	**0.18**	**0.59**	**0.24**	0.02	**-0.25**	**0.10**	**-0.10**	1												
Market Concentration	(21)	**-0.06**	-0.02	**-0.06**	0.00	-0.02	-0.01	**0.05**	**-0.13**	**-0.06**	0.01	**0.03**	-0.02	0.02	**-0.09**	**0.06**	0.02	**-0.06**	**0.03**	**-0.08**	**-0.08**	1										
Book Leverage	(22)	0.00	0.01	-0.01	**-0.04**	0.01	**-0.04**	**0.11**	**-0.15**	-0.02	**-0.04**	0.01	**0.13**	**0.06**	**0.28**	**0.14**	**-0.07**	-0.02	**-0.13**	**-0.18**	**0.14**	0.02	1									
Managers' Avg. Vega	(23)	**0.28**	**0.09**	**0.28**	-0.02	0.02	**-0.03**	**0.19**	**0.03**	**-0.04**	**-0.03**	**0.13**	**0.24**	**0.04**	**0.53**	**0.18**	**0.03**	**-0.27**	**0.10**	**-0.04**	**0.43**	**-0.07**	0.02	1								
Managerial Ownership	(24)	**-0.05**	-0.01	**-0.05**	-0.02	**-0.03**	-0.01	**-0.16**	**-0.04**	**0.05**	-0.01	**0.07**	**-0.10**	**-0.30**	**-0.19**	**-0.14**	**0.04**	**0.06**	**0.03**	0.02	**-0.24**	0.01	**-0.10**	**-0.08**	1							
Lag(Q)	(25)	**0.08**	0.02	**0.08**	**0.04**	0.01	0.02	-0.01	**0.28**	**0.11**	**0.06**	**0.11**	**-0.11**	**-0.03**	**-0.12**	**-0.17**	**0.31**	**-0.19**	**0.21**	**0.23**	**0.06**	-0.01	**-0.24**	**0.17**	**0.05**	1						
Ln(Sales)	(26)	**0.32**	**0.06**	**0.33**	-0.02	**0.03**	-0.02	**0.43**	**-0.31**	**-0.04**	**-0.06**	**0.05**	**0.53**	**0.17**	**0.92**	**0.45**	**0.03**	**-0.40**	**0.21**	**-0.35**	**0.54**	**-0.04**	**0.21**	**0.46**	**-0.14**	**-0.10**	1					
Gross Margin	(27)	**0.09**	**0.04**	**0.08**	**0.05**	0.00	**0.06**	**-0.05**	**0.27**	**0.04**	**0.05**	**0.21**	**-0.16**	0.02	**-0.07**	**-0.19**	**0.03**	**-0.05**	**0.15**	**0.13**	**0.05**	**-0.06**	**-0.15**	**0.15**	**-0.02**	**0.37**	**-0.22**	1				
Product Similarity	(28)	**0.05**	0.02	**0.05**	0.02	0.01	0.02	**-0.10**	**0.43**	**0.09**	0.00	**-0.03**	**-0.08**	-0.02	**-0.05**	**-0.20**	**-0.05**	**0.13**	**-0.12**	**0.36**	**0.04**	**-0.34**	**-0.04**	**0.06**	-0.02	**0.14**	**-0.19**	**0.25**	1			
CSR Strengths	(29)	**0.33**	**0.07**	**0.33**	**0.11**	**0.08**	**0.16**	**0.32**	**0.03**	**-0.03**	**-0.04**	**0.13**	**0.39**	**0.20**	**0.58**	**0.33**	-0.02	**-0.21**	**0.06**	**-0.06**	**0.32**	**-0.05**	**0.04**	**0.42**	**-0.14**	**0.08**	**0.55**	**0.08**	-0.02	1		
Ln(Tobin's Q)	(30)	**0.08**	0.01	**0.08**	**0.03**	-0.01	0.00	-0.01	**0.27**	**0.06**	**-0.03**	**0.10**	**-0.13**	-0.03	**-0.13**	**-0.14**	**0.18**	**-0.11**	**0.14**	**0.22**	**0.03**	0.00	**-0.20**	**0.14**	**0.05**	**0.82**	**-0.11**	**0.33**	**0.12**	**0.06**	1	
Ln(Market Share)	(31)	**0.23**	**0.04**	**0.23**	**-0.05**	0.01	**-0.06**	**0.36**	**-0.28**	**-0.08**	**-0.04**	**0.07**	**0.42**	**0.13**	**0.73**	**0.42**	**0.04**	**-0.36**	**0.18**	**-0.34**	**0.44**	0.00	**0.26**	**0.37**	**-0.13**	**-0.09**	**0.78**	**-0.21**	**-0.27**	**0.44**	**-0.09**	1
# Business Segments	(32)	**0.08**	0.02	**0.08**	**-0.04**	-0.02	**-0.05**	**0.13**	**-0.12**	**-0.10**	0.02	**-0.07**	**0.18**	**0.09**	**0.29**	**0.33**	**0.03**	**-0.17**	**0.04**	**-0.17**	**0.16**	**0.07**	**0.09**	**0.12**	**-0.07**	**-0.14**	**0.29**	**-0.16**	**-0.20**	**0.17**	**-0.12**	**0.32**	1

female executives reduces the predicted number of next year's operating lawsuits by 0.08, when all other variables take their mean values. This reduction is non-trivial, considering that the unconditional mean (median) number of such lawsuits is only 0.55 (0).

On the other hand, gender diversity on the board seems to affect securities lawsuits only. This is another important finding. Board composition matters for securities lawsuits likely because securities lawsuits mainly involve disclosure and governance issues, where the board plays a direct oversight role (see, e.g., Brochet and Srinivasan, 2014; Ferris et al., 2003; and Strahan, 1998). Our finding of a negative relation between board gender diversity and securities lawsuits is consistent with those of Cumming et al. (2015) for

Table 3.
Analysis of levels: Negative binomial models of the number of securities and operating lawsuits filed against firms.

The table presents negative binomial models of the number of lawsuits filed against a firm in year ($t + 1$) on variables measuring the power of women executives in the top management team and control variables in year *t*. The sample consists of firms included in both Execucomp and Audit Analytics databases over the years 2002 to 2011. All the variables are defined in the Appendix. The power of women executives is measured using the number of female executives in panel A and female executives' pay slice in panel B. In both Panels, model (1) is for all lawsuits, (2) is for operating lawsuits and (3) is for securities lawsuits. All the models include year and Fama-French 48 industry fixed effects. Standard errors are corrected for heteroscedasticity and clustered within a firm, and *t*-statistics are in parentheses. *, **, and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Panel A: Using the number of female executives

	(1) All Lawsuits$_{t+1}$	(2) Operating Lawsuits$_{t+1}$	(3) Securities Lawsuits$_{t+1}$
Female Execs ≥ 2	−0.212** (−2.28)	−0.258*** (−2.65)	0.246 (1.01)
Female Execs = 1	0.019 (0.28)	0.004 (0.05)	0.122 (0.79)
Female Indep. Dir. Indicator	0.001 (0.02)	0.043 (0.58)	−0.273* (−1.85)
Board Independence	0.282 (1.29)	0.342 (1.49)	−0.065 (−0.15)
Ln(Total Assets)	0.586*** (22.99)	0.595*** (22.25)	0.492*** (8.99)
Firm Age	0.002 (0.76)	0.002 (0.92)	−0.004 (−0.79)
Stock Return	−0.150** (−2.47)	−0.041 (−0.63)	−0.788*** (−5.13)
Stock Volatility	0.167*** (3.49)	0.134*** (2.76)	0.425*** (4.12)
ROA	0.177 (0.85)	0.141 (0.63)	0.562 (1.40)
Cash to Assets	0.102* (1.72)	0.095 (1.59)	0.108 (1.27)
Book Leverage	−0.825*** (−4.29)	−0.920*** (−4.66)	−0.033 (−0.07)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	8341	8341	8341
Pseudo R^2	0.128	0.136	0.091

Panel B: Using female executives' pay slice

	(1) All Lawsuits$_{t+1}$	(2) Operating Lawsuits$_{t+1}$	(3) Securities Lawsuits$_{t+1}$
Female Exec. Pay Slice	−0.539** (−2.42)	−0.578** (−2.45)	−0.056 (−0.11)
Female Indep. Dir. Indicator	−0.002 (−0.03)	0.039 (0.52)	−0.264* (−1.78)
Board Independence	0.298 (1.36)	0.357 (1.56)	−0.057 (−0.13)
Ln(Total Assets)	0.584*** (22.86)	0.594*** (22.13)	0.487*** (8.82)
Firm Age	0.002 (0.79)	0.002 (0.95)	−0.004 (−0.76)
Stock Return	−0.150** (−2.48)	−0.041 (−0.63)	−0.786*** (−5.15)
Stock Volatility	0.168*** (3.53)	0.135*** (2.78)	0.428*** (4.15)
ROA	0.171 (0.83)	0.133 (0.60)	0.568 (1.41)
Cash to Assets	0.101* (1.72)	0.095 (1.59)	0.104 (1.23)
Book Leverage	−0.822*** (−4.26)	−0.918*** (−4.64)	−0.009 (−0.02)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	8341	8341	8341
Pseudo R^2	0.128	0.136	0.091

China. We focus on our new contribution of women's power in management on operating lawsuits and its implications.

In panel B of Table 3, we use the pay slice of female executives as our second measure of women's power in management and estimate regressions similar to those in columns (1) to (3) of Panel A. This alternative measure also obtains a negative and statistically significant coefficient in predicting next year's operating lawsuits. In particular, firms where women managers have more power, as measured by their pay slice, face fewer operating lawsuits in year $t + 1$. However, female managers' power is unrelated to next years' securities lawsuits.[9] In terms of economic significance, the results in column (2) suggest that compared to a firm with *Female Exec. Pay Slice* of zero, a firm with a 20% pay slice (equivalent to one female executive with a pay slice equal to that of each of the other four top executives), faces 0.036 fewer operating lawsuits. This effect is sizeable, but understandably smaller than that of *Female Execs ≥ 2*.

Most control variables assume expected signs. Not surprisingly, larger firms face more lawsuits of both kinds. This finding is consistent with their more complex operations that give rise to more disputes, and their deeper pockets that make them more

[9] We use two proxies for women's power in management to ensure that our results are not sensitive to our variable choice. However, the two measures are not quite independent. As seen in Panel B of Table 2, the correlation between *Female Execs ≥ 2* and *Female Exec. Pay Slice* is a whopping 0.65. When we include both variables in the same regression, the latter subsumes the effect of the former in operating lawsuits, while the two variables take opposite signs for securities lawsuits, likely reflecting multicollinearity. We believe that our count-based variable is a cleaner measure of power and coalitions than pay slice because the latter may also be subject to governance issues (see, e.g., Bebchuk et al., 2011). So we present most of the results in the paper based on the count-based measure. However, our results go in the same direction regardless of which measure we use.

Table 4.
Effect of Female Execs ≥ 2 among nearest neighbor matched sample.

The table presents the results of a nearest neighborhood matched treatment effects model. For each treated firm (*Female Execs ≥ 2*), we find up to two control firms in the same year, Fama-French 48 industry and the presence or absence of a female independent director that do not have *Female Execs ≥ 2* and have the minimum Mahalanobis distance based on the continuous variables listed below the table. Firms are matched one year prior to the lawsuit filing year. The Mahalanobis distance between two firms j and k is given by $\sqrt{(\boldsymbol{x}_j - \boldsymbol{x}_k)' W_x^{-1} (\boldsymbol{x}_j - \boldsymbol{x}_k)}$, where $\boldsymbol{x}$ is a vector of covariates and W is the variance-covariance matrix of the covariates. *, **, and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Operating Lawsuits_{t+1}	*Coef.*	*z*	*N*
Avg. Treatment Effect (ATE):			
Female Execs ≥ 2	−0.236***	−3.76	1728
Matching variables:			
Exact: Year, Fama-French 48 industry, Female Indep. Dir. Indicator			
Nearest neighbor: Ln(Total Assets), Firm Age, Stock Return, Stock volatility, ROA			

attractive targets of lawsuits. Consistent with the idea that a large stock price decline is the core trigger for securities lawsuits, the coefficient of prior stock returns is significantly negative in regressions of securities lawsuits, as previously found in Kim and Skinner (2012). While this coefficient is also negative in regressions of operating lawsuits, its magnitude is much smaller and statistically insignificant. Perhaps these negative stock returns reflect operational (cash flow) difficulties leading to nonperformance of contracts and to lawsuits. Having more cash attracts more lawsuits of both kinds, though its coefficient is statistically significant only for operating lawsuits. Book leverage negatively predicts operating lawsuits, plausibly because financial risk posed by higher leverage discourages managers from taking more operational risk, resulting in fewer lawsuits. While stock volatility positively predicts both types of lawsuits, the effect is much larger for securities lawsuits, where adverse stock price movements (which affect stock volatility) are often at the heart of the cases.

3.3. Is the relation between female executives and lawsuits driven by self-selection?

Our baseline models yield a robust negative relation between women's power in management and operating lawsuits. This observed relation can be a result of two non-mutually exclusive processes. The first is the self-selection, i.e., firms and executives select each other based on firm culture and individual preferences. For example, some companies likely have a culture of avoiding excessive risk to avoid lawsuits. Female executives, who tend to be more risk-averse than their male counterparts, may choose to work for these firms, which may find that women fit their risk-averse culture better. The second explanation is a causal effect, i.e., women's power in management leads a firm to adopt safer policies that avoid the risk of lawsuits. Our tests are motivated by theories and previous empirical findings of managerial risk aversion. But our conclusions are not dependent on the evidence of strict causality. In fact, female executives choosing to work for firms with a culture of lower risk-taking is also consistent with female executives' greater risk-aversion. Nevertheless, we try to distinguish between the selection and treatment effects using three approaches.

First, we conduct a matched sample analysis where we match the firms with Female Execs ≥ 2 to firms without them in the previous year, based on firm characteristics important for risk and litigation. We match the samples based on the nearest neighbor of continuous variables (Ln(Total Assets), Firm Age, Stock Return, Stock volatility, and ROA), and exact match by year, Fama and French 48 industry and the presence or absence of female directors. Table 4 shows that firms where female executives have more power (*Female Execs ≥ 2*) in year t face fewer lawsuits in year $t + 1$ when compared to a sample of firms with very similar risk characteristics in year t. The average treatment effect (ATE) implies that firms with multiple women top executives face 0.236 fewer operating lawsuits per year compared to the control sample.[10] This effect is quite large compared to the average annual number of 0.55 such lawsuits against a sample firm. This result is consistent with our main regression analysis and the treatment effect model results in Table 9 below. This result suggests a treatment effect of female executives on lawsuits, as opposed to a selection effect, because we compare lawsuits in year $t + 1$ faced by two groups of firms that have similar probabilities of having multiple female executives and similar risks in year t, but one group has multiple female executives and the other does not. However, our matching variables may not be good enough. This is a general limitation of any matched sample analysis, which depends on *observable* and imperfectly measured firm characteristics. Given this limitation, we cannot entirely rule out the possibility that an omitted variable may be driving both the increase in female executives and the decrease in lawsuits.

Second, we use a firm-fixed effects model that relates within-firm variation in female power in management to variation in lawsuits against firms. This model controls for fixed firm-specific factors (both observable and unobservable) such as firm culture and industry practices, which tend to be slow-moving and therefore unlikely to change within our sample period. In untabulated results,

[10] The results are similar (ATE = −0.297, z-statistic = −3.39) when the set of matching variables also includes Advtg. Intensity, CSR Concerns and R&D/Assets, which we discover as litigation-prone firm policies in section 4 below. Because these three are outcome variables (i.e., firm policies), rather than control variables, we tabulate the results of the model without these as matching variables.

Table 5.
Change analysis: Regressions of changes in the number of lawsuits against a firm on changes in the number of female executives.

The table presents OLS regressions of the percentage change in the number of lawsuits filed against a firm in year $(t + 1)$ from year t on changes in the number of female executives in year t from year $t - 1$and in year $t - 1$ from year $t - 2$, and changes in control variables in year t from year $t - 1$. **%Δ** denotes the first difference in the natural log of one plus the number of respective lawsuits. Models (1) to (3) are for changes in operating lawsuits: (1) is for the full sample, (2) is for the sub-sample of firm-years with non-zero changes in these lawsuits, and (3) is for the sub-sample of firm-years with non-zero changes in the number of female executives. Models (4) and (5), (6) are defined similarly for securities lawsuits. The sample consists of firms included in both Execucomp and Audit Analytics databases from the years 2002 to 2011. The variables are defined in the Appendix. All models include Fama-French 48 industry and year fixed effects. Standard errors are corrected for heteroscedasticity and clustered within a firm, and *t*-statistics are in parentheses. *, **, and *** denote statistical significance at 10%, 5% and 1% levels respectively.

	(1) %Δ Operating Lawsuits$_{t+1}$	(2) %Δ Operating Lawsuits$_{t+1}$ (Given Δ ≠ 0)	(3) %Δ Operating Lawsuits$_{t+1}$ (Given ΔFemExec ≠ 0)	(4) %ΔSecurities Lawsuits$_{t+1}$	(5) %ΔSecurities Lawsuits$_{t+1}$ (Given Δ ≠ 0)	(6) %ΔSecurities Lawsuits$_{t+1}$ (Given ΔFemExec ≠ 0)
Δ(Female Execs ≥ 2)	−0.074** (−2.20)	−0.243** (−2.39)	−0.243** (−2.39)	−0.006 (−0.35)	−0.123 (−0.39)	−0.008 (−0.36)
Δ(Female Execs ≥ 2)$_{t-1}$	−0.033 (−0.86)	−0.096 (−0.92)	−0.096 (−0.92)	0.006 (0.25)	−0.045 (−0.15)	−0.001 (−0.03)
ΔFemale Indep. Dir. Indicator	0.015 (0.52)	0.076 (0.96)	0.076 (0.96)	−0.013 (−1.10)	−0.274 (−1.61)	−0.027 (−0.63)
Δ Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	5286	1888	1888	5286	380	536

Table 6.
Do past changes in lawsuits predict changes in women executives' power?

Columns (1) to (3) of the table present OLS regressions of variables measuring changes in the power of women executives in the top management team in year ($t + 1$) from year t on the percentage change in the number of lawsuits filed against a firm and control variables in year t from year $t - 1$. Column (3) is for the sub-sample of firm-years with non-zero changes in the number of operating lawsuits. Column (4) presents OLS regressions where both the dependent and explanatory variables are in levels. **%Δ** denotes the first difference in the natural log of one plus the number of respective lawsuits. The power of women executives is measured using the number of female executives. The sample consists of firms included in both Execucomp and Audit Analytics databases from the years 2002 to 2011. All the variables are defined in the Appendix. All the models include Fama-French 48 industry and year fixed effects. Standard errors are corrected for heteroscedasticity and clustered within a firm, and *t*-statistics are in parentheses. *, **, and *** denote statistical significance at 10%, 5% and 1% levels respectively.

	(1) Δ(Female Execs ≥ 2)$_{t+1}$	(2) Δ(Female Execs ≥ 2)$_{t+1}$	(3) Δ(Female Execs ≥ 2)$_{t+1}$ (Given %Δ Operating Lawsuits ≠ 0)	(4) (Female Execs ≥ 2)$_{t+1}$ (Levels)[a]
%ΔSecurities Lawsuits[a]	−0.014 (−1.12)		−0.018 (−1.04)	−0.007 (−0.48)
%ΔOperating Lawsuits[a]		−0.004 (−0.72)	−0.003 (−0.60)	−0.001 (−0.08)
ΔFemale Indep. Dir. Indicator[a]	0.013 (1.58)	0.013 (1.56)	−0.012 (−0.96)	0.040*** (3.70)
Δ Firm controls[a]	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
State FE	No	No	No	Yes
N	6273	6273	2182	6856
Adj. R^2	(0.003)	(0.003)	(0.008)	0.080
Adj. R^2 without Industry and State FE				0.016

[a] In column 4, all the variables are in levels.

we show the results of firm-fixed effects models corroborate those from the baseline models. We find that both our measures of women's power in management predict operating lawsuits negatively and significantly; they do not predict securities lawsuits. Since the variation in women's power *within a firm* predicts the variation in future lawsuits, our results are not driven by a firm's time-invariant risk-culture. The magnitude of this effect is a substantial 0.15 fewer operating lawsuits per year in firms with multiple women at the top compared to firms without them.

Our third approach examines the relation between lagged changes in female power on changes in lawsuits. Table 5 presents the first difference model separately for operating lawsuits and securities lawsuits. The main explanatory variables are the indicator for multiple women executives and its lag. Results using pay-slice measures are similar but are not reported for brevity. For each type of lawsuit, our analysis includes models that use (1) the full sample, (2) the sub-sample of years where there was a non-zero change in the number of lawsuits, and (3) the sub-sample of years where there was a non-zero change in the number of female executives in the top executive team. The dependent variable is the difference in the natural log of 1 plus the number of lawsuits from t to $t + 1$. In all of the models, we find that a change in women's power in the top executive team predicts a significant decrease in operating lawsuits the next year. Together, these three tests provide some evidence of a causal effect of women's power in management on operating lawsuits against a firm.

Our results raise an important question: What prompts some firms to hire multiple women executives? Specifically, do firms hire more female executives to reduce lawsuits, or for other reasons that eventually contributed to the reduction in lawsuits and firm value?[11] In Table 6, we analyze whether changes in the number of past lawsuits a firm faces or changes in any other firm-level variables predict future changes in women's power. We find that past changes in neither securities lawsuits nor operating lawsuits predict changes in the presence of multiple female managers [models 1 and 2]. In model 3, we limit the subsample to the years with non-zero changes in operating lawsuits, but still find no effect of such changes on changes in women's power the next year. Moreover, we do not find changes in any other firm-level variables (not tabulated for brevity) in these models (that may point to 'trigger events') that lead to an increase in female power. These results are perhaps not surprising because large changes in female leadership are likely a slow process and are infrequent. So it is difficult to pinpoint what causes these changes from the difference regressions. Finally, we experiment with level regressions, such as the one shown in column 4, predicting the presence of multiple female executives. In level regressions also, we do not find any evidence that female executives' power is related to past lawsuits. In level regressions predicting *Female Execs ≥ 2*, industry and state fixed-effects seem more important because they vastly increase the predictive power (adjusted R^2) of these models. So, female executives' power is likely to be a product of long-term and gradual changes due to industry and location-level factors, perhaps driven by local labor market conditions. We find that some firm-level variables are also significant, but their overall explanatory power is quite low (adjusted $R^2 = 0.016$ without vs. 0.080 with industry and state fixed effects).

[11] As an example of the latter possibility, maybe female executives were hired to replace male executives who made some bad acquisitions that drained cash. The stock drops as the market learns more about these acquisitions. At the same time, the firm is compelled to cut back on some risky, but valuable, R&D projects due to a lack of funding.

Table 7.
Regressions of the number of post-filing settlements and settlement amounts.

This table presents negative binomial (1), OLS (3) and firm fixed effects ((2), (4)) models of the number of settlements and settlement dollars among cases filed against a firm in a given year ($t + 1$) on variables measuring the power of women executives and control variables in year *t*. The sample includes firms which faced at least one lawsuit as a defendant in a given year and are in both Execucomp and Audit Analytics databases. All the variables are defined in the Appendix. Negative binomial and OLS models include year and Fama-French 48 industry fixed effects; firm fixed effects models include year fixed effects. Standard errors are corrected for heteroscedasticity and clustered within a firm, and t-statistics are in parentheses. *, **, and *** denote statistical significance at 10%, 5% and 1% levels respectively.

	(1) # Settlements_{t+1} (Neg. Bin.)	(2) # Settlements_{t+1} (Firm FE)	(3) $\text{Ln(\$ Settlement)}_{t+1}$ (OLS)	(4) $\text{Ln(\$ Settlement)}_{t+1}$ (Firm FE)
Female Execs ≥ 2	−0.224 (−1.07)	−0.033 (−0.61)	−0.119 (−0.35)	−0.231 (−0.31)
Female Execs = 1	−0.103 (−0.75)	0.011 (0.36)	−0.063 (−0.26)	0.302 (0.69)
Female Indep. Dir. Indicator	−0.238 (−1.57)	0.012 (0.42)	−0.445* (−1.69)	0.118 (0.27)
Board Independence	0.128 (0.31)	−0.137 (−1.19)	0.010 (0.01)	−1.826 (−1.17)
Ln(Total Assets)	0.160*** (2.88)	0.076** (2.26)	0.291*** (2.92)	1.188** (2.50)
Firm Age	0.009** (2.09)	0.005 (0.06)	0.011 (1.47)	−0.362 (−0.36)
Stock Return	−0.292* (−1.96)	−0.035 (−1.55)	−0.450 (−1.60)	−0.353 (−1.07)
Stock Volatility	0.281*** (2.59)	0.009 (0.40)	0.417** (2.47)	0.008 (0.03)
ROA	0.594 (1.03)	0.033 (0.69)	0.615 (1.05)	0.182 (0.28)
Cash to Assets	−0.100 (−0.92)	0.007 (0.35)	−0.277 (−1.43)	0.136 (0.50)
Book Leverage	0.497 (1.26)	0.171 (1.38)	0.613 (0.87)	1.409 (0.89)
Firm or industry fixed effects	Industry	Firm	Industry	Firm
Year fixed effects	Yes	Yes	Yes	Yes
N	2875	2875	2875	2875

While the lack of specific 'trigger events' is somewhat reassuring in that our results do not appear to be driven by the selection of women executives to deal with lawsuit-related events, we cannot entirely rule out the possibility of such events. Our finding in Section 4 that fewer operating lawsuits are not necessarily good for shareholders can potentially explain why firms do not add women managers in response to an increase in the number of such lawsuits. But the lack of specific knowledge about why firms sometimes increase the number of female executives limits our ability to claim a causal effect of female executives on firm policies.

3.4. Do women executives settle more easily?

Our results so far show a significantly negative relation between women's power in management and the number of operating lawsuits filed against a firm. This result can arise from two non-mutually exclusive channels. First, female executives adopt firm policies that are less susceptible to lawsuits. For example, they are less likely to develop products that infringe on a competitor's intellectual property rights. Second, female executives adopt similar policies as their male counterparts and face similar litigation risk. However, they prefer settling disputes privately, which has a definite outcome, to fighting them in the court. That is, to avoid protracted legal fights, perhaps women executives settle more easily and pay larger settlement amounts than their male colleagues.

Our data only includes cases that are filed in the court, so we do not observe potential lawsuits that are settled before they reach the court. However, we do have some data on cases that are settled after they are filed with a court. Cases can be settled outside the court even after they go to the court as both parties update their beliefs about the outcome of a case. If higher risk-aversion of women executives predicts a higher probability of settling cases outside of the courts, this should be true both before and after the cases are filed with the courts.

In Table 7, we present the results of regressions of post-filing settlement counts and settlement amounts. The first two columns present the results of settlement counts using negative binomial models and firm fixed effects. They show that women's power does not significantly predict the number of cases that are settled out of court. The results are similar for the next two models of the natural log of dollar settlement amounts. Once again, from both negative binominal and firm fixed effect models, women's power in management are statistically insignificant in predicting dollar settlements. Overall, Table 7 offers no evidence that firms with more women executives settle more cases or pay larger settlement amounts after the cases are filed in court. These results likely reflect firms' reluctance to create incentives for potential plaintiffs to sue more once they realize that firms with more women managers are easier targets. These results do not support the idea that the observed relation between women's power in management and lawsuits against firms is due to differences in settlements.[12] But to the extent that the nature of pre- and post-filing settlements differs (e.g., pre-filing settlement may be more likely when lawsuit filing would be embarrassing for the defendant), our findings based on post-litigation settlements do not resolve this issue completely.

[12] In unreported tests, we also estimate first difference regressions of settlement counts and settlement amounts similar to those in Table 5. In both regressions, the coefficient of *Δ(Female Execs ≥ 2)* variable is negative and significant at the 10% level, which runs counter to the prediction of the settlement story. In similar regressions where we replace *Δ(Female Execs ≥ 2)* by *Δ(Female Exec. Pay Slice),* the coefficient of the latter variable is statistically insignificant.

3.5. Timing of dispute incidence and lawsuit filing

Our tests focus on the lawsuit filing date rather than the dispute incidence date because the latter date is not reported in the Audit Analytics (AA) database. We started by trying to identify this date ourselves. For a random sample of 20 cases from our sample, we obtained and read (rather lengthy) complaint filings by doing internet searches using case docket numbers from AA, but were unable to identify clear start dates for the disputes. Melody Banks, the Director of Litigation Research at AA told us in an e-mail exchange in May 2018 that they have found over the years that the latter date is very hard to identify from case filings for the operating lawsuits that we focus on. The only lawsuits for which AA has this date are securities class action lawsuits, where the case filing specifies a start and end date of the class. Based on our conversations with a few law professors, we learned that dispute start dates are hard to pinpoint in non-securities lawsuits because disputes often arise not at a specific date but over time. From these conversions we also learned that most lawsuits tend to be filed fairly soon, usually within six months to a year after a party feels that it has suffered harm. Lawyers typically advise clients to file a case as soon as possible (1) because it is easier to gather evidence and bring a charge while the case is relatively fresh and, (2) because of statutes of limitation. Therefore, in our baseline tests in Table 3, all the explanatory variables are lagged by one year relative to the lawsuit filing year, which seems to be a reasonable compromise based on this information. Our untabulated results are similar when we lag female executives' power by two or three years instead.

The lack of precise data on dispute incidence dates introduces noise in our tests. However, this noise in the alignment of disputes with female executives' power should lead to an attenuation bias, making it more difficult to find significant results (see, e.g., Wooldridge (2002, pp. 75)). Moreover, our findings in Section 4 suggest that lawsuits arise because of aggressive firm policies such as excess R&D, intensive advertising and promotion, and policies that are inimical to other parties that a firm deals with or that are affected by its business practices. These findings suggest that the settlement story does not dominate our results. We leave a complete resolution of this issue to future research.

4. A simultaneous equations model of firm policies, litigation risk and valuation

So far, we have established that firms in which female managers are more powerful face fewer operating lawsuits. We provide some evidence to suggest that the relation is unlikely to be driven by a greater propensity of female manages to settle. An important question is whether greater exposure to the risk of such lawsuits necessarily hurts firm valuation. The answer to this question likely depends on the reasons behind a firms' exposure to such lawsuits. There are at least two possibilities for a firm's greater exposure to operating lawsuits: (1) managers take actions that benefit stockholders at the expense of other stakeholders, and (2) managers take actions that harm both shareholders and other stakeholders. In this section we test whether a firm's exposure to lawsuits predicts its valuation, and if so, why. The first possibility implies that lawsuits should be positively related to firm valuation, while the second possibility implies that they should be negatively related to it.

Prominent examples that support the first story are the numerous lawsuits between Apple and Samsung that became part of the smartphone 'patent wars'. Both companies are fiercely competitive and innovative. As a result, while they are highly valued by investors, they often they end up infringing on each other's property rights. Moreover, both also compete fiercely on price, so they are under tremendous pressure to cut production costs. As a result, they are routinely criticized for dealing with suppliers that treat their workers unfairly.[13]

We expect that female executives affect some firm policies, and those policies, in turn, affect litigation risk and firm valuation simultaneously. To test this hypothesis, we employ a simultaneous equations system that allows us to model how the power of female executives predicts various firm policies that affect a firm's litigation exposure and whether and how these policies affect firm valuations.

4.1. The empirical model

Given the lack of theories specific to operating lawsuits, we do not have true structural equations. So our study is largely exploratory. Following the recommendations of Gow et al. (2016), we make inferences about potential cause and effect by relying on previous, more general theoretical and empirical findings, and make use of path diagrams to motivate our system of regression equations. We start by considering a few 'candidate' corporate policies that previous studies have found to be value-relevant but risky, and explore if these policies entice operating lawsuits. These policies include aggressive investment in research and development (R&D), capital expenditure, acquisitions, and advertising expenditure. We also consider a firm's relations with other stakeholders and the broader community using KLD data on corporate social responsibility (CSR). Several studies have found that R&D is an important vehicle for growth and value-creation. However, R&D endeavors are risky because they have long gestation periods and high probabilities of failure.[14] More importantly, R&D and innovation-related activities are highly susceptible to lawsuits. For example, competitors or other patent assertion entities (aka 'patent trolls') can sue a firm for violating intellectual property rights (see, e.g., Boldrin and Levine, 2002; Bessen et al., 2011; Jaffe and Lerner, 2011; Cohen et al., 2016; and Smeets, 2014). Moreover, coming up with new products, especially under time-pressure to outdo competitors, leads firms to make mistakes that result in

[13] See, for example, 'Apple failing to protect Chinese factory workers,' http://www.bbc.com/news/business-30532463.
[14] See, e.g., Holmstrom (1989), Manso (2011), Tian and Wang (2014) and Adhikari and Agrawal (2016).

product liability lawsuits (see, e.g., Herbig and Golden, 1994; and Hunziker and Jones, 1994). To a lesser extent, similar arguments apply to capital expenditures and acquisitions, which tend to be riskier than firms' ongoing operations, and therefore are more susceptible to lawsuits. However, as discussed later, we find that capital expenditure and acquisitions do not significantly affect lawsuits after accounting for the simultaneity in the system, so we do not analyze them as endogenous variables in the simultaneous equations system, but include them as controls.

We analyze advertising expenditure as another policy variable that potentially affects lawsuits and firm valuation. Joshi and Hanssens (2010) document a positive effect of advertising expense on firm value through various indirect and direct channels. Whereas Joshi and Hanssens (2010) analyze a sample of only four large companies in the computer manufacturing industry, we use a much more comprehensive sample. Moreover, we believe that ours is the first study to examine whether advertising intensity is also associated with operating lawsuits. Advertising intensity can influence litigation risk through several channels. First, as suggested by Servaes and Tamayo (2013), advertising increases customer awareness of a firm's products and its activities (both good and bad) that matter to stakeholders. Greater awareness of good deeds may increase customer loyalty to the firm and its products and services, while awareness of bad deeds can invite litigation. So, for a given level of product quality and firm involvement in actions affecting broader stakeholders, advertising intensity offers a risk-return trade-off: it promotes the company and its products, but also subjects the firm to greater scrutiny. Second, Joshi and Hanssens (2010) find that a firm's advertising expense has a *negative* effect on its competitors' valuations. This effect can intensify rivalry and attract scrutiny and lawsuits from disgruntled competitors. Third, aggressive promotion can also increase the chances of deceptive advertising, thereby attracting lawsuits.[15] David et al. (2010) find that aggressive advertising of a drug to consumers reduces its match with the patient, which increases the reported rate of adverse drug reactions and leads to greater regulatory action.

Finally, we consider a firm's policies on environmental, social and human rights issues as a potential link between women executives' power, litigation risk and firm valuation. In particular, we analyze CSR concerns using KLD data as a way to capture any remaining policies that may be related to lawsuits, and may have implications for firm valuation. Using a variety of public sources and its private survey of firms, KLD collects data on corporate policies, practices and events that affect firm stakeholders on a variety of dimensions. These dimensions include environment, community, employment, diversity, product and human rights. Any policy, practice or event that raises a red flag (points to a strength) on any of these dimensions is recorded as a concern (strength) on that dimension for the firm. Importantly, KLD attempts to record strengths and concerns as soon as these events become known to their analysts. So while KLD concerns may not be reflected in current lawsuits against a firm, they can lead to disputes with various stakeholders that increase the probability of the firm being sued in the future.[16] Following Di Giuli and Kostovetsky (2014), we assume that KLD concerns are outcomes of a firm's policies, including CSR policies, whereas strengths are a result of proactive investments in CSR. Therefore, we examine whether women's power in management predicts KLD Concerns, which can lead to potential future lawsuits.

The corresponding simultaneous equations system is as follows:

$$
\begin{aligned}
&OperatingLawsuits = l_0 + l_1(FemaleExecs \geq 2)_{t-1} + l_2(FemaleExecs = 1)_{t-1} + l_3(ExcessR\&D) + l_4(Advtg.\ Intensity) \\
&\qquad + l_5(CSRConcerns) + \mathbf{X}\lambda + \mathbf{Z_A}\Lambda + \varepsilon_l \\
&ExcessR\&D = r_0 + r_1(FemaleExecs \geq 2)_{t-1} + r_2(FemaleExecs = 1)_{t-1} + \mathbf{X}\rho + \mathbf{Z}_B\mathbf{B} + \varepsilon_b \\
&Advtg.\ Intensity = a_0 + a_1(FemaleExecs \geq 2)_{t-1} + a_2(FemaleExecs = 1)_{t-1} + \mathbf{X}\alpha + \mathbf{Z}_\mathrm{A}\mathrm{A} + \varepsilon_a \\
&CSRConcernsc_0 + c_1(FemaleExecs \geq 2)_{t-1} + c_2(FemaleExecs = 1)_{t-1} + \mathbf{X}\gamma + \mathbf{Z}_\Gamma\Gamma + \varepsilon_c \\
&Ln(Tobin'sQ) = m_0 + m_1(FemaleExecs \geq 2)_{t-1} + m_2(FemaleExecs = 1)_{t-1} + m_3(ExcessR\&D) + m_4(Advtg.\ Intensity) \\
&\qquad + m_5(CSRConcerns) + m_6(OperatingLawsuits) + \mathbf{X}\mu + \mathbf{Z}_M\mathbf{M} + \varepsilon_m
\end{aligned}
\tag{1}
$$

A simplified path diagram for our system is as follows:

[15] A prominent anecdote is DeVry Education Group, which in 2016 fired Daniel Hamburg, its CEO for nine years, following allegations of misleading advertising by the U.S. Federal Trade Commission. Interestingly, Hamburg was considered a transformative CEO, as mentioned in the statement by the company's board chair "*Under his leadership, DeVry Group has transformed from primarily serving undergraduate and business school students in the United States to a global education provider.…*" Presumably, promotion of the university and its program, which claimed that "90 percent of graduates actively seeking employment landed jobs" was one of the biggest factors that had led to the company's success. DeVry's advertising to sales ratio was about 13% at the time, much higher than our sample mean (median) of 3.2% (1.4%) among firms with non-missing advertising expenses on Compustat.

[16] Here are some examples from Krüger (2015) showing how KLD concerns can lead to lawsuits against a firm:

In May 2006, the Political Economy Research Institute (PERI) included ADM on its Toxic 100, a list of the top 100 corporate air polluters in the U.S. ADM ranked tenth on the Toxic 100, which is based on the quantity and toxicity of hundreds of chemicals released into the air.

In February 2007, two Swiss charities reported that workers faced low wages and health risks in factories in China, Thailand, and the Philippines that supplied five companies, including Apple.

In October 2007, in two separate incidents, the federal Consumer Product Safety Commission recommended that Family Dollar Stores recall children's toys because they contained excessive levels of lead in their paint.

Moreover, Krüger (2015) finds that although there is persistence in KLD scores, they reflect contemporaneous events.

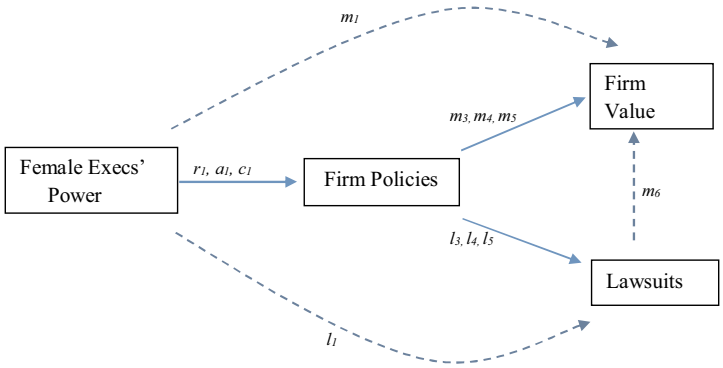

Fig. 1. Path diagram of female executives' power, firm policies, lawsuits and firm valuation.

This path diagram illustrates our main hypothesis that significant power of female executives influences litigation through the three policies that are also relevant for valuation (paths of solid arrows). In other words, greater female power in management predicts firm policies, which simultaneously affect both exposure to operating lawsuits and firm valuation. We also allow the system to determine if female power affects valuations and lawsuits directly (dashed arrows, coefficients m_1 and l_1 respectively). Although we do not have any specific hypothesis regarding this direct (structural) relation, a direct effect may represent any unobservable differences caused by the styles of male and female executives or potentially value-relevant variables omitted from the system. Finally, we allow the system to determine if litigation exposure is directly associated with firm valuation (dashed arrow: coefficient m_6). Because the system may not have included all the relevant variables for valuation and lawsuits, a direct association between lawsuits and firm valuation may be due to some relevant policy variables that are omitted from the system.[17]

Xs in system (1) are matrices of common control variables, i.e., those that appear in two or more equations in the system, e.g., year and industry fixed-effects, and firm size. **Z**s are matrices of control variables that are unique to an equation and serve as the identifying variables in the system. We discuss more about control variables and identifying restrictions in Section 4.2.[18]

To estimate *Excess R&D* etc., we follow Biddle et al. (2009) and estimate a firm-specific model of investment as a function of growth opportunities, as measured by past sales growth. Biddle et al. (2009) aggregate three major components of investment (R&D, Capital Expenditure and Acquisitions). We analyze each component separately because prior studies suggest that these policies affect risk and firm valuation differently, and they likely have different sensitivities to growth opportunities.[19]

$$R\&D_{i,t} \text{ or } Capex_{i,t} \text{ or } Aquis_{i,t} = \beta_0 + \beta_1 * Sales\ Growth_{i,t-1} + \varepsilon_{i,t}$$

$Sales\ Growth_{t-1}$ is the percentage change in sales from $t-2$ to $t-1$. Following previous papers, we estimate this equation for each Fama-French 48 industry-year. We estimate excess investments as follows:

$$Excess\ R\&D_{i,t} \text{ or } Capex_{i,t} \text{ or } Aquis_{i,t} = Actual - Predicted\,(R\&D_{i,t} \text{ or } Capex_{i,t} \text{ or } Aquis_{i,t})$$

Moreover, unlike Biddle et al. (2009), who rank these residuals to construct over- or underinvestment variables, we take an agnostic approach. For instance, a positive excess R&D can either be a symptom of overinvestment (hence bad for firm valuation) or a value-enhancing decision by managers who see opportunities beyond those conveyed by past sales growth. We allow the data to separate such differences.

Our choice of empirical models for this test is worth explaining. We are less interested in testing the effect of *realized* lawsuits against a firm in a given year because, not surprisingly, lawsuit filings lead to stock price declines, at least in the short run. Instead, our goal is to assess how lawsuits against a firm, which are a symptom of some underlying firm policies and practices, predict firm valuation. Therefore, we adopt a cross-sectional test of female executive power, firm policies, litigation and firm valuation, rather than a time-series test.

[17] Obviously, there likely are other firm policies that affect litigation risk and valuation. Our choice to focus on these three policy variables represents a trade-off between tractability and completeness. We do not claim to be exhaustive, but try to include important policy variables that are well-established in the literature. While adding more endogenous policy variables can be more informative, it makes identification of the system more difficult.

[18] A well-identified system of regression equations satisfies rank and order conditions. Having unique variables in each equation serves satisfies these conditions. Our system is over-identified and has more reduced-form parameters than structural parameters.

[19] R&D is considered a much riskier investment than capital expenditures. Investments in R&D and innovation are risky but value-enhancing (see, e.g., Hirshleifer et al., 2012). However, several studies on the 'asset growth anomaly' find that asset growth via capital expenditures can be a symptom of poor governance and can be value-decreasing (see, e.g., Cooper et al., 2008). The risk effect of acquisitions is ambiguous, with some acquiring firms experiencing an increase in risk, while others experience a decrease (see, e.g., Agrawal and Mandelker, 1987; and Gormley and Matsa, 2016).

4.2. Control variables and identification

In this section, we briefly discuss some theories and previous empirical findings to motivate the control variables in our system of Eq. (1). In particular, we attempt to incorporate the incentives of three important sets of actors: shareholders, managers and potential plaintiffs in affecting the endogenous variables in the system.

Implicit in our hypothesis is the notion that operating lawsuits arise because some managers are willing to push the limits of the law to create value for shareholders. The benefits of this litigation exposure for managers do not come from lawsuits per se, but from firm policies underlying the litigation risk. However, being sued increases the probability of managers losing their jobs (see, e.g., Aharony et al., 2015). So, everything else the same, this propensity to be sued should be negatively correlated with the cost of losing the job, which we proxy with the CEO's total compensation (similar to Gow et al., 2016). So for the *Operating Lawsuits* equation, the CEO's total compensation serves as an identifying variable because it is less important for other endogenous variables in the system. For plaintiffs, the expected benefit of suing a firm should exceed the expected costs. Suing larger, more profitable firms with deep pockets offers greater benefit for the potential plaintiffs. For industry rivals, the benefits of winning lawsuits are likely also greater in markets with high competition. So, we control for asset size, profitability, cash holding and product market concentration (the inverse of competition using the Hoberg and Phillips (2016) text-based measure).[20]

Investment in R&D is risky and offers a positively skewed payoff. Prior literature shows that it is a function of managerial ownership (e.g., delta) and the sensitivity of managerial compensation to risk (vega; see, e.g., Coles et al. (2006)). Shareholders are much more likely to welcome R&D in companies with higher growth opportunities. So, managerial ownership, vega and growth opportunities (lagged market-to-book ratio) serve as the identifying variables in this regression. Moreover, prior literature shows that product market competition affects the incentive to invest in R&D and the valuation of R&D (see, e.g., Aghion et al., 2005; Gu, 2016). Firms that compete in areas with more homogeneous products are forced to invest more in R&D for differentiation. So, we control for product similarity and product market concentration using the text-based measure of Hoberg and Phillips (2016). On the other hand, agency theory predicts that large discretionary cash holdings encourage, and debt discourages, managers to overinvest. Therefore, following Biddle et al. (2009), we control for cash holdings and financial leverage in the *Excess R&D* regression.

Control variables for advertising intensity include gross margin, because a higher margin leaves room to spend more on advertising and promotion. The marginal benefit of a dollar of advertising expense is likely to be higher for firms with higher sales volume, so we control for the volume of past sales. So these two variables serve as identifying variables in this regression. Product market competition and product similarity among competitors likely affect the optimal level of advertising, so we control for both variables using Hoberg and Phillips' (2016) text-based measures.

Operating lawsuits largely arise from a firm's interactions with its various stakeholders: employees, suppliers, customers, competitors, and the larger community. It is plausible that firms can benefit their shareholders by disregarding other stakeholders' welfare and profiting from negative externalities. But managers derive utility from their reputation among key stakeholders, including the broader community, and one important way they build reputation is by caring about environmental and social issues. However, the importance of such issues varies across individuals and communities. For example, Democrats tend to care more about CSR than Republicans, so firms in Democrat-leaning states tend to spend more on CSR than those in Republican-leaning states, even though CSR spending decreases future profitability (see Di Giuli and Kostovetsky, 2014). Local stakeholders' education level and awareness also plausibly influence a firm's involvement in CSR. So a firm's location is one of the most important determinants of its involvement in CSR. Because location-level characteristics tend to be stable over time but vary in the cross-section, we control for state fixed effects using the location of a firm's headquarters. Moreover, CSR concerns are likely affected by how much the firm has invested in the community, which we control by CSR strengths in the same regression. These variables serve as our identifying variables in the regression of CSR concerns.

The final dependent variable of interest is firm valuation, defined as the natural log of Tobin's Q. Our main explanatory variables of interest are various firm policies we considered earlier and the number of operating lawsuits. The regression of Tobin's Q controls for several factors known to affect firm valuation and includes industry fixed effects (see, e.g., Hirshleifer et al., 2012). A firm's market share, the number of business segments and the number of securities lawsuits are well-known predictors of firm valuation, and serve as identifying variables in this regression.

4.3. Results and discussion

Table 8 presents the results of the system of regressions (1). Columns 1–5 present structural parameters, and columns 6–10 present the corresponding reduced form parameters estimated from the system. Simply put, a structural parameter represents the direct effect of an explanatory variable on an endogenous variable. On the other hand, a reduced form parameter represents the total effect of an explanatory variable–the sum of both direct and indirect effects–on an endogenous variable. In other words, a reduced-form parameter is the estimate of the change in an endogenous variable after accounting for all simultaneity in the system. For structural regressions, we also present the predicted signs of the parameters based on previous theoretical and empirical findings.

[20] From the Hoberg and Phillips (2016) website, we obtain data on firms' exposure to product competition based on how similar a firm's products are to other firms. Hoberg and Phillips derive this 'total similarity' measure based on how firms describe their products and services in the mandatory product description section of 10-K filings. The authors show that this classification does a better job of identifying the degree of competition and rivals than traditional industry classifications.

However, we make no prediction about the signs of the reduced-form parameters because they can be a function of multiple variables. As we will discuss later, comparison of structural parameters to reduced form parameters helps us make inferences about the channel(s) through which one variable in the system affects others. As Wooldridge (2002, pp. 225) points out, if the structural model is correctly specified and at least one equation is over-identified, we obtain asymptotically more efficient estimators of the reduced form parameters by deriving the estimates from the structural parameter estimates.

We estimate the system of Eq. (1) using a three-stage least squares (3SLS) method, which allows each regression in the system to affect each other by variables or by error terms correlated across the equations. In Panel A, column 1, where the dependent variable is *Operating Lawsuits*, each of our three main variables of interest–*Excess R&D, Advtg. Intensity* and *CSR Concerns*–positively predicts the number of operating lawsuits. This finding is consistent with our hypothesis that the process of developing and promoting new products can intensify rivalry with competitors; aggressive advertising can put a spotlight on a firm's relations with other stakeholders; and actions that solely benefit shareholders can create negative externalities (measured by CSR concerns) that encroach on the welfare of non-financial stakeholders and the broader community, some of which can lead to lawsuits against the firm.

Notably, the coefficient of *Female Execs ≥ 2*, even though negative, is insignificant in predicting lawsuits. This result suggests that the power of female executives *per se* does not affect operating lawsuits. In the system of Eq. (1), and the causal path in Fig. 1, the estimated l_1 is not different from zero. However, our main interest in this study is whether female executives' power in management affects lawsuits via their policies (combination of parameters: l_3, r_1, l_4, a_1, l_5, and c_1), which we will shortly assess via reduced-form parameters. Most control variables take predicted signs. For example, larger firms, and firms in less concentrated (more competitive) markets face more lawsuits. CEOs' total compensation (cost of being fired due to lawsuits) is negatively related to lawsuits. *Excess Capex* is positively, and *Excess Acquis* is negatively, related to lawsuits, although the latter is statistically insignificant.[21]

The next question is whether and how female executives influence these lawsuit-prone policies (i.e., *Excess R&D, Advtg. Intensity* and *CSR Concerns*). The second column shows the structural parameters related to *Excess R&D* as the dependent variable. Here, consistent with our hypothesis, the variable *Female Execs ≥ 2* obtains a negative and statistically significant coefficient in predicting excess R&D. The coefficient of −0.005 implies that a firm with two or more female executives is associated with −0.005 less *Excess R&D* ratio, which is a decrease of about 9% of this variable's standard deviation (0.005/0.057). This result is consistent with prior studies that find that female managers, who tend to more risk-averse, undertake fewer risky investments compared to their male counterparts and achieve slower growth (see, e.g., Huang and Kisgen (2013)). Key control variables mostly take expected signs. For instance, excess R&D is positively affected by growth opportunities (lag Q) and managers' incentive to increase risk (*Managers' Avg. Vega*). It is negatively associated with the concentration of managers' wealth in the firm (i.e., portfolio under-diversification), measured by *Managerial Ownership*. Consistent with the free cash flow hypothesis of overinvestment, cash holding (leverage) positively (negatively) predicts excess R&D.

Column 3 shows that greater power of female executives negatively predicts advertising intensity. The point estimate of *Female Execs ≥ 2* is substantial, although the coefficient just misses the 10% level of statistical significance in the structural estimation (but it is significant in the reduced-form estimation in column 8). The point estimate suggests that a firm with two or more female top executives spends 0.003 less on advertising as a fraction of total revenue, which is a decrease of about 13% of this variable's standard deviation. Important control variables generally take expected signs. For instance, firms with higher gross margins, higher sales and more cash holdings spend more on advertising.

In column 4, we find that greater power of women managers significantly and negatively predicts *CSR Concerns*. We also find that the presence of even one woman on the management team negatively predicts such concerns, although the magnitude is larger for firms with multiple female executives (*Female Execs ≥ 2)*. Firms that are larger, older, and in more concentrated industries have more CSR concerns, while firms with a female independent director have fewer concerns.

So far, our system estimates reveal that firms where female executives have more power spend less on R&D, have lower advertising intensity and adopt less controversial business practices, reflected in fewer CSR concerns. Each of these policies leads a firm to face more operating lawsuits. The last equation in the system reveals how each of these policies influences firm valuation. Column 5 presents estimates of structural parameters in the firm valuation regression. As hypothesized, we find that *Excess R&D* and *Advtg. Intensity* both predict firm valuation positively. These results are consistent with prior papers that study R&D and advertising policies separately (e.g., Chauvin and Hirschey, 1993; and Joshi and Hanssens, 2010). We find that their results hold in our much larger sample and in a model that allows for simultaneous decisions on these policies. In column 5, *CSR Concerns* also predict firm valuation positively, consistent with rent extraction by shareholders at the cost of other stakeholders. Although the issue of whether CSR spending is good or bad for firm valuation is highly debated in the literature, our findings are generally consistent with those of Di Giuli and Kostovetsky (2014) and Chen et al. (2018), who find that better CSR ratings generally come at a cost to shareholders. In sum, we find that all three policies are litigation-prone but, on average, value-enhancing.

Interestingly, the system estimates that the direct effect of *Female Execs ≥ 2* on Tobin's Q is positive even though it just misses statistical significance. This result suggests that after controlling for many important value-relevant policy differences, the presence of multiple female executives is somewhat positively associated with firm valuation. This pure positive association between multiple female executives and valuation can be due to two factors: (1) omitted variables in the system related to value-enhancing policies pursued by female executives,[22] and (2) matching of female executives to firms with higher valuations. But our main interest here is

[21] *Excess Capex* also turns insignificant in the corresponding reduced form estimate in column 6.

[22] For instance, some previous studies have found that female CFOs are associated with less expensive bank loans and better quality of financial reporting (see Francis et al., 2013).

not in this pure (or residual) effect or even in the total effect of female executives on firm valuation, but on their indirect effects via corporate policies, which requires carefully analyzing the reduced form parameters.

Columns 6 through 10 present estimates of the reduced form parameters of the system, which, approximately, are estimates of the *total* effect of each exogenous variable on the endogenous variables. In column 6, the reduced form coefficient of *Female Execs ≥ 2* in predicting operating lawsuits is −0.187, which is significant at the 1% level. This effect approximately equals the sum of 1) the direct effect of *Female Execs ≥ 2* on lawsuits, and 2) its indirect effect, which equals the sum of the product of the effect of *Female Execs ≥ 2* on different policies (Excess R&D, advertising intensity, CSR concerns) and the effects of these policies on lawsuits. Using the structural parameters from columns 1 to 4, we can obtain an approximate reduced form coefficient as $r_1 \times l_3 + a_1 \times l_4 + c_1 \times l_5 + l_1 = -0.153$ ($= -0.005 \times 5.460 - 0.003 \times 12.715 - 0.203 \times 0.402 - 0.006$).[23,24] Because the direct effect of *Female Execs ≥ 2 on* lawsuits, obtained from the structural equations (l_1), is negligible, nearly all of the effect of *Female Execs ≥ 2* on lawsuits can be attributed to firm policy channels.

Columns 7, 8 and 9, present estimates of the reduced form regressions of the three corporate policy variables. The coefficient estimates on *Female Execs ≥ 2* in predicting these policy variables are comparable to those obtained from structural models. The effect on *Advtg. Intensity* here turns statistically significant at the 10% level. Structural regressions of the three policy variables do not have any endogenous explanatory variables, so there should not be much difference between reduced-form and structural parameters (because there is no 'indirect effect'). The difference arises in an over-identified system because of the correlation of these endogenous variables to all exogenous variables in the entire system.

Perhaps the most interesting result comes from reduced form estimates of the firm valuation (Ln(Tobin's Q) regression. Strikingly, the reduced form estimate of *Female Execs ≥ 2* in predicting Ln*(Tobin's Q)* is −0.029, which is statistically significant at the 5% level. This estimate represents the sum of the direct effect of female executives and its indirect effect via firm policies. Similar to the lawsuit regression, we can obtain an approximate total effect of *Female Execs ≥ 2* on firm valuation by taking the sum of the product of the structural parameters as follows: $l_1 \times m_6 + r_1 \times m_3 + a_1 \times m_4 + c_1 \times m_5 + m_1 = -0.030$ ($= -0.006 \times 0.053 - 0.005 \times 7.966 - 0.003 \times 5.679 - 0.203 \times 0.075 + 0.042$).[25] Next, the loss of valuation attributable to litigation-prone firm policies (indirect effect) can be obtained by subtracting the direct effects from the total effects, as follows: – 0.030–0.042 = −0.072. Alternatively, using the reduced-form estimate as the total effect, the estimated indirect effect of *Female Execs ≥ 2* due to the differences in firm policies is −0.071 (= −0.029–0.042). Thus, our estimates suggest that multiple female executives have an indirect effect of about −7% from avoiding litigation-prone firm policies, and a total effect of about −3%. Interestingly, the total effects of a single female executive on both lawsuits[26] and Q, estimated in reduced form equations, are also negative and statistically significant, although their magnitudes are much smaller compared to those of multiple women executives. Importantly, the estimated effect of multiple women executives on value *through litigation-prone policies* (−7%) is several times larger than the corresponding effect of a single female executive (−1.7%).[27] Finally, as expected, securities lawsuits have significantly negative effects on valuation in both system and reduced form estimates.

4.4. Information content of operating lawsuits

Our system estimates yield a positive and statistically significant coefficient on operating lawsuits (m_6) in predicting firm valuation, which is consistent with our conjecture that some lawsuits are a symptom of risky but value-enhancing firm policies. However, the structural estimate is the direct (residual) effect of litigation risk on firm value after controlling for the relevant corporate policies. The positive estimate of m_6 may represent other omitted firm policy variables that we do not consider in the system. However, our question is whether the link between lawsuits and value comes from our three underlying policies, which is not obvious from the system. We now address this issue. The structural regression of Q controls for all three endogenous firm policies related to lawsuits. Consistent with the notion that operating lawsuits largely stem from these risky firm policies, it is plausible that these policies subsume the main coefficient of lawsuits. We test this possibility by omitting all three endogenous policy variables from the Tobin's Q regression, and let other variables subsume the effects of these omitted variables. This test is similar in spirit to the 'with-and-without-controls' approach used by Larcker et al. (2007).

[23] In an accurately specified system that is exactly identified (i.e., it has equal number of structural and reduced form parameters), reduced form parameters can be obtained precisely by solving the structural parameters, and vice versa. However, our system is over-identified, i.e. we have fewer structural parameters than reduced-form parameters. Having multiple instruments is generally desirable for identification. But in an over-identified system, each structural parameter can be recovered by more than one nonlinear combination of the reduced-form parameters. So, the structural parameters are obtained by the 'best fit' of the reduced form parameters.

[24] This estimate is almost identical to that from the untabulated firm fixed effects model (-0.152). It is not directly comparable to estimates from negative binomial models (in Table 3), which assume a different data-generating process and in which the marginal effect depends on the point of the variables' distribution (e.g., mean, median or percentile) at which the effect is estimated.

[25] Once again, the total is not exactly −0.029 because the system is over-identified, but it is very close.

[26] The corresponding coefficient in the fixed effects model (Table 5) is also negative, though statistically insignificant. The reduced form model controls for all the exogenous variables that appear in any equation in the simultaneous equations system. So it includes a lot more controls than the fixed effects model. The estimates from the reduced form model are not comparable to those from the negative binomial model in Table 3 because the latter assumes a different data-generating process.

[27] The effect of a single female executive on value through firm policies can be estimated as follows: $r_2 \times m_3 + a_2 \times m_4 + c_2 \times m_5 = -0.003*0.7996 - 0.001*5.679 - 0.124*0.075 = -0.017$. This value equals the total effect estimated by the reduced form parameter in column 10. This is because the direct effect estimated in column 5 is small and far from being statistically significant.

Table 8.

Structural and reduced-form regressions of litigation, firm policies and valuation.

Panel A of this table presents the results of the following system of regressions.

$$OperatingLawsuits = l_0 + l_1(FemaleExecs \geq 2)_{t-1} + l_2(FemaleExecs = 1)_{t-1} + l_3(ExcessR\&D) + l_4(Advtg.\ Intensity) + l_5(CSRConcerns) + \mathbf{X}\lambda + \mathbf{Z_A}\Lambda + \varepsilon_l$$

$$ExcessR\&D = r_0 + r_1(FemaleExecs \geq 2)_{t-1} + r_2(FemaleExecs = 1)_{t-1} + \mathbf{X}\rho + \mathbf{Z}_B\mathbf{B} + \varepsilon_b$$

$$Advtg.\ Intensity = a_0 + a_1(FemaleExecs \geq 2)_{t-1} + a_2(FemaleExecs = 1)_{t-1} + \mathbf{X}\alpha + \mathbf{Z}_\mathrm{A}\mathrm{A} + \varepsilon_a$$

$$CSRConcerns = c_0 + c_1(FemaleExecs \geq 2)_{t-1} + c_2(FemaleExecs = 1)_{t-1} + \mathbf{X}\gamma + \mathbf{Z}_1\Gamma + \varepsilon_c$$

$$Ln(Tobin'sQ) = m_0 + m_1(FemaleExecs \geq 2)_{t-1} + m_2(FemaleExecs = 1)_{t-1} + m_3(ExcessR\&D) + m_4(Advtg.\ Intensity) + m_5(CSRConcerns) + m_6(OperatingLawsuits) + \mathbf{X}\mu + \mathbf{Z}_M\mathbf{M} + \varepsilon_m$$

Panel A: Full model of system of equations

	Structural Parameters (Direct Effect)										Reduced-form Parameters (Total Effect)				
	(1) Operating Lawsuits		(2) Excess R&D		(3) Advtg. Intensity		(4) CSR Concerns		(5) Ln (Tobin's Q)		(6) Operating Lawsuits	(7) Excess R&D	(8) Advtg. Intensity	(9) CSR Concerns	(10) Ln (Tobin's Q)
Female Execs ≥ 2	(?)	−0.006	(−)	−0.005*	(−)	−0.003	(−)	−0.203**	(?)	0.042	−0.187***	−0.010***	−0.004*	−0.183**	−0.029**
		(−0.08)		(−1.74)		(−1.57)		(−2.22)		(1.55)	(−2.70)	(−3.49)	(−1.71)	(−2.00)	(−2.57)
Female Execs = 1	(?)	0.005	(−)	−0.003	(−)	−0.001	(−)	−0.124*	(?)	0.012	−0.100*	−0.004**	−0.001	−0.142**	−0.017***
		(0.10)		(−1.34)		(−0.46)		(−1.79)		(0.79)	(−1.90)	(−2.12)	(−1.12)	(−2.11)	(−2.69)
Operating Lawsuits									(?)	0.053**					
										(2.49)					
Excess R&D	(+)	5.460***							(+)	7.966***					
		(2.64)								(16.42)					
Advtg. Intensity	(+)	12.715***							(+)	5.679***					
		(3.19)								(4.01)					
CSR Concerns	(+)	0.402***							(?)	0.075***					
		(6.98)								(3.80)					
Excess Capex	(?)	1.617***							(?)	0.906***	0.347	−0.067***	−0.012	−0.987*	−0.241***
		(4.34)								(6.46)	(1.07)	(−4.15)	(−1.27)	(−1.66)	(−4.12)
Excess Aquis	(?)	−0.173							(?)	−0.652***	0.154	0.045***	−0.000	0.137	−0.286***
		(−1.36)								(−16.97)	(1.41)	(3.91)	(−0.26)	(1.05)	(−10.92)
Female Indep. Dir. Indicator	(?)	0.223***	(?)	0.002	(?)	−0.001	(?)	−0.584***	(?)	0.030	−0.042	0.002	−0.001	−0.625***	−0.004
		(4.95)		(0.92)		(−1.02)		(−9.55)		(1.59)	(−1.17)	(1.20)	(−0.97)	(−10.40)	(−0.70)
Board Independence	(−)	−0.074	(?)	0.004	(?)	0.002	(?)	0.408*	(?)	−0.136***	0.196	−0.001	0.003	0.576***	−0.001
		(−0.42)		(0.66)		(0.56)		(1.85)		(−2.67)	(1.22)	(−0.13)	(0.71)	(2.60)	(−0.04)
Ln(Total Assets)	(+)	0.264**	(+)	−0.003***	(?)	−0.003*	(+)	0.608***	(−)	−0.188***	0.217**	−0.007***	−0.004**	0.370***	−0.027***
		(2.52)		(−2.78)		(−1.89)		(14.67)		(−10.24)	(2.12)	(−2.78)	(−2.46)	(4.64)	(−3.23)
Firm Age	(−)	−0.003	(?)	−0.000	(−)	−0.000	(+)	0.017***	(−)	−0.002***	0.000	0.000	−0.000	0.013***	0.000
		(−1.43)		(−0.63)		(−1.07)		(6.17)		(−3.26)	(0.26)	(0.30)	(−0.72)	(4.89)	(0.24)
Stock Return	(−)	−0.027					(−)	0.033			0.003	−0.000	−0.001	0.039	−0.091***
		(−0.60)						(0.80)			(0.07)	(−0.11)	(−0.89)	(0.81)	(−10.60)
Stock Volatility	(+)	−0.009					(+)	0.222***	(?)	−0.145***	0.135***	0.005***	0.001	0.241***	−0.022***
		(−0.23)						(4.45)		(−12.11)	(3.54)	(4.00)	(1.05)	(4.95)	(−4.32)
ROA	(+)	0.967***	(−)	−0.074***			(−)	−0.293	(+)	1.204***	−0.178	−0.066***	−0.017***	−0.607***	−0.074
		(3.62)		(−5.29)				(−1.41)		(11.72)	(−1.09)	(−4.41)	(−2.63)	(−2.90)	(−1.43)

(*continued on next page*)

Table 8. (*continued*)

Panel A: Full model of system of equations

	Structural Parameters (Direct Effect)										Reduced-form Parameters (Total Effect)				
	(1) Operating Lawsuits		(2) Excess R&D		(3) Advtg. Intensity		(4) CSR Concerns		(5) Ln (Tobin's Q)		(6) Operating Lawsuits	(7) Excess R&D	(8) Advtg. Intensity	(9) CSR Concerns	(10) Ln (Tobin's Q)
Cash to Assets	(+)	−0.079	(+)	0.016***	(+)	0.003**	(+)	0.091**	(+)	−0.065***	0.119**	0.014***	0.002*	0.210***	0.018***
		(−1.58)		(5.84)		(2.21)		(2.11)		(−2.79)	(2.38)	(5.76)	(1.90)	(3.86)	(2.80)
Ln(Total Compensation)	(−)	−0.310*									−0.316*	0.002	0.000	−0.007	−0.005
		(−1.78)									(−1.76)	(1.64)	(0.59)	(−0.37)	(−1.30)
Market Concentration	(−)	−0.250**	(−)	−0.011**	(−)	0.006*	(+)	0.426**			−0.150	−0.006	0.006**	0.197	0.031**
		(−2.03)		(−2.44)		(1.87)		(2.55)			(−1.34)	(−1.51)	(2.21)	(1.20)	(2.10)
Book Leverage			(−)	−0.011*					(?)	−0.001	−0.478***	−0.012*	0.010*	−0.597**	−0.024
				(−1.75)						(−0.01)	(−3.78)	(−1.89)	(1.79)	(−2.56)	(−1.26)
Product Similarity			(+)	0.005***	(+)	−0.000					−0.024	0.005***	−0.000*	−0.067***	0.001
				(6.82)		(−1.00)					(−1.55)	(6.12)	(−1.67)	(−5.28)	(1.05)
Lag(Q)			(+)	0.029***							0.149	0.016***	0.002	0.039	0.839***
				(7.85)							(1.43)	(4.46)	(1.18)	(0.47)	(76.48)
Managers' Avg. Vega			(+)	0.000***							0.000	0.000	0.000	−0.000	−0.000
				(3.07)							(1.30)	(1.58)	(0.21)	(−0.77)	(−1.21)
Managerial Ownership			(−)	−0.000**							−0.000	−0.000	0.000***	0.001	0.000*
				(−1.99)							(−0.30)	(−1.00)	(3.04)	(1.55)	(1.93)
Ln(Sales)					(+)	0.004***					0.289**	0.002	0.005*	0.064	0.029
						(2.79)					(2.34)	(0.56)	(1.73)	(0.43)	(1.54)
Gross Margin					(+)	0.034***					0.670***	0.048***	0.035***	−0.588***	0.083***
						(6.14)					(3.91)	(3.52)	(5.87)	(−2.81)	(3.10)
CSR Strengths							(+)	0.115***			0.065***	0.002***	0.001**	0.105***	0.004***
								(5.70)			(3.43)	(5.07)	(2.47)	(5.22)	(2.94)
Securities Lawsuits									(−)	−0.043***	0.247***	0.000	−0.001	0.067	−0.036***
										(−2.84)	(4.32)	(0.28)	(−1.07)	(1.04)	(−2.94)
Ln(Market Share)									(+)	0.093***	0.015	0.002	0.001	0.270**	−0.008
										(4.44)	(0.15)	(0.58)	(0.36)	(1.99)	(−0.45)
# Business Segments									(−)	−0.003	0.018	0.000	−0.000	−0.024	0.000
										(−0.58)	(0.99)	(0.63)	(−0.59)	(−0.89)	(0.13)
Constant		0.010		0.003		−0.027*-**		−1.511		1.227***	−0.512	0.033	0.007	1.213	0.114
		(0.01)		(0.16)		(−4.41)		(−1.15)		(5.83)	(−0.45)	(1.06)	(0.27)	(0.67)	(0.55)
Fixed Effects		Ind, Year		Ind, Year		Ind, Year		Ind, Year, State		Ind, Year	Ind, Year, State	Ind, Year, State	Ind, Year, State	Ind, Year, State	Ind, Year, State
N		7156		7156		7156		7156		7156	7156	7156	7156	7156	7156
Adj. R^2											0.302	0.439	0.296	0.508	0.792

(*continued on next page*)

Table 8. (*continued*)

Panel B: Model excluding endogenous policies from Tobin's Q regression

	Structural Parameters (Direct Effect)									Reduced-form Parameters (Total Effect)				
	(1) Operating Lawsuits		(2) Excess R&D		(3) Advtg. Intensity		(4) CSR Concerns		(5) Ln (Tobin's Q)	(6) Operating Lawsuits	(7) Excess R&D	(8) Advtg. Intensity	(9) CSR Concerns	(10) Ln (Tobin's Q)
Female Execs ≥ 2	(?)	−0.007	(−)	−0.006*	(−)	−0.003	(−)	−0.203**	(?)	−0.001	−0.187***	−0.010***	−0.004*	−0.183**	−0.029**
		(−0.09)		(−1.75)		(−1.55)		(−2.23)		(−0.04)	(−2.70)	(−3.49)	(−1.71)	(−2.00)	(−2.57)
Female Execs = 1	(?)	0.005	(−)	−0.003	(−)	−0.001	(−)	−0.123*	(?)	−0.016	−0.100*	−0.004**	−0.001	−0.142**	−0.017***
		(0.09)		(−1.47)		(−0.47)		(−1.79)		(−0.90)	(−1.90)	(−2.12)	(−1.12)	(−2.11)	(−2.69)
Operating Lawsuits									(?)	0.168***					
										(7.86)					
Excess R&D	(+)	5.306***													
		(2.69)													
Advtg. Intensity	(+)	12.562***													
		(3.12)													
CSR Concerns	(+)	0.401***													
		−0.007													
Other control variables		*Yes*		*Yes*		*Yes*		*Yes*		*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Fixed Effects		Ind, Year		Ind, Year		Ind, Year		Ind, Year, State		Ind, Year	Ind, Year, State	Ind, Year, State	Ind, Year, State	Ind, Year, State	Ind, Year, State
N		7156		7156		7156		7156		7156	7156	7156	7156	7156	7156
Adj. R^2											0.302	0.439	0.330	0.509	0.792

All the variables are defined in the Appendix. **Xs** represent matrices of common explanatory variables (common to at least two equations in the system, e.g., year and industry fixed effects), and **Zs** are matrices of unique explanatory variables (unique variable(s) to the equation). The sample consists of firms included in both Execucomp and Audit Analytics databases from the years 2002 to 2011. The system is estimated using a three-stage least squares method. Predicted signs of structural parameters are in parenthesis in front of the estimated coefficients. In panel B, *Tobin's Q* regression excludes *Excess R&D, Advtg. Intensity* and *CSR Concerns* as explanatory variables. Standard errors are corrected for heteroscedasticity and clustered within a firm, and *t*-statistics are in parentheses. *, **, and *** denote statistical significance at 10%, 5% and 1% levels respectively.

Panel B of Table 8 shows estimates of the system of equations that is identical to that in panel A, except that the Tobin's Q regression does not include the three policy variables. As shown in Column 5, the coefficient estimate on operating lawsuits increases to 0.168 from 0.053 and becomes highly significant (t-statistic = 7.86) in predicting firm valuation. This result is consistent with our conjecture that the underlying firm policies produce the positive relation between operating lawsuits and firm valuation. The size and significance of all other variables in the structural and reduced-form regressions remain almost the same. Also noticeable is the fact that the direct effect of *Female Execs* ≥ *2* turns from positive to negative and insignificant, highlighting the influence of *Female Execs* ≥ *2* on the three underlying firm policies.[28] Using this system, an approximate total effect of *Female Execs* ≥ *2* on firm valuation can be obtained as the product of the total effect of *Female Execs* ≥ *2* on operating lawsuits (from the reduced form estimate in column (6)), and the effect of operating lawsuits on valuation, $-0.187 \times 0.168 = -0.031$, which is comparable to the reduced form parameter of -0.029.

In sum, our battery of tests suggests that the negative effect of women's power in management is at least partially driven by women managers' preference to avoid some risky and litigation-prone firm policies that are generally value-increasing. We identify three such policies: less aggressive R&D, less advertising and avoidance of policies inimical to other stakeholders.

4.5. Self-selection: treatment effect model

Our analysis so far in this section suggests that firms where female executives have more power have lower levels of R&D, advertising intensity and CSR concerns. Together, these conservative policies reduce the chance of operating lawsuits against firms, but also lead to lower firm valuation. These findings are consistent with findings of the prior literature that women executives cause firms to adopt lower-risk policies. But it is also possible that risk-averse women choose to work for firms that try to avoid lawsuits. The lack of a strong exogenous shock to female executive positions (particularly those affecting *Female Execs* ≥ *2* only) makes it difficult to establish that female executives *cause* this difference in policies. So our findings may partly reflect female executives choosing to work for firms with a risk-averse culture that gives rise to fewer lawsuits and lower firm values. This interpretation is still consistent with women executives' greater risk-aversion.[29]

Nevertheless, we next analyze whether our results hold after explicitly correcting for such self-selection via treatment effect models. To improve identification, our selection models include an instrumental variable for the presence of multiple female executives in the top management team. To construct our instrument, we follow previous studies (see, e.g., Adams and Ferreira, 2009; and Faccio et al., 2016) and calculate the fraction of male directors on a firm's board who are on the boards of other companies that have females among their top five executives (*Male Dir. w/ Fem. Exec. Link*). The rationale behind this instrument is that male directors are likely more comfortable hiring women in top positions if they have experience working with women in senior executive positions in other companies on whose boards they serve. Supporting this notion, this variable positively predicts *Female Execs* ≥ *2* in first-stage (selection) regressions shown in Panel B of Table 10, but it is plausibly exogenous to litigation-prone firm policies. The selection models control for other variables like those used by Adams and Ferreira (2009) and the lagged dependent variable to predict the presence of female executives. Both stages of these models are estimated simultaneously by the method of maximum likelihood estimation (MLE).

In Panel A of Table 9, female executives' power (*Female Execs* ≥ *2*) continues to negatively and significantly predict operating lawsuits and all three firm policies, namely excess R&D, Advtg. intensity and CSR concerns. These results suggest that the observed relations between female executives' power and firm policies are not entirely driven by self-selection. The p-value of the Wald test of independent equations, shown at the bottom of Panel B, is below 0.01 in models of firm policies (models 2 through 4), suggesting that selection effects are also important for firm policy choices. Together, these results support both a selection effect of women choosing to work for firms with a lower risk-taking culture and a treatment effect of women choosing lower-risk policies that invite fewer lawsuits.

5. Conclusion

We examine whether managerial risk-aversion affects lawsuits against firms. We use two measures of women's power in the top executive team as proxies for managerial risk aversion, and find that women's power negatively predicts operating lawsuits against firms. Results from a simultaneous equations framework suggest that these lawsuits are a function of risky firm policies that are value-increasing. Firms where women have more power appear to reduce litigation risk partly by avoiding such policies. Finally, we find some evidence of both a selection effect of women choosing to work for firms with a lower risk-taking culture and a treatment effect of women choosing lower-risk policies that invite fewer lawsuits. Our evidence that some litigation-prone firm policies are value-enhancing helps explain why lawsuits against firms are so prevalent despite their apparent negative impacts on shareholders and

[28] Note that even in this setting, we do not necessarily expect the structural coefficient of Female Execs ≥ 2 to be significantly negative in predicting value. Our interest is not in the direct effect of women executives' power on firm valuation, but rather their indirect effect via litigation-prone underlying policies, which is shown by the reduced-form models.

[29] Our simultaneous equations system allows for both possibilities. An alternative specification would add a regression of female executives' power (*Female Execs* ≥ *2*) as an endogenous variable in the system to try to establish causality. We refrain from using this approach to keep the system tractable. A misspecification in one equation in a simultaneous equations system contaminates the entire system, and the problem gets worse the larger the number of equations in the system.

Table 9.
Treatment effect with selection bias model.

The table presents the results of treatment effect models with selection bias using maximum likelihood estimation (MLE). The instrumental variable for *Female Execs ≥ 2* is the fraction of male directors on a firm's board who sit on boards of other companies that have women among their top executives (*Male Dir. w/ Fem. Exec. Link*). All models include year and Fama-French 48 industry fixed effects. Standard errors are corrected for heteroscedasticity and clustered within a firm, and *t*-statistics are in parentheses. *, **, and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Panel A: Treatment effect model Treatment models:	(1) Operating Lawsuits$_{t+1}$	(2) Excess R&D$_{t+1}$	(3) Advtg. Intensity$_{t+1}$	(4) CSR Concerns$_{t+1}$
Female Execs ≥ 2	−0.661* (−1.71)	−0.052*** (−4.07)	−0.030*** (−17.51)	−2.508*** (−27.19)
Female Execs = 1	−0.092* (−1.73)	−0.003 (−1.41)	0.000 (0.49)	−0.100 (−1.41)
Ln(Total Assets)	0.410*** (10.51)	−0.000 (−0.11)	0.001 (1.28)	0.682*** (13.15)
Firm Age	0.003 (1.53)	−0.000*** (−3.06)	−0.000 (−1.15)	0.013*** (5.23)
Stock Return	−0.078 (−1.53)	0.002 (1.05)	−0.000 (−0.51)	0.109** (2.18)
Stock Volatility	0.074** (2.10)	0.004** (2.21)	−0.000 (−0.02)	0.172*** (3.50)
ROA	0.152 (1.42)	−0.040*** (−2.86)	−0.006 (−1.52)	−0.501** (−2.06)
Cash to Assets	0.047 (0.84)	0.029*** (7.82)	0.002* (1.73)	0.021 (0.54)
Book Leverage	−0.849*** (−6.14)	−0.027*** (−3.99)	0.001 (0.15)	−0.634*** (−2.95)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	6898	5769	5769	5711

Panel B: Selection model	(1) Female Execs ≥ 2	(2) Female Execs ≥ 2	(3) Female Execs ≥ 2	(4) Female Execs ≥ 2
Male Dir. w/ Fem. Exec. Link	*0.929*** (4.47)*	*0.733*** (3.29)*	*0.251** (1.98)*	*0.144 (1.08)*
Female Indep. Dir. Indicator	0.316*** (3.90)	0.256*** (3.03)	0.182*** (3.27)	0.264*** (5.73)
Ln(Total Assets)	−0.114*** (−3.09)	−0.150*** (−4.19)	−0.010 (−0.38)	0.191*** (5.32)
Tobin's Q	−0.011 (−0.36)	−0.058 (−1.40)	−0.028 (−1.11)	−0.040* (−1.87)
CEO Chairman	−0.005 (−0.06)	0.010 (0.13)	−0.036 (−0.74)	−0.052 (−1.07)
CEO Age	−0.006 (−1.02)	−0.009 (−1.59)	0.003 (1.01)	−0.001 (−0.43)
Operating Lawsuits	−0.125 (−1.13)			
Excess R&D		−7.650*** (−2.98)		
Advtg. Intensity			−37.368*** (−17.29)	
CSR Concern				−0.485*** (−23.00)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	6898	5769	5769	5711
p-value (Wald test of independent equations)	0.135	0.003***	0.000***	0.000**

managers upon filing. As a first comprehensive study of non-securities lawsuits, the paper faces some challenges of data limitations, which opens up opportunities for future research. One fruitful area seems to be whether management and board structures (including women's power) are influenced by a firm's exposure to lawsuits.

Appendix: Variable definitions

Variable	Definitions
All Lawsuits	Number of all lawsuits filed in a given year in which the firm is mentioned as a defendant: From *Legal Case and Legal Parties* of *Audit Analytics*
Operating Lawsuits	Number of all lawsuits not related to securities laws (*IS_CATEGORY_TYPE_41*) filed in a given year in which the firm is mentioned as a defendant: From *Legal Case And Legal Parties* of *Audit Analytics*
Securities Lawsuits	Number of all lawsuits related to Securities Law (*IS_CATEGORY_TYPE_41*) filed in a given year in which the firm is mentioned as a defendant: From *Legal Case And Legal Parties* of *Audit Analytics*
Female Exec. Indicator	An indicator variable which = 1 if a firm has at least one female executive in its top management team, 0 otherwise: From Execucomp
Female Execs ≥ 2	An indicator variable which = 1 if a firm has two or more female executives in its top management team, 0 otherwise: From Execucomp
Female Execs = 1	An indicator variable which = 1 if a firm has exactly one female executive in its top management team, 0 otherwise: From Execucomp
Female Exec. Pay Slice	The sum of all female executives' total compensation (TDC2), divided by the sum of all executives' total compensation.: From Execucomp
Female Indep. Dir. Indicator	An indicator variable which = 1 if a firm has at least one female independent director on the board, 0 otherwise: From ISS (RiskMetrics)
Board Independence	Fraction of independent directors on the board: From ISS (RiskMetrics)
Ln(Total Assets)	Natural log of Total Assets: From Compustat
Firm Age	Firm age from its first appearance on the Compustat database
Stock Return	Stock return for the year: From CRSP
Stock Volatility	Natural log of the variance of daily stock returns for the year
Cash to Assets	Cash and marketable securities divided by total assets: From Compustat
ROA	Return on assets = Net Income/Total Assets: From Compustat
Book Leverage	Short term plus long term debt divided by total assets: From Compustat
Ln(Tobin's Q)	Natural log of (Book value of total assets + Market value of equity–Book value of equity) / Book value of total assets (Compustat: at–ceq + csho*prcc_f–txditc)/at
# Settlement	Number of all lawsuits filed in a given year against the firm with settlement dollars (settlement_dollars) > 0: From *Legal Case And Legal Parties* of *Audit Analytics*
$ Settlement	Sum of settlement dollars for the lawsuits filed in a given year against the firm: From *Legal Case And Legal Parties* of *Audit Analytics*
CSR Concerns	The sum of concerns related to environment, community, employment, diversity, product and human rights: From KLD (now MSCI)
CSR Strengths	The sum of strengths on the above categories: From KLD (now MSCI)
# Business Segments	Number of business segments: From Compustat
Excess R&D/Excess Capex/Excess Aquis.	$Excess\ R\&D_{i,t}\ or\ Capex_{i,t}\ or\ Aquis_{i,t} = Actual - Predicted\ (R\&D_{i,t}\ or\ Capex_{i,t}\ or\ Aquis_{i,t})$, where predicted values are obtained from the following equations estimated for each Fama-French 48 industry-year: $R\&D_{i,t}\ or\ Capex_{i,t}\ or\ Aquis_{i,t} = \beta_0 + \beta_1 * Sales\ Growth_{i,t-1} + \varepsilon_{i,t}$ $Sales\ Growth_{t-1}$ is the percentage change in sales from $t-2$ to $t-1$.
Advtg. Intensity	Advertising expense divided by sales. Advertising expense is replaced by zero when missing. From Compustat
Ln(Total Compensation)	Natural log of total compensation (TDC2): From Execucomp
Market Concentration	Market concentration based on the product description sections of firms' 10-K filings (*TNIC3HHI*): Hoberg and Phillips (2016) data library
Managers' Avg. Vega	The average Vega of top 5 executives' compensation
Managerial Ownership	Total shares owned by top 5 executives divided by the number of shares outstanding
Gross Margin	Sales minus cost of goods sold, divided by sales: From Compustat
Product Similarity	A measure of similarity of a firm's products to those of the competitors based on the product description section of 10-K filings (TNIC3TSIMM): Hoberg and Phillips (2016) data library
Ln(Market Share)	Natural log of market share, calculated as the ratio of a firm's sales to total Fama-French 48 industry sales

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