

## **Innovating for Women? The Relationship between Female Influence on the Top Management Team and Innovation's Focus**

### *Abstract:*

*Utilizing a longitudinal dataset from 387 pharmaceutical companies, this study investigates the relationship between the increase in female influence in the top management team (FITMT) and the innovation focus of firms. It examines how FITMT affects the development of innovations tailored to female-specific needs and those directed at other vulnerable categories, such as children. The analysis reveals that a heightened FITMT is significantly associated with an increased focus on female-focused innovations but does not show a similar effect for innovations targeting other vulnerable groups. The research employs patent data to assess the nature of innovation focus, with FITMT quantified by both the representation and power of female members in TMTs. These findings offer critical insights into how gender dynamics at the TMT level influence strategic innovation decisions, highlighting the need for a nuanced understanding of how female leadership can shape a firm's innovation trajectory.*

*Keywords: Innovation, Top Management Team, Gender, Empathy, Natural Language Processing*

## **1. Introduction**

Executive influence on firm actions and performance is increasingly important (Neely et al., 2020). Understanding top management team (TMT) composition, particularly gender diversity, is essential for marketing stakeholders. Prior research shows TMT composition significantly affects innovation strategy (Hambrick, 2007), but the influence of gender distribution on innovation focus, defined as tailoring innovation to specific demographics, remains underexplored (Koning, Samila, & Ferguson, 2020; 2021). This paper explores how TMT gender impacts innovation outcomes and extends research on gendered innovation, highlighting potential product-market biases resulting from TMT gender representation (Koning et al., 2021).

Grounded in empathy theory (Davis, 1980; 1983), our study investigates how empathic concern and perspective-taking within TMTs influence innovation focus. We test this model in the pharmaceutical industry using an instrumental variable approach and two-stage least squares (2SLS) estimation.

## **2. Theoretical Development and Hypotheses**

Top executives shape innovative culture and strategy (Chatman & Cha, 2003; Frambach & Schillewaert, 2002), with their demographic traits influencing firm innovation (Tang, Li, & Yang, 2015). Executives are able to direct, at least in part, the innovation strategy of the firm by conveying their strategic vision around specific opportunities that ultimately impact the focus of the innovative effort made by the firm (e.g. developing more sustainability-focus innovation) (Du, Bstieler, and Yalcinkaya, 2022). Women bring diversity in experience and information (Van Knippenberg et al., 2004; Dezsö & Ross, 2012), and their influence in TMTs depends on both representation and power (Finkelstein, 1992). As gender diversity in senior leadership increases (Iyer, 2020), women's influence in TMTs grows, shaping innovation strategy (Srivastava et al., 2023). Empathy is a multidimensional concept, encompassing cognitive elements, such as perspective-taking, and affective components, like empathic concern (Davis, 1980; 1983). For perspective-taking, previous research in marketing (Hattula, Herzog, Dahl, and Reinecke, 2015) indicates that managers tend to rely on their prior knowledge of the given problem, resulting in predictions that are more self-referential and egocentric. The firsthand knowledge of customer problems directly influences the type, quantity, and quality of identified opportunities (DeTienne & Chandler, 2007), and systematic gender differences in specific prior knowledge within the TMT impact the ability to recognize opportunities (DeTienne & Chandler, 2007), subsequently influencing strategic decision-making. Women within the TMT may bring valuable insights into critical strategic inquiries, particularly those concerning other women (Daily, Certo, Dalton, 1999). Their ability to relate more effectively to female consumers (Einiö, Feng, and Jaravel, 2019) can enhance the accuracy of evaluating innovations catering to their specific needs. Given that firms not only determine the extent of research but also allocate resources across different projects, a TMT with a more substantial and influential female

representation is likely to prioritize and invest in innovations tailored to female-centric markets.

*Hypothesis 1 (HP1): There is a positive relationship between female influence in the top management team and innovations catering to female needs.*

On the other hand, empathic concern reflects a propensity to experience feelings of sympathy and compassion for those facing adversity (Davis; 1980, 1983). Organizational science research suggests that women exhibit higher levels of empathy, making them more pro-social than their male counterparts (Kamas & Preston, 2021). Women, generally more responsive to societal needs and possessing a heightened moral and ethical orientation (Jaffee & Hyde, 2000; McInerney-Lacombe et al., 2008), are expected to adopt a communal approach emphasizing concern for others, friendliness, and unselfish behavior. Consequently, there emerges a plausible additional hypothesis, suggesting that women may demonstrate greater attention to innovations directed at more vulnerable groups, such as children.

*Hypothesis 2 (HP2): There is a positive relationship between female influence in the top management team and innovations catering to the needs of vulnerable groups.*

### **3. Methodology**

We tested our conceptual model using a sample of 387 pharmaceutical companies (SIC code: 283) from 2000 to 2020 (to exclude COVID-19). Our data were collected from Compustat, BoardEx, KPSS Technological Innovation, Resource Allocation, Growth, and the USPTO. Given the high rate of patenting in this industry to protect innovation (Prabhu, Chandy, Ellis, 2005), patents, from USPTO and PatentsView, were used to measure firms' innovation focus. This data was matched with firm names from BoardEx and Compustat using the KPSS dataset. The final dataset contains details of 34,790 patent applications over 81 quarters, resulting in an unbalanced panel of 17,366 firm-quarter observations.

*Dependent variables:* We measure innovation focus using patents' titles and abstracts and text analysis (Cao, Koning, & Nanda, 2020). The calculated score for *female-focused innovation* ranges from negative (male focus) to positive (female focus), reflecting a patent's gender focus. As representatives of vulnerable groups, we focus on children and create *child-focused innovation* as the second dependent variable. We follow a similar measurement approach. Both measures are aggregated to represent a firm's quarterly innovation focus. *Independent variable:* The Female Influence in the TMT (*FITMT*) is quantified using a composite measure that includes the ratio of female positions in the TMT as well as three other components that express the role and power of women in the TMT (Srivastava et al., 2023). *Controls:* Our model includes controls for TMT-level and firm-level variables that may affect innovation focus. These encompass the TMT size, the total number of patent applications per quarter, the duration of having a diversified team (*female tenure*), and the influence of marketing executives within the firm (*marketing power*).

We specify fixed-effects panel data models with control variables to account for the variance driven by observable firm factors. We include quarter-specific fixed effects as well as firm-specific fixed effects. To address endogeneity issues, we create a peer-based instrument (WPFITMT) calculated as the average FITMT of firms headquartered in the same state but operating in different industries, thus capturing local peer pressure to include female executives without directly influencing innovation focus (since pharmaceutical products are sold globally). The instrument is significantly associated with FITMT ( $\beta=0.297$ ,  $p < .01$ ), supporting its relevance. While using industry peers might violate exclusion criteria, geographic peers from other industries are unlikely to affect the firm's innovation decisions, influencing only through the appointment of female top managers.

#### 4. Results and Implications

Table 1: The impact of FITMT on Female-focused and Child-focused Innovation

| Variables:              | (1)<br>First-stage<br>FITMT | (2)<br>Second-stage<br>Female-focused<br>Innovation | (3)<br>Second-stage<br>Child-focused<br>Innovation |
|-------------------------|-----------------------------|---|--|
| WPFITMT                 | 0.297***<br>(0.0431)        |   |  |
| FITMT                   |                             | 15.96**<br>(7.602)                                  | -6.098<br>(5.537)                                  |
| Total number of patents | -0.000291***<br>(2.50e-05)  | 0.00467<br>(0.00343)                                | -0.000921<br>(0.00225)                             |
| Team size               | 0.00224***<br>(2.20e-05)    | -0.0352**<br>(0.0176)                               | 0.0108<br>(0.0128)                                 |
| Female tenure           | -4.25e-05***<br>(9.89e-06)  | 0.000366<br>(0.000735)                              | 0.000851<br>(0.000649)                             |
| Marketing power         | -0.0266***<br>(0.00596)     | 0.469<br>(0.584)                                    | 0.126<br>(0.401)                                   |
| Quarter fixed-effects   | YES                         | YES   | YES  |
| Firm fixed-effects      | YES                         | YES   | YES  |
| Model fit statistics    |                             | $\chi^2(84)= 118.78$                                | $\chi^2(84)= 128.80$                               |
| Observations            | 17,366                      | 17,366  | 17,366   |
| Number of firms         | 387                         | 387   | 387  |

Robust standard errors in parentheses

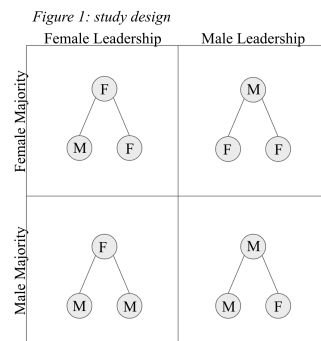
\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

The results, as detailed in Table 1, provide robust support for the first hypothesis. Utilizing a two-stage least-squares fixed-effects estimator (2SLS), we find that the coefficient for the instrumented *FITMT* has a positive and significant impact on the female focus of a firm's innovations (Model 2). This indicates that firms with a greater representation and power of women in their TMTs are more likely to develop products focused on female needs. Such findings underscore the direct and significant role of female influence at the top management level in steering innovation strategies.

Conversely, the evidence presented in Model 3 does not support the second hypothesis. We observe no significant relationship between *FITMT* and the firm's innovation focus on vulnerable categories, specifically innovations directed towards children. This lack of significant impact might suggest that while female representation and power in TMTs contribute to focusing on female-specific needs, they do not necessarily lead to a broader

empathetic focus on other vulnerable groups. This discrepancy might be attributed to a tendency for women in leadership positions to prioritize innovations based on self-referential perspectives, rather than a generalized increase in emotional empathy. In the context of gender and product innovation, there is increasing recognition that innovations often cater predominantly to male needs, driven by the homophily effect among male inventors (Koning et al., 2020; 2021). Legislative efforts, like the “Inventor Diversity for Economic Advancement Act” (IDEA Act) passed in 2021, require the USPTO to collect inventor demographic data to address innovation inequality (Mickey & Smith-Doerr, 2022). Our preliminary findings suggest that gender representation in upper management also shapes innovation, influencing strategic priorities and resource allocation, extending beyond inventor teams.

While the preliminary results are promising, the next phase involves a laboratory experiment (study design in Figure 1) in a design thinking workshop. Participants will brainstorm and define a persona for a product. We will manipulate group composition and the gender of the leader to assess how these factors influence the product idea and empathy type. Groups of three, with randomized gender roles, will develop concepts, and feedback will be collected to gauge pro-social tendencies and persona creation processes. A manipulation check will ensure leader recognition. These findings will complement our current data, offering deeper insights into how team gender dynamics affect innovation focus.



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