Firm performance and contribution of female training

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Abstract

Framing of the research*. The present research contributes to the field of studying the effects of gender diversity and management training on firm performance.*

Purpose of the paper. *The present study investigates the impact of training of senior managers on firm efficiency. In doing so, our focus is on understanding whether female involvement in training improves this relationship.*

Methodology. *This empirical study is based on archival data of training activities undertaken by 6,403 Italian firms out of 123,117 firms enrolled in Fondirigenti from 2000 to 2018. We implement a multi-stage methodology for econometric estimation. First, total factor productivity is estimated for all firms in the sample. Next, training and female involvement are assessed following the Heckman selection model (Heckman, 1976).*

Results*. We find a positive effect of senior management training on firm productivity. This effect is enlarged if female managers are involved in training activities. Participation in training activities helps women unleash their potential and provides additional benefits to the firm.*

Research limitations. *Due to data availability, it was not possible to distinguish between general and firm-specific training.*

Practical implications. *Our results indicate that carefully crafted training activities help female managers to unleash their potential and fully contribute to the performance of their firms, as upper echelons theory predicts. Firms should promote more female leaders and provide them with training opportunities to increase their contribution.*

Originality of the paper. *Most of the existing evidence on the effect of the female presence in leadership positions relates to a very narrow context of top management and board of directors of large, publicly traded companies. The present investigation addresses a novel context of senior managers who undergo management training in a sample of Italian firms that adhere to Fondirigenti. The sample includes small, medium, and large firms.*

Key words: female managers; managerial training; firm performance; TFP; senior managers; gender diversity

1. **Introduction**

There are still few women in top corporate management positions. Although the situation has significantly improved in recent years, with female C-suite members rising from 17 percent in 2015 to 21 percent in

2020, the crisis generated by COVID-19 threatens the progress made (Thomas *et al.*, 2020; Crotti *et al.*, 2021). Therefore, many companies insist that a "business case" be presented in order to continue to invest in this issue (Deloitte, 2011; OECD, 2012).

Numerous studies in the existing literature offer substantial evidence supporting the importance of increasing female representation at the highest levels of organizations (Post and Byron, 2015; Jeong and Harrison, 2017). However, the evidence on this matter could be more consistent. Meta-analyses encompassing four decades of research reveal a positive correlation between female presence in top teams and long-term financial performance (Post and Byron, 2015; Jeong and Harrison, 2017). Nevertheless, the markets' reaction to the appointment of female CEOs is contingent on the context. For instance, the impact of female board representation is positive in countries with higher gender parity (Post and Byron, 2015; Hoobler *et al.*, 2018).

Having female leaders in corporate suites brings about several positive results, such as reducing the gender pay gap (Elkinawy and Stater, 2011) and fostering greater representation of women in top management positions (Stainback *et al.*, 2016; Furlotti *et al.*, 2019). It also fosters organizational innovation and creativity (Dezsö and Ross, 2012), leading to more dynamic and forward-thinking companies. Lastly, female leaders have proven to be effective in resolving critical situations (Cook and Glass, 2016), contributing to better crisis management and decision-making within organizations.

Moreover, female top managers or board representatives substantially increase firms' sustainability efforts (Birindelli *et al.*, 2019; Ciasullo *et al.*, 2022; Galletta *et al.*, 2022). This demonstrates that gender diversity at the highest leadership echelons enhances organizational performance and aligns with sustainable business practices.

These findings collectively emphasize the significance of achieving gender diversity at the highest levels of leadership, contributing to more inclusive and successful organizations that are better equipped to adapt to challenges, foster innovation, and pursue sustainable practices.

However, most of the existing evidence on the effect of the female presence in leadership positions relates to a very narrow context. These studies primarily represent large, publicly traded US companies, either mentioned in the Fortune list or included in the S&P index (Post and Byron, 2015; Jeong and Harrison, 2017). Evidence on firms outside the US is scant. Most of the studies conducted on firms outside the US also focus their investigations on the largest publicly traded firms (Post and Byron, 2015; Jeong and Harrison, 2017). While it is important to learn best practices from the best world companies, there is a need to create a "business case" that will appeal to a "regular" firm.

Taking a theoretical standpoint, the resource-based view of firms (Wernerfelt, 1984) and the dynamic capabilities perspective (Teece and Pisano, 1990, 1994, 1997; Teece, 1996) underscore the role of management in shaping corporate performance through purposefully extending, creating, or modifying the organization's resource base (Helfat *et al.*, 2009). The intentional element in capabilities highlights the importance

of management in defining organizational routines, making investment decisions, and coordinating intangible resources to attain efficiency and innovation benefits (Teece, 1984; Dosi, 1988; March, 1994).

In this context, success in competitive environments emerges from the continuous development, alignment, and reconfiguration of firm-specific assets (Teece and Pisano, 1994, 1997; Augier and Teece, 2006). Among these assets, quality company management, as an intangible asset, plays a critical role in attaining sustainable competitive advantage (Pisano, 2017). Consequently, managerial training contributes to the development of intangible firm assets. In addition, when an organization embraces diversity, it broadens the range of possible strategies and methods it can pursue in the marketplace, leading to the development of unique capabilities. By recruiting and training female managers, companies can enhance their decision-making abilities and organizational procedures, allowing them to identify and take advantage of opportunities more efficiently (Augier and Teece, 2009). This, in turn, results in better overall company performance (Christiansen *et al.*, 2016).

The present study investigates the impact of training of senior managers on firm efficiency. In doing so, the focus is on understanding whether female involvement in training improves this relationship. The investigation addresses a novel context for the research on gender diversity. We analyze senior managers that undergo management training in a sample of Italian firms that adhere to Fondirigenti. The sample includes small, medium, and large firms.

Italy provides a compelling and unique case study, as its context allows us to examine theories (which we consolidate into our working hypotheses) under extreme conditions: specifically, the low intensity of training Italian firms offer. This presents an intriguing opportunity to explore the potential impact of senior managers' training, unaccompanied by high-intensity worker training, on total factor productivity (TFP). Additionally, this context enables us to investigate the role of female managers and how they may mediate this relationship.

Our study contributes to the literature on gender diversity by underlying the role of female senior managers in firm efficiency. At the same time, we contribute to the literature on the impact of training on firm performance by investigating the effect of firm investment in senior manager training. Moreover, the present analysis turns attention to the context neglected in the previous research by addressing non-US firms of different sizes.

The rest of this paper is organized as follows. Section 2 presents the relevant literature. Section 3 puts forward the research hypotheses. The methodology is set out in Section 4. Section 5 is devoted to data presentation. The results are presented in Section 6, and discussed in Section 7. Finally, Section 8 concludes the paper.

2. Literature

2.1 Gender diversity

The influence of female representation in top management teams and advisory boards on firm performance has yielded a body of mixed evidence (Post and Byron, 2015; Jeong and Harrison, 2017). However, insightful meta-analyses encompassing four decades of research reveal a positive correlation between female presence in top teams and long-term financial performance (Post and Byron, 2015; Jeong and Harrison, 2017). Yet, the market's response to the appointment of female CEOs is context dependent. For instance, female board representation is positively associated with countries having greater gender parity (Post and Byron, 2015; Hoobler *et al.*, 2018), while female representation in top management teams is negatively linked to short-term stock market returns (Jeong and Harrison, 2017).

Furthermore, the presence of women on advisory boards has been found to decrease the likelihood of securities fraud (Cumming *et al.*, 2015). Moreover, women are more likely than men to be considered for promotion to positions associated with crises or high-risk situations (Ryan and Haslam, 2005; Glass and Glass, 2016). This highlights the potential value of female leadership in managing challenging circumstances.

Additionally, female leadership within companies has been associated with higher levels of innovation (Dezsö and Ross, 2012) and improved corporate reputation (Bear *et al.*, 2010). These outcomes emphasize the importance of gender diversity in fostering creativity and enhancing the overall perception of a company.

Furthermore, female representation in the high echelons of leadership contributes to reducing the gender pay gap (Elkinawy and Stater, 2011). Notably, appointing women to advisory boards has a positive spillover effect on the executive team and lower organizational levels (Matsa and Miller, 2011; Skaggs *et al.*, 2012; Stainback *et al.*, 2016). This cascading effect reinforces the significance of women's inclusion in strategic decision-making positions within organizations.

On another note, the impact of female top managers and board representatives extends to fostering firms' sustainability efforts (Birindelli *et al.*, 2019; Ciasullo *et al.*, 2022; Galletta *et al.*, 2022). This observation emphasizes that gender diversity at the highest leadership echelons enhances organizational performance and aligns with sustainable business practices (Marchini *et al.*, 2022). However, a robust female presence in leadership roles is needed to foster responsible environmental practices within companies (Coscia, 2023).

Despite a relatively large literature focusing on gender diversity and its impact on firm performance, most research attention has concentrated on investigating top management teams or members of boards of directors (e.g., Post and Byron, 2015; Jeong and Harrison, 2017), and little is known about gender diversity at lower levels of management (Kirsch, 2018).

Numerous studies on female representation have been carried out on large publicly traded companies. These studies frequently involve

analyzing samples of firms that are part of the Standard and Poor's index (for instance, Hoskisson *et al.*, 2002; Adams and Ferreira, 2009; Carter *et al.*, 2010; Dezsö and Ross, 2012). In other cases, researchers have used samples from the Fortune Most Admired Companies list, as seen in the works of Bear *et al.* (2010), Cook and Glass (2014), Cook and Glass (2015), and Glass and Cook (2016). A few studies, however, have concentrated on subsets of the largest publicly traded companies at the national level, as demonstrated by Kang *et al.* (2007), Rose (2007), Furlotti *et al.* (2019), and Ciasullo *et al.* (2022).

This excessive focus on large companies and top teams may be due to the difficulty in acquiring information on the gender composition of management teams. Companies traded on the stock exchange have obligations to disclose certain information that otherwise is very difficult to obtain. Moreover, it is possible for these companies to calculate the measure of financial performance by Tobin's q (Tobin, 1969). This measure corresponds to a ratio of the market value of a firm's assets to their replacement value. This value is considered to include the future market valuation of the firm implicitly and thus reflects its overall strategic competitive advantage (i.e., Post and Byron, 2015).

The question of the effect of gender diversity at lower levels of management as well as in the context of smaller and less successful companies remains open. The present study aims to close this gap by analyzing gender diversity in senior management teams in a sample of small, medium, and large Italian companies.

2.2 Training

Extensive literature on training and its importance is readily available, and with time, interest in this subject has steadily increased, leading to a growing number of studies aiming to capture the impact of employer-provided training on productivity.

From a theoretical point of view, firm-offered training contributes to the development of intangible assets, which are crucial for obtaining competitive advantage according to the resource-based view (Teece, 1984; Wenerfelt, 1984; Barney, 1986). Firms can purposefully extend and modify their resource base through training programs, aligning it with their strategic goals (Protogerou, Caloghirou, and Spyros, 2012). By providing employees, especially managers, with the necessary knowledge and skills, firms can better exploit their existing resources and explore new opportunities to achieve superior performance. Learning empowers individuals to address specific problems effectively and efficiently through experimentation and repetition.

Furthermore, learning is a dual process involving both individuals and organizations simultaneously. While learning occurs at the individual level, the knowledge acquired is shared and institutionalized at the organizational level, integrating insightful and innovative ideas into the core elements of the organizational culture (Protogerou, Caloghirou, and Spyros, 2012).

Moreover, the dynamic capability view emphasizes the firm's ability to adapt and respond to changing environments. Training is crucial in

building learning capability, a fundamental aspect of dynamic capabilities (Teece and Pisano, 1997; Eisenhardt and Martin, 2000). Learning enables individuals and organizations to acquire new knowledge, adapt to evolving market conditions, and continuously improve their processes and routines.

Firm-offered training enhances the capacity of employees, particularly managers, to sense market opportunities and seize them effectively. It allows the firm to reconfigure its resources and processes in response to new challenges and opportunities, improving firm performance over time.

While training at all organizational levels is important, managerial training is crucial for a competitive advantage. In their meta-analysis, Durán and Aguado (2022) demonstrate that managers play a fundamental role in shaping dynamic capabilities, underscoring the significance of human factors in driving organizational evolution. Similarly, co-evolutionary theory emphasizes the pivotal role of managers in sustaining organizational evolution and, consequently, determining overall performance (Cafferata, 2016). This perspective aligns with evolutionary theory (Teece, 2007), which also recognizes the importance of the human factor in organizational evolution and performance.

Bloom and Van Reenen (2010) found that the variations in management practices across firms and countries played a crucial role in explaining the significant differences in productivity that could not be easily attributed to other factors. Extensive empirical evidence on the drivers of critical operating capabilities, such as productivity, quality, manufacturing flexibility, and R&D performance, unequivocally underscores the crucial role of effective management in influencing firm performance (Pisano, 2017).

Investing in training activities to improve the quality of management becomes a pivotal strategy for firms seeking to achieve sustainable competitive advantages and superior performance. By empowering their workforce with knowledge and skills, especially in managerial roles, organizations can better exploit existing resources, explore new opportunities, and adapt to dynamic market conditions, thereby positioning themselves for long-term success.

Measuring the returns on training investment for firms poses several challenges. One significant obstacle is the availability of data on training activities. Additionally, unobserved training heterogeneity and endogeneity can affect the econometric estimation of the impact of training on firm productivity. Researchers have shifted their research horizon from cross-sectional to longitudinal studies to address these biases. This change allows for a more comprehensive examination of the relationship between training and productivity.

The interest in understanding the return on investment of training activities has been growing among employers, and the availability of firm-level data has further facilitated the empirical investigation of this topic. However, the empirical findings have been mixed.

Bartel (1994) studied the effect of training programs on net sales. He found no impact of formal training on productivity in the same year, even after controlling for other human resource policies. Yet, businesses that invested in training programs experienced faster productivity

growth. Black and Lynch (1996) showed that the proportion of time spent in formal off-the-job training positively affected the performance of manufacturing sector firms, while computer training positively impacted nonmanufacturing-sector firms.

However, it is essential to account for endogeneity in the analysis. Black and Lynch (2001) demonstrated that the positive relationship between training and productivity disappeared when correctly considering endogeneity. On the other hand, Turcotte and Rennison (2004) found that an increase in technological training for employees was linked to a significant increase in productivity.

Ballot, Fakhfakh, and Taymaz (2006) revealed that returns on training could be shared between firms and employees, with firms experiencing higher returns. Dearden, Reed, and Van Reenen (2006) showed that an increase in the proportion of trained employees led to wage and value-added per worker proliferation. Barrett and O'Connell (2001) found that general training positively impacted productivity growth for Irish firms, while specific training had no effect.

Conti (2005) conducted an empirical analysis using individual-level data on training and firm-level data on productivity and wages for 1996-1999 in an industry panel representing all sectors of the Italian economy. Similarly, Colombo and Stanca (2014) examined the impact of workers' training on productivity and wages using a database representing the population of Italian firms, merging training information with company account data from 2002 to 2005. The results from both studies demonstrated that training had a positive and significantly impactful effect on productivity, although to varying degrees. Conti (2005) found that increasing the stock of trained workers in an industry by one percentage point led to a 0.4 percent increase in productivity, while Colombo and Stanca (2014) reported that a 1 percent increase in training was associated with a 0.07 percent increase in value-added per worker.

Feltrinelli, Gabriele, and Trento (2017) demonstrated that off-the-job formal training for middle managers in Italy during 2006-2011 had a noteworthy nonlinear exogenous impact on total factor productivity, particularly in larger firms.

The empirical literature overwhelmingly supports a positive and significant relationship between training activity and firm performance. However, the results are not always consistent in estimating the magnitude of this relationship, as seen in various studies (Barrett and O'Connell, 2001; Ballot, Fakhfakh, and Taymaz, 2006; Zwick, 2006; Colombo and Stanca, 2014). Despite these variations, the general consensus points to the importance of training in enhancing firm performance and productivity.

Despite the challenges in measuring training returns and varying empirical findings on the relationship between training and productivity, there is a general consensus supporting the significant positive effect of training on firm performance and productivity.

3. Research hypotheses

Numerous studies have consistently shown that individuals benefit from training, leading to improved performance, better paid and more stable jobs, and increased job satisfaction (Bloom and Van Reenen, 2007; Zwick, 2005). Over the past two decades, the research focus has expanded from the individual to the organizational level, exploring the potential returns on training investments for firms. Notably, the literature has highlighted the existence of two causal relationships between training and firm performance (Bloom and Van Reenen, 2007). More competitive firms tend to train more, simply because they recognize more benefits from this costly activity.

Hence, we put forward the following hypothesis:

H1: More productive firms train their managers more.

Assessing the impact of training on firm performance is challenging, but empirical evidence consistently shows a significant positive effect (e.g., Bartel, 1994, 2000; Dearden, Reed, and Van Reenen, 2006), suggesting that it enhances firm performance by improving the overall skill level. Nationally, the evidence is less definitive, but it points toward the positive effects of investment in human capital on productivity growth, innovation propensity, and success in research and development (R&D) (Gospel, 2005).

From a theoretical perspective, training is considered as an investment, according to human capital theory, leading to improved employee productivity and better economic performance (Becker, 1964). The literature supports the idea that firm-specific training creates value and can be a source of sustainable competitive advantage, as it generates complex and tacit knowledge that is difficult for competitors to imitate (Rumelt, 1984). Empirical evidence further confirms this perspective (i.e., Bidwell, 2011; Campbell *et al.*, 2014).

In contrast, general training is viewed as a firm's investment that employees can take to other companies, potentially not generating direct economic value for the firm. However, empirical research finds a positive relationship between general training and a firm's financial performance (i.e., Georgiadis and Pitelis, 2014; Feltrinelli *et al.*, 2017; Riley *et al.*, 2017), indicating that competitive advantage can still be gained.

This logic leads to the second hypothesis:

H2: Investment in training for senior management, regardless of it being generic or firm-specific, leads to significant gains in the firm's productivity.

The present study evaluates the participation of female senior managers in training. Upper echelons theory suggests that managers' cognitive frames and decisions depend on their characteristics and previous experiences (Hambrick and Mason, 1984). Female managers are considered to have different life and work experiences, view the world from another standpoint, and represent other consumer markets (Post and Byron, 2015).

Therefore, the promotion of women to senior positions should improve organizational performance. However, existing research suggests that there are still few women at the top levels, and it is hard for them to make their voices heard in a still male-dominated world, especially if they are not in the position of the leader. Women tend to be less aggressive in sustaining their views, making it challenging to consider their opinions and reducing the potential positive contribution that women can make as senior leaders. Moreover, women tend to be more risk-averse than men and thus less inclined to voice innovative ideas in regular working meetings.

During the informal situation created in off-the-job training, where the trainer is responsible for creating a safe space for learning and experimentation and building a peer-support community, women can gain their voices and be seen and reconsidered by colleagues (Ely *et al.*, 2011). Consequently, this helps them overcome confidence bias and contribute their opinions and views as predicted by upper echelons' theory.

Moreover, women demonstrate a greater inclination toward formal education, with female leaders often possessing more university degrees and being more likely to hold advanced degrees compared to their male counterparts (Hillman *et al.*, 2002; Carter *et al.*, 2010). This tendency leads to a higher level of dedication to training opportunities and a more profound commitment to learning from them (Severiens and TenDam, 1994), potentially resulting in greater returns from their participation. Conversely, men tend to be more interested in courses that enhance their qualifications. This reasoning leads to the following hypothesis:

H3: Involvement of female managers in training has a positive effect on firms' performance.

4. Methodology

4.1 Regression models

We employ a multi-stage methodology. First, we estimate the TFP. Second, we estimate the probability of doing training for the individual firm. Finally, we estimate the effects of training and female manager training using a regression that includes a correction term for accounting for self-selection.

To estimate TFP, the study employs the Levinsohn and Petrin (2003) method, which effectively addresses a crucial issue in production function estimation-the correlation between unobservable productivity shocks and input levels. This approach accounts for firms' responses to positive productivity shocks by expanding output, which necessitates additional inputs, and vice versa for adverse shocks, leading to contraction in production and a decrease in inputs. Levinsohn and Petrin recommend using an intermediate input as a proxy for investments to mitigate the simultaneity bias associated with input levels. The production technology assumed in this analysis is Cobb-Douglas (Levinshon and Petrin, 2003):

$$y_t = \beta_0 + \beta_l l_t + \beta_k k_t + \beta_m m_t + w_y + \eta_y \quad [1]$$

where y_t is the logarithm of the firm's output (value-added), l_t and m_t are the logarithms of the freely variable input labor and the intermediate input, and k_t is the logarithm of the state variable (total assets). The error has two components: the transmitted productivity component, given as w_t, and an uncorrelated error term with input choices.

We employ the Heckman selection model to address potential selection bias, utilizing a two-step estimation framework (Heckman, 1976). Additionally, we account for endogeneity concerns by using instrumental variables in the second step of the regression model.

The general form of the two estimated models is as follows:

In the first step, we model the probability of firms providing training using a probit specification:

$$prob(training_{i,t}=1) = probit\{\beta_0+\beta_1 TFP_{i,t-1}+\beta_2 X_{i,t}+\tau_t+\varepsilon_{i,t}\} \quad [2]$$

Where the probability of using training is regressed against the past level of TFP to correct for potential endogeneity in the use of training related to the productivity level of firms, a series of control variables: age, unit labor cost, cost of external services, sector of activity, a time trend, In the next phase, we conduct a regression analysis on a set of firms that offer training, where we estimate the TFP using [1] and include various variables. Specifically, we introduce the training variable:

$$\ln(TFP_{i,t})=\beta_0+\beta_1\ln(TrPC_{i,t-1})+\beta_2 WomPerTrain_{i,t-1}+\beta_3 X_{i,t-1}+IMR_{i,t-1}+\tau_t+\varepsilon_{i,t} \quad [3]$$

In each of the equations, the symbol "*i*" denotes a particular firm and "*t*" denotes a specific year. The variable $TFP_{i,t}$ represents the overall productivity of the given firm in the indicated year. In the formula, we use a logarithmic transformation of the variable.

The variable TrPC represents the overall number of training hours used by firm i in year t per overall number of senior managers in the firm. $X_{i,t}$ is a vector of independent covariates: size, age, sector of activity (SIC two-digit level), and the geographical area of activity at NUTS 1 level. To control for the impact of business cycles, the variable τ_t is included as a time dummy. Another variable, denoted by $IMR_{i,t-1}$, is the inverse Mills ratio, calculated based on the regression shown in Equation [2]. This variable is included in the instrumental variable regression model as an independent variable to address potential selection bias.

To mitigate potential simultaneity bias, all independent variables are lagged by one period with respect to the dependent variables. The estimation of Equation [3] employs the IV technique, enabling the management of training variables' endogeneity. This accounts for the possibility that more productive firms engage in more training due to greater resource availability or a better understanding of the value derived from middle manager training. Neglecting this consideration could mistakenly imply a causal relationship between training and productivity. Addressing the endogeneity of the training variable is crucial to avoid

biased estimations. Additionally, we calculate robust standard errors to address heteroskedasticity.

4.2 Choice of instrument

An essential aspect of the current models involves the incorporation of an instrument to address potential endogeneity concerns that exhibit characteristics resembling the theoretical instrument. In the context of our study, endogeneity arises because we aim to isolate the impact of manager training on firm TFP. However, we cannot preemptively exclude the possibility that past TFP influences the level of training activity within a firm. In such a scenario, the "standard" regression coefficients could be biased (Wooldridge, 2002).

Consequently, we employ an external instrument-the yearly sum of money amassed by Fondirigenti for each firm's training activity, referred to as the "conto formazione" (annual funds earmarked for senior manager training). This funding is generated through administrative regulations tied to Fondirigenti membership. Specifically, Fondirigenti sets aside a portion of the annual fee owed by firms-0.30% of the total senior managers' wages paid by a firm each year-in a dedicated fund accessible solely for financing training for senior managers. This fund expires after three years, after which the firm loses access to it, and Fondirigenti reallocates the funds for other purposes.

This variable exhibits a significant correlation with the yearly training hours and expenditure. Simultaneously, its correlations with the utilized performance indicators are negligible and near zero. Consequently, the number of training hours and expenditure are contingent on the annual training budget allocated to each firm, which, ex ante, correlates with training hours but not with firm performance.

5. Data

5.1 Dataset

The empirical analysis is based on a nine-year unique panel dataset, created by merging two complementary datasets from Fondirigenti and the Italian section of the Bureau van Dijk. Fondirigenti is an interprofessional fund established in 2004 to finance senior managers' training in participating Italian firms. The dataset from Fondirigenti provides detailed information on firms' senior management training activities, including the number of managers in training, days spent on training, total hours, and overall training expenditure. Additionally, it classifies firms as "active" or "inactive" based on their credit balance usage, indicating that money availability is not a constraint in the sample. The second data source provides accounting data for firms, enabling the construction of firm-level indicators, such as sector of activity, sales, value-added, fixed capital stock, number of employees, labor costs, and other financial variables. This matching process yields a robust firm-level panel dataset covering

nine years from 2010 to 2018, consisting of 12,234 firms, with reliable and comprehensive information on senior management training practices. The substantial sample size is noteworthy compared to previous training studies, making it comparable to studies on gender diversity[1].

5.2 Descriptive statistics

Table 1 presents the descriptive statistics of the variables analyzed. Approximately 30 percent of the sample consists of "active" firms, which utilized a portion of the training credit balance between 2010 and 2018. Small firms, defined as those with fewer than fifty employees, constitute 48 percent of the total sample, while medium and large firms (more than fifty employees) make up around 91 percent of the firms using training services. The majority of the firms (about 77 percent) are located in the North of Italy, and around 78 percent have been in business for over 14 years. The sample is predominantly composed of firms operating in the manufacturing sector (almost 70 percent), with companies providing services accounting for only 30 percent.

Tab. 1: Descriptive statistics

Variables:	Firms that activated training					Firms that did not active training				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
TFP	6,403	205	212	0-49	5.416	116,714	159	568	0.01	90810
Total Employees	6,403	801	3.718	3	139433	116,714	177	1,236	1	148,126
Firm Age	6,403	33.31	21.08	1	152	116,714	27.52	18.5	1	156
Cost of labor per employee (unit labor cost)	6,403	62	36	0.07	1.040	116,711	58	299	3	65476
Credit (Yearly amount of money available for training activity)	6,403	52,115	339,607	0.32	1.02e+07	116,711	1,363	1,708	500	31,124
Percentage of training hours dedicated to female managers (only in firms that involve female managers in training)	5,441	38%	31	0.07%	100%					
Firms that involve at least one female manager in training	1,959	36%								
Total number of training hours	5,441	166	633	2	28499					
Total number of senior managers in training	5,441	28	88	1	1569					
Hours of training per manager involved in training	5,441	20.35	2.00	1.00	231.73					
Training hours per total managers	5,441	1.88	2.47	0.07	154.00					

Source: Our elaboration.

Only 36 percent of the "active" firms involved at least one female manager in training. Of those firms, 38 percent of total training hours were

[1] There are several reasons why this dataset stands out. First, it includes diverse measures of training activity, such as the number of hours or days, the number of participants, activities per manager, and training costs and methods, which are not common in most datasets. Second, the available training variables, such as the length of training (hours or days) and training expenditure, are considered strong indicators according to influential studies in the academic literature. Third, unlike many training studies relying on surveys, this dataset is generated by the firms themselves, ensuring accuracy and reliability as all training plans are submitted, recorded, and triple-checked by the firm, training provider, and Fondirigenti. This minimizes measurement errors and ensures data completeness. Moreover, using a company database avoids biases resulting from individuals' inaccurate recall of training received and variations in training definitions across firms. Fourth, the data is collected in real-time, immediately after the training activity is completed, ensuring thorough and up-to-date information. Fifth, the dataset is fully representative of all managers in the firm, as it includes training activities for every senior manager once the firm joins Fondirigenti.

allocated to women. On average, firms involved 28 managers in training, offering around 20 hours of training per manager. Male and female managers received the same number of training hours.

Managers involved in training had an average age of 50.29 years. Female managers were slightly younger, registering an average age of 48.8 years, while male managers' average age was 50.59 years.

6. Results

Table 2 reports the probit regression results, which measure the probability for a firm to activate training. Significant predictors of training activity are the firm dimension (0.404) and its age (0.108): larger and older firms utilize more training and are highly likely to upgrade their capabilities. The coefficient related to the past TFP score is positive (0.258) and significant. Hence, more efficient firms are more inclined to invest in managerial training, lending support to hypothesis H1. These firms recognize opportunities created by training to boost competitive advantage and invest in it to maintain their efficiency. The probability of initiating a training program increases with firm age and its dimension. The nature of the fund partly explains this. Firms need to accumulate a considerable amount of money on the account to activate training programs. This goal can be reached faster by larger and older firms.

Tab. 2: Determinants of training. Probit model. Dependent variable: the probability of using the training at the time (t) (prob(training=1)

Independent variables:	
Ln[Total Factor Productivity at time (t-1)]	0.2578*** (0.011)
Ln[Employees at time (t-1)]	0.4037*** (0.006)
Age at time (t)	0.1076*** (0.009)
Unit Labor Cost at time (t-1)	0.0000*** (0.000)
Services (t-1)	0.0001 (0.000)
Year controls	yes
Sector controls	yes
Region controls	yes
Constant	-5.3682*** (0.074)
Chi2 test	8905
Prob. Chi2	0.000
Pseudo-R2	0.180
Observations	107,583

Notes: Sector controls consider ATECO 2-digit sectors. Geographic controls for regions
Standard errors in parentheses.
*** p<0.01. ** p<0.05. * p<0.1

Source: our elaboration.

Table 3 summarizes the effects of training and female managers' involvement in training on TFP. Table 3 column (1) represents a benchmark model of training impact. Column (2) also includes the variable of interest

related to the proportion of training hours dedicated to female managers. The results are very similar. Hence, we refer to column (2) in presenting and commenting on them. First, the inverse Mills ratio (IMR) is negative and significant, indicating self-selection in the sample (see the discussion about hypothesis H1) and justifying the two-step procedure applied. The estimate of the impact of training on TFP is positive (1.615) and significant. Raising the training hours per senior manager by 1 percent increases TFP by around 1.62 percent. This supports hypothesis H2.

The effect of female managers' presence in training registers a positive and significant coefficient (0.003). Firms that involve female managers in training receive an additional boost to their TFP. This result lets us conclude in favor of hypothesis H3. These firms gain an advantage from enhancing the managerial capabilities of their managers through training. They enlarge the benefit given by training through further stimulating diversity. The higher the proportion of female managers involved in training, the larger the effect. This coefficient is economically significant. Dedicating managerial training entirely to female managers would augment TFP by 27 percent. If gender parity is reached among managers who undergo training, the TFP would increase by 13.5 percent compared to companies that reserve training only to male managers.

Tab. 3: The effect of training intensity and women training on the TFP. Dependent variable: Ln[TFP(t)]

Independent variables:	(1)	(2)
Ln of Training hours per manager at time (t-1)	1.6594*** (0.642)	1.6151*** (0.610)
Proportion of training hours dedicated to female managers		0.0027** (0.001)
Ln[Employees at time (t-1)]	-0.8399*** (0.094)	-0.8356*** (0.093)
Age(t)	-0.3453*** (0.043)	-0.3429*** (0.041)
IMR	-3.9662*** (0.291)	-3.9273*** (0.272)
Year controls	yes	yes
Sector controls	yes	yes
Region controls	yes	yes
Constant	15.2854*** (1.151)	15.2429*** (1.134)
Chi2 test	596.5	628.1
Prob. Chi2	0.000	0.000
Observations	5.441	5.441

Notes: Sectors controls consider ATECO 2-digit sectors. Geographic controls for regions
Standard errors in parentheses
*** p<0.01. ** p<0.05. * p<0.1

Source: our elaboration.

To facilitate understanding the economic significance of this value, Table 4 provides a hypothetical example. Suppose a firm placed in the bottom 10 percent in terms of firm productivity wishes to improve its performance. By increasing its training intensity by 25 percent, it could reach a productivity level in the bottom 25 percent (i.e., the 25th percentile) of the least productive firms. A firm in the top 50 percent of the most effective firms that would like to boost its productivity further could do

so by increasing its training intensity by 34 percent. This would allow it to reach the top 25 percent (i.e., the 75th percentile) of firms.

Based on the examples in Table 4, a hypothetical firm with a TFP value within 25 percent of the less productive firms with only male managers in training could reach the 33rd percentile by reserving half of the places in training activity for female managers. The same firm could get the 40th percentile if all managers in training were women. To reach a similar improvement without diversity, a firm with only male managers in training would need to increase training intensity by 16 percent. This can be achieved without spending extra budget by increasing managerial diversity.

The two effects, the impact of training and the involvement of women, are cumulative. Firms that involve female managers in training reached higher efficiency levels than other firms in our sample.

Tab. 4: A hypothetical example of the impact of training on the TFP of the overall sample

TFP starting value		% increase in training intensity needed to reach the intended value	TFP to be reached	
percentile	value		percentile	value
p10	98	25%	p25	138
p25	138	25%	p50	189
p50	189	34%	p75	292
p75	292	30%	p90	432

Source: our elaboration.

7. Discussion

The results of the present study confirm that investment in managerial training improves firm performance. This means that firms that activate executive training, involve more managers, and dedicate more hours to training experience improved productivity in the subsequent year. Feltrinelli *et al.* (2017) conduct a study in a similar context and find a "too-much-of-a-good-thing" effect. According to this effect, increasing investment in training offers incremental results only until a particular optimum point is reached. After that point, additional training will result in lower returns in terms of productivity growth. We find a positive linear relationship between training hours and TFP improvements in our setting. This indicates that the more the firm invests in training, the better its productivity growth is. Feltrinelli *et al.* (2017) analyze the period from 2006 to 2011. In the present study, a period from 2010 to 2019 is considered. Higher uncertainty and fast changes faced by firms characterizes the latter period. Increasing tension may require firms to turn their attention to training to purposefully acquire the necessary capabilities that help them to compete in the turbulent marketplace (Helfat *et al.*, 2009). These results are in line with the dynamic capability model (Teece and Pisano, 1990, 1997).

The most prominent result of the present study is that the impact of training on productivity is enlarged if female managers are involved in

the activity. This result provides additional proof of the importance of promoting diversity at different levels of management by showing that investment in the training of female managers gives additional benefits to firm productivity. Promoting gender diversity among managers involved in training allows companies to improve efficiency without extra financial investment.

Our results demonstrate that training helps unleash female leaders' potential to contribute fully to firms' performance. Given the critical productivity boost that accompanies the involvement of female managers in training, more attention should be dedicated to exploring what drives this result.

Finally, we observe that more productive firms are more inclined to invest in training. The measurement of the impact of training in the present study is not affected by this finding due to the econometric procedure adopted by the study. However, this result suggests that more productive firms investing in managerial training increase their productivity. This may lead to a growing disparity among firms in terms of productivity. This observation needs to be explored in future studies.

8. Conclusions

The present study empirically examines the relationship between firm investment in human capital, gender diversity, and performance. It is the first study that investigates the impact of diversity.

This study offers several contributions to the literature. First, the paper contributes to the literature on the impact of management training on firm performance. Previous literature has examined the effect of comprehensive training (Riley *et al.*, 2017), employee training, and middle managers' training (Feltrinelli *et al.*, 2017). Our results confirm that investment in senior management human capital, either general or firm-specific, constitutes the source of competitive advantage (Morris *et al.*, 2017).

The previous literature has demonstrated the importance of female presence in top management teams and boards of advisors. The present study helps to indicate how this contribution can be improved. Participation in training activities seems to help women unleash their potential and provide additional benefits to the firm. We claim that a skillfully created training program, in addition to its main aims of building skills and transferring knowledge, creates firm-specific human capital given by the generation of a unique safe space that allows for learning and experimentation. This space is the cornerstone for successfully applying upper echelons theory in practice. Moreover, our results suggest that the more women are involved, the more diversity goes through the training and the higher the advantage to the firm.

The present study sheds light on an under-researched category of management, namely, senior management. This group is less studied in the literature but is essential for strategy definition and implementation. Given that the Italian context is characterized by scant investment in employee training, the investment in senior management supported by national law can be seen as a source of firms' competitive advantage.

Finally, previous studies have concentrated on investigating the stars of business-the largest and most high-performing companies. The present inquiry extends the earlier results to the context of "regular" firms. It also confirms that, in the context of smaller firms, gender diversity matters and brings competitive advantage.

8.1 Managerial implications

Human capital matters in upgrading a firm's dynamic capabilities. Our results suggest that firms need to invest in their overall training and give more space to female leaders as this boosts companies' competitive advantage. However, the fact that 60 percent of firms activate training programs without involving a single woman suggests that there may be no senior-level women who could be involved in the first place.

The research suggests an action plan for firms willing to improve their efficiency. They need to embrace diversity within their organization, individuate personalities with high potential, and invest in their development (Ely *et al.*, 2011). Firms that do have women but do not provide them with the opportunity for growth should do so, as training helps women unleash their potential and improve the firm's performance.

Firms' development activities should be carefully planned to involve more diversity in training and create an atmosphere that helps to unleash the participants' inherent capacity. Indeed, the evidence demonstrates considerable differences between firms that invest in training and those that do not. Moreover, this difference is growing as more efficient firms tend to reinvest in the training and development of their human capital. This gives them an additional advantage in attracting a better workforce, particularly female managers.

8.2 Limitations

All studies have limitations, and the present one is no exception. Although the investigation relies on a rich dataset providing detailed information about training activities of managers in Italian firms, the strength of the dataset constitutes its weakness. The focus on training activities prevents the collection of data on the firm itself. While the gender composition of managers who underwent training is registered in archives, there is no information on the composition of the gender mix of managers not involved in training. For instance, it is impossible to understand whether firms addressed training activities only to male participants because the training was specific for the positions occupied by male managers or whether the lack of involvement of female managers was due to the absence of female senior managers in the firm.

From the information at our disposal, it is impossible to infer if the training was generic or firm specific. While firm-specific and generic human capitals constitute value at the senior management level, as demonstrated by the present study's results, a better distinction between the two types would have helped to test the theory.

Our results related to gender diversity may be driven by the fact that only a few women can make it to the top. These managers are probably

better prepared and have more experience and investing in their human capital provides higher returns (Dezsö and Ross, 2012). Our data do not allow us to investigate this alternative hypothesis. Future research should address this point.

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