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The Impact of Gender Diversity on Innovative Performance: Empirical Analysis in the Caribbean Region

El impacto de la diversidad de género en el desempeño innovador: Análisis empírico en la región Caribe

Yury Castillo
yuricastillo@unicauca.edu.co
Universidad del Cauca

Isabel Álvarez
mialvare@ucm.es
Instituto Complutense de Estudios Internacionales (ICEI)

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Abstract

This paper investigates the impact of gender diversity on the innovative performance of Caribbean firms, specifically analyzing women's representation across three organizational areas: the overall workforce, management, and skilled production and non-production roles. The study used data from the Innovation, Firm Productivity, and Gender (IFPG) database, encompassing 1,979 firms across 13 Caribbean countries from 2017 to 2020. Probit models were employed for econometric analysis. The results confirm that diversity significantly enhances the likelihood of innovation, though the magnitude of its impact varies depending on women's roles within firms. Gender diversity has stronger effects within the overall workforce and skilled production and non-production roles than within management teams. These findings suggest important managerial and policy implications for developing measures to reduce gender disparities in innovation.

Keywords: Gender diversity, Caribbean region, innovative performance, developing economies.

Resumen

Este artículo investiga la influencia de la diversidad de género en la innovación de las empresas de la región Caribe, considerando la presencia de mujeres tanto en la fuerza laboral total, como en el equipo directivo, y las actividades productivas y no productivas. El estudio se ha realizado con la información de la base de datos Innovación, Productividad Empresarial y Género (IFPG) que recopila información de 1.979 empresas ubicadas en 13 países del Caribe para el período de 2017 a 2020. Se utilizaron modelos Probit para el análisis econométrico. Los resultados confirman que la diversidad de género tiene un efecto positivo en la probabilidad de innovar, siendo mayor el impacto al considerar las mujeres en la fuerza laboral total y en las actividades productivas y no productivas, que en el equipo directivo. Estos hallazgos invitan a reflexionar sobre posibles implicaciones gerenciales y de política para cerrar las brechas de género en innovación en economías en desarrollo.

Palabras clave: Diversidad de género, región Caribe, desempeño innovador, economías en desarrollo.

JEL Classification/ Clasificación JEL: O32; O54.

1. Introduction

Many factors can condition and influence the innovation capacities of firms and countries; among the most commonly analyzed are R&D investment, absorptive capacity, and business strategy. These factors have been extensively explored in the literature (Cohen and Levinthal, 1990; Kafouros et al., 2020; Protogerou, Caloghirou and Vonortas, 2017). However, aspects related to human capital, specifically gender diversity — a balanced and varied representation of men and women in the workplace (Campbell and Mīnguez-Vera, 2008; Østergaard, Timmermans and Kristinsson, 2011) — remain largely unexplored in the innovation literature (Alsos et al., 2013; Bogers et al., 2018; Ljunggren et al., 2010). Recently, however, this topic has gained increased interest.

Given the importance of human capital in fostering innovation, gender dynamics have drawn the attention of both academics and policymakers, leading to a notable rise in studies over the past decade that incorporate human resources and demographic factors for a more nuanced understanding of innovation (Arun et al., 2020; Bogers et al., 2018; Garcia Martinez et al., 2017; Gallego and Gutiérrez Urdaneta, 2018). Growing evidence suggests that a more balanced gender composition could be key to enhancing firm-level innovation (Arun et al., 2020; Díaz-García et al., 2013; Teruel and Segarra-Blasco, 2017; Østergaard et al., 2011). Nevertheless, few studies compare the effects of gender diversity across different functional areas or roles held by women within firms. Considering that innovation is a cross-cutting process, it is essential to examine how gender diversity in various organizational areas may strengthen innovation outcomes, especially within developing economies.

Most studies on the gender diversity–innovation relationship have been conducted in developed economies, where demographic characteristics, women's labor market participation, and innovation capacities differ significantly from those in developing regions. In Caribbean economies, for instance, the impact of gender diversity on innovation is a critical yet underexplored area. While these economies have relatively high levels of women's labor market participation, their innovation rankings are less favorable. Without fully integrating women into the innovation processes of firms, these economies miss opportunities for productivity gains. A more balanced gender composition could optimize individual skills and capabilities, translating into stronger innovation performance, ultimately enhancing growth and competitiveness.

The Caribbean presents a favorable context for examining gender diversity's impact on innovation. Across the Latin America and Caribbean (LAC) region, women's labor force participation rose by 25% between 1990 and 2018 (The World Bank, 2020). The Economic Participation and Opportunity sub-index in the LAC region is 64.2%, surpassing the global average of 58% (World Economic Forum, 2021). Specifically, the Caribbean has a robust rate of women in various firm positions (Moore et al., 2017). Yet, Caribbean nations are ranked lower in terms of innovation on the Global Innovation Index 2023 (WIPO, 2023)

In light of these considerations, this paper posits that gender diversity positively influences firm innovation through the participation of women across organizational levels. We argue that this effect is maximized when gender balance exists at all organizational levels, rather than being concentrated solely in management. Innovation, as a cross-functional process, requires a breadth of knowledge derived from diverse perspectives, spanning both strategic and operational phases. This study draws on data from the Innovation, Firm Productivity, and Gender (IFPG) database, comprising data from 1,979 firms in 13 Caribbean countries[1] from 2017 to 2020 (Compete Caribbean, 2021). Probit models were employed for econometric analysis.

Section 2 reviews the relevant literature, focusing on key arguments regarding the relationship between gender diversity and innovation. Section 3 describes the methodology used. In Section 4, we present our main findings, and Section 5 offers concluding remarks.

2. Background

The traditional association between women and domestic activities has resulted in notable disadvantages in the labor market, as reflected in wage disparities and the underrepresentation of women in fields related to technical advances, such as STEM (Science, Technology, Engineering, Mathematics) — fields foundational to technological development (Siravegna, 2021; Sevilla et al., 2023). This entrenched association between gender and roles has perpetuated multiple sources of inequality in the workplace, presenting significant obstacles to women's career advancement, often exacerbated by hostile work environments (Pololi et al., 2013).

In innovation-related fields, research shows that female participation in the workplace enhances a firm's innovative capacity through women's unique perspectives, insights, and skill sets (Díaz-García et al., 2013; Garcia-Martínez et al., 2017; Romero-Martínez et al., 2017; Østergaard et al., 2011). Studies confirm that women are not inherently lacking in skills needed for innovation and patenting (Swede, 2003); however, a substantial gender gap persists in patenting outcomes (Sugimoto, 2015; Medina and Alvarez, 2022). Available

1 Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Guyana, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Suriname, the Bahamas, and Trinidad and Tobago.

empirical evidence suggests that gender diversity positively affects innovation within firms when women hold roles in at least three key areas: (i) shareholders (ownership); (ii) top managerial positions; and (iii) diverse functional areas with high gender diversity (Arun et al., 2020; Dohse et al., 2019; Teruel and Segarra-Blasco, 2017).

The existing literature indicates that women in executive roles substantially impact multiple dimensions of innovation, especially when serving as firm owners, CEOs, or within top management teams (TMTs). The upper echelon theory (Hambrick, 2007) supports this view, positing that a team's composition (notably in TMTs) shapes a firm's strategic direction, as diverse cognitive perspectives among decision-makers enrich strategic choices.

One reason women in executive roles positively impact innovation is their increased focus on R&D activities relative to their male counterparts (Miller and Del Carmen Triana, 2009) and their openness to new ideas (Santos et al., 2019). Women also conduct more rigorous monitoring and gather detailed environmental data (Galbreath, 2011), which helps mitigate asymmetric information and R&D-related agency issues (Tong and Zhang, 2021; Chen et al., 2021). With a stronger grasp of market insights, women leaders make well-informed decisions and tend to foster organizational structures conducive to innovation, cooperation, and information exchange — all essential to successful R&D (Chen et al., 2021).

Further studies confirm the positive influence of women in top roles on a firm's innovative behavior and performance (Arun et al., 2020; Dohse et al., 2019; Moore et al., 2017; Ritter-Hayashi et al., 2019). TMTs with relatively balanced gender representation achieve higher innovation outcomes (Ain et al., 2021; Ritter-Hayashi et al., 2019; Ruiz-Jiménez et al., 2016; Torchia et al., 2018; Xie et al., 2020). Gender diversity within TMTs can foster novel ideas and improve resource allocation and investment opportunities in R&D, thereby enhancing innovation performance (Miller and Del Carmen Triana, 2009; Mukarram et al., 2018).

While some studies evaluate gender diversity across the entire workforce, as opposed to only TMTs or CEOs, diversity within small teams (e.g., TMTs) may not adequately represent the broader impact of employee diversity on innovation (Østergaard et al., 2011). Since the innovation process involves collaboration across multiple organizational levels and with external entities (Lundvall, 2010), it is crucial to examine a firm's wider skill and knowledge composition to understand the impact of workforce diversity on innovation performance (Østergaard et al., 2011, p. 508). Research suggests that gender diversity in the workforce positively enhances a firm's innovative capability, especially in facilitating process, marketing, and organizational innovations within larger firms (Teruel and Segarra-Blasco, 2017) and that it significantly boosts overall firm innovativeness (Ritter-Hayashi et al., 2019).

The effect of gender diversity may also vary depending on the type of innovation, as each type demands distinct resources and skills (Gallego and Gutiérrez Urdaneta, 2018; Teruel and Segarra-Blasco, 2017). For instance, technological innovation (involving new or improved products and processes) often requires creativity, investment, risk tolerance, and complex operational

development. Such innovation may benefit from women's capacity to resolve conflicts, generate new ideas, and manage intricate R&D tasks (Díaz-García et al., 2013; Xie et al., 2021). In contrast, non-technological innovations (organizational and marketing-related) may benefit from women's "people-oriented" approach (Torchia et al., 2018), as this facilitates environmental monitoring and customer needs assessment, both of which positively influence marketing innovation and organizational change.

Although studies on gender diversity and innovation generally report positive outcomes, most focus on single areas of influence within a firm, such as management teams or R&D divisions. Few studies compare the effects of gender diversity across different organizational roles. Considering this gap, our study supports the hypothesis that the impact of gender diversity on innovation depends on the areas within a firm where women are represented. Specifically, gender diversity within the overall workforce and in production and non-production activities exerts a stronger influence on innovation than diversity limited to small groups like management teams.

3. Methodology

3.1. Data

To examine the relationship between gender diversity and innovation performance in Caribbean firms, this study utilizes the Innovation, Firm Productivity, and Gender (IFPG) database, funded by the Compete Caribbean Partnership Facility (CCPF) and its donors: the Inter-American Development Bank (IDB), the United Kingdom's Foreign and Commonwealth Development Office, the Caribbean Development Bank, and the Government of Canada. Data collection was coordinated and overseen by the IDB's Competitiveness, Technology, and Innovation Division (IFD/CTI), the Caribbean Country Department (CCB), and the IDB-Invest Strategy and Development Department (DSP).

The IFPG database was created to provide up-to-date, internationally comparable data on private sector issues in the region, including productivity, innovation, gender, and the effects of the COVID-19 pandemic. The survey, conducted by the IDB in 2020, includes data from 1,979 firms across 13 Caribbean countries, with 57% of these firms in the services sector and 43% in manufacturing. In this survey, 39% of the 1,972 firms in the sample developed at least one type of innovation (product, process, organizational and/or marketing) between 2017 and 2020, with technological innovation showing the strongest performance[2].

3.2. Method

In this study, innovation is defined as a new or significantly improved product or process (or a combination of both) that differs markedly from

2 A previous study using the same survey is found in Álvarez and Castillo (2023).

prior products or processes offered by the firm or used in its operations. Innovations may relate to goods or services, business processes, marketing methods, or organizational methods within business practices, workplace organization, or external relations (Compete Caribbean, 2021). Technological innovation includes innovations in goods, services, and/or business processes, whereas non-technological innovation encompasses new marketing and/or organizational methods.

To evaluate the effect of gender diversity on innovation, the empirical model distinguishes between technological and non-technological innovation (Eqs. 1, 2). It assumes that decisions regarding technological and non-technological innovation are interdependent and influenced by common factors. To analyze the propensity to innovate and perform econometric estimations, biprobit regression models are applied across all firms in the sample, using the following general form:

$$y_1^* = x\beta_1 + \mathfrak{x}\beta_2 + \varepsilon_1$$
$$y_1 = \begin{cases} 1 \; if \; y_1^* > 0 \\ 0 \; if \; y_1^* \leq 0 \end{cases} \qquad \text{(Eq. 1)}$$

$$y_2^* = x\beta_2 + \mathfrak{x}\beta_2 + \varepsilon_2$$
$$y_1 = \begin{cases} 1 \; if \; y_2^* > 0 \\ 0 \; if \; y_2^* \leq 0 \end{cases} \qquad \text{(Eq. 2)}$$

where and are the unobserved latent variables, which in this case represent technological innovation (INNTEC) or non-technological innovation (INNnoTEC), respectively. y^*_1 represents measures of gender diversity, y^*_2 represents a set of control variables, and and are correlated error terms. Probit and logit models have been used in similar studies on the relationship between gender diversity and innovation (e.g. Teruel and Segarra-Blasco, 2017; Ritter-Hayashi, Vermeulen, and Knoben,2019).

Regarding the variables introduced in the models, the dependent variable in both cases indicates whether the firm manages to achieve either technological or non-technological innovations (INNTEC and INNnoTEC in Eq. 1 and 2, respectively – see the list of variable definitions in Annex D). Both are binary variables: INNTEC takes the value of 1 if firms achieved some product or process innovation between 2017 and 2020, and 0 if otherwise. INNnoTEC takes the value of 1 if firms registered organizational or market innovation during the same period, and 0 if otherwise.

The main independent variable is the presence of gender diversity in the firm. For this, we utilize three distinct measures of gender diversity:

- Total workforce gender diversity (TWF_gd): This variable includes all firm' employees. In line with those studies that observe categorical diversity attributes for team diversity, the Blau Index of Heterogeneity (1977) is used, similar to previous studies on gender diversity and innovation (Teruel and Segarra-Blasco, 2017; Xie *et al.*, 2020):

$$D = 1 - \sum_{i=1}^{k} Pi^2,$$

where k represents the total number of categories of a variable. Here only two categories are possible (male and female), and Pi is the proportion of employees that falls into category k. The minimum value of D = 0 occurs when all employees fall within the same category and there is no variety (e.g., all employees are men). The greater the distribution across categories, the higher the diversity index value; the highest value (D = 0.5) indicates equality in the distribution.

- Management team gender diversity (MT_gd): The Blau Index is used to define gender diversity in employees in management or roles of leadership, strategy, improvement, and growth of the firm.
- Skilled production and non-production gender diversity (SP_gd): The Blau Index is used to define gender diversity among employees directly active in the production process or at a supervisory level (production), or in professional, support, and administrative roles, as well as sales employees and others (non-production) where management is considered a skilled activity.

The control variables include those that describe the internal characteristics of firms and have been shown in previous studies (e.g., Díaz-García et al., 2013; Ritter-Hayashi et al., 2019; Teruel and Segarra-Blasco, 2017) to influence innovative performance. First, R&D investment (Inv_R&D) is measured as the average investment in research and development over the past three years, normalized by the number of employees. Second, firm age (Age) is represented by the log of years since its founding. Third, international trade (Export) is a dummy variable set to 1 if the firm exports, and 0 otherwise. Fourth, the variable for group affiliation (Group) is a dummy that takes the value 1 if the firm is part of a larger firm, and 0 otherwise. Finally, the use of intellectual property protections (Use_IP) is a dummy variable that takes the value 1 if the firm employed any intellectual property protection mechanisms during the observation period, and 0 otherwise.

The final three control variables are sector (Sector), country (Country), and firm size (Size), measured by the number of employees. Sectoral variation is captured by six dummy variables based on Castellacci's sector taxonomy, with each dummy set to 1 if a firm operates within a specific sector and 0 otherwise. Castellacci's taxonomy is particularly suited to this study as it provides a comprehensive framework for understanding innovation characteristics across both manufacturing and service industries, highlighting sectoral interrelations within the economy. These interrelations are defined primarily by a sector's role as either a supplier or recipient of goods and services, as well as its technological content.

This taxonomy divides the economy into four broad sectoral groups, each with two sub-groups: (1) Advanced Knowledge Providers, which include Knowledge-Based Services (KBS) and Specialized Manufacturing

Suppliers (SMS); (2) Mass Production Goods, encompassing Science-Based Manufacturing (SBM) and Scale-Intensive Manufacturing (SIM); (3) Support Infrastructure Services, including Network Infrastructure Services (NIS) and Physical Infrastructure Services (PIS); and (4) Personal Goods and Services, comprising Supplier-Dominated Manufacturing (SDM) and Provider-Dominated Services (PDoS). This classification is suitable for analyzing datasets like the IFPG, which cover both manufacturing and services sectors. For more on this taxonomy, see Castellacci (2020). A detailed breakdown of sectors within each sub-group can be found in Annex A.

Regarding countries, 13 dummy variables were created taking the value 1 if a firm is in a specific country. Finally, four dummies capture different size effects. Size as a continuous variable is not used, because the diversity measures depend on the size of the firm, and the high correlation between these two measures can generate multicollinearity problems; using dummy variables allows some indication of the impact of diversity on the likelihood to innovate within a group of firms of similar sizes (Østergaard *et al*., 2011). Four groups were created: (Size1: less than or equal to 10 employees; Size2: from 11 to 49 employees; Size3: from 50 to 249 employees; and Size4: over 250 employees).

Another potential concern is the endogeneity in the relationship between gender diversity and innovation, as has been noted in previous studies on omitted unobservable firm characteristics (Teruel and Segarra-Blasco, 2017; Gallego and Gutierrez, 2018). For example, managers focused on innovation and gender diversity may increase the hiring of women within their firms (Gallego and Gutierrez, 2018), and therefore gender diversity could become an endogenous variable relative to the dependent variable, hence correlated with ε_i, (Teruel and Segarra-Blasco, 2017). To address possible endogeneity, a control function correction method is applied (Blundell and Powell, 2003). In the first stage, Equation (3) is estimated as follows:

$$\text{gender\_ diversity} = xB_{1+\gamma}B_2 + \varepsilon_1 \qquad \text{(Eq. 3)}$$

where *gender_diversity* represents firm-level measures as previously defined B_1 is the instrumental variable for TWF_gd, MT_gd, and SP_gd – each calculated as the sectoral mean of its respective Blau index at the two-digit level, following the approach of Teruel and Segarra-Blasco (2017). B_2 includes control variables of Size_con (log of total employees), Age, Export, Group, and Sector effects based on Castellaci's taxonomy, and Country. Robust standard errors are used in all estimations. Table 1 presents first-stage results, while Table 2 displays results from exclusionary tests, validating the instruments. Each instrument is tested against technological and non-technological innovation to confirm no direct effect on innovation measures. The predicted values for gender diversity (*gender_diversity_hat*) are then introduced in Equations (1) and (2).

Table 1. First stage to estimate predicted gender diversity variables

Dependent variable	TWF_gd	MT_gd	SP_gd
mTWF_gd	1.04*** (0.14)		
mMT_gd		1.72*** (0.37)	
mSP_gd			1.43*** (0.22)
Size_con	0.07*** (0.01)	0.168** (0.01)	0.15*** (0.01)
Age	-0.01 (0.01)	-0.02 (0.02)	-0.03** (0.01)
Export	-0.01 (0.009)	-0.0004 (0.03)	-0.002 (0.02)
Group	0.03* (0.01)	0.07* (0.03)	0.01 (0.02)
Cons	-0.18** (0.06)	-0.88** (0.14)	-0.49*** (0.08)
Obs	1979	1979	1.891
Log pseudolikelihood	-81.74	-1313.83	-810.07
R-squared	0.70	0.13	0.26

Notes: All model estimations were conducted using a Tobit model. Regressions include dummy variables to control for the country and two-digit sector classifications based on Castellacci's taxonomy. Coefficient values are reported, with robust standard errors in parentheses. ɻ $p > 0.10$ * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2. Test of exclusionary restriction

	INNTEC	INNnoTEC	INNTEC	INNnoTEC	INNTEC	INNnoTEC
mTWF_gd	0.84 (1.06)	1.81 (1.09)				
mMT_gd			0.782 (0.959)	1.02 (1.09)		
mSP_gd					0.46 (0.96)	0.52 (1.06)
Constant	-0.64** (0.38)	-1.26*** (0.40)	-0.55* (0.28)	-0.93** (0.32)	-0.47ɻ (0.27)	-0.81** (0.30)
Obs	1.979		1.979		1.979	
Log pseudo likelihood	-1964.43		-1965.12		-1965.52	

Notes: All regressions include dummies controlling for the country and Castellacci's sector. Coefficient values are reported. Robust standard errors are in parentheses. ɻ $p > 0.10$ * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

4. Results

The econometric analysis evaluates the impact of a balanced gender presence on firm-level innovation, measured by the likelihood of implementing technological and non-technological innovations. Table 3 presents estimation results using predicted measures of gender diversity, first across the total workforce (Model 1), then by specific roles within the firm — in management

(MT_gd) (Model 2) and in production and non-production activities (SP_gd) (Model 3). To avoid collinearity, these diversity measures are included separately.

Results indicate that all three gender diversity measures significantly and positively affect the likelihood of firms developing technological innovations. Gender diversity across the total workforce (TWF_gd) has a positive and significant effect on both technological and non-technological innovation, although the effect is somewhat weaker for the latter. These findings align with studies by García-Martínez et al. (2017) and Østergaard et al. (2011), which highlight the positive impact of workforce-wide gender diversity on firm innovation.

Gender diversity within management roles (MT_gd) significantly and positively affects technological innovation but shows no impact on non-technological innovation. This result reinforces the idea that balanced management teams enhance firm innovation by drawing on the combined skills and experiences of both genders, consistent with findings from Ritter-Hayashi et al. (2019) and Ruiz Jiménez and Fuentes (2016). Similarly, gender diversity in production and non-production activities (SP_gd) also shows a significant effect, with the strongest impact on technological innovation.

Table 3. Effect of gender diversity on firms' propensity to innovate

	Model 1: TWF_gd		Model 2: MT_gd		Model 3. SP_gd	
	INNTEC	INNnoTEC	INNTEC	INNnoTEC	INNTEC	INNnoTEC
TWF_gd_hat	0.92*** (0.22)	0.34† (0.20)				
MT_gd_hat			0.49*** (0.11)	0.12 (0.10)		
SP_gd _hat					0.62*** (0.11)	0.18 (0.11)
Inv_R&D	2.78E-06*** (7.31E-07)	1.52E-06*** (2.78E-07)	2.76E-06*** (7.71E-07)	1.52E-06*** (2.80E-07)	2.81E-06*** (7.47E-07)	1.52E-06*** (2.80E-07)
Age	-0.01 (0.01)	0.02 (0.01)	-0.01 (0.01)	0.02 (0.01)	0.01 (0.01)	0.02† (0.01)
Export	0.01 (0.02)	0.03† (0.02)	0.00 (0.02)	0.03† (0.02)	0.003 (0.02)	0.03† (0.02)
Group	-0.01 (0.03)	-0.03 (0.02)	-0.02 (0.03)	-0.03 (0.02)	0.01 (0.02)	-0.02 (0.02)
Use_IP	0.39*** (0.03)	0.24*** (0.02)	0.39*** (0.03)	0.24*** (0.02)	0.39*** (0.03)	0.24*** (0.02)
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
Size	Yes	Yes	Yes	Yes	Yes	Yes
Obser	1979		1979		1979	
Log pseudolikelihood	-1668.24		-1666.45		-1663.11	

Notes: Marginal effects of explanatory variables on the propensity to innovate are reported. Robust standard errors in parentheses, † $p > 0.10$ * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

These findings confirm that the impact of gender diversity varies by innovation type, consistent with results from Teruel and Segarra-Blasco (2017) and Gallego and Gutierrez (2018). This differentiation likely arises because each innovation type requires distinct employee skills (Teruel and Segarra-Blasco, 2017).

Regarding the effect of gender diversity across the total workforce, the findings support the hypothesis that heterogeneous teams—comprising varied knowledge, skills, and thinking styles—can enhance innovation performance (Garcïa-Martínez et al., 2017; Østergaard et al., 2011). This effect is particularly pronounced in the case of technological innovation. Notably, in the services sector, total workforce diversity does not significantly influence non-technological innovation (see Annexes B and C).

To further illustrate that gender diversity's effect on innovation depends on women's roles within firms, and that the impact is strongest when diversity spans all organizational levels, two additional types of gender diversity were analyzed.

The first analysis examines gender diversity among workers involved in management, leadership, strategy, and organizational growth activities (MT_gd). Findings indicate a strong positive impact of diversity on technological innovation, though no effect on non-technological innovation. By sector, this measure is significant and positive for both types of innovation (technological and non-technological) in manufacturing, while in services, it is significant only for technological innovation (see Annexes B and C). None of the three gender diversity variables used in this study are significant for non-technological innovation across the full sample or within the services sector. This may relate to Fernandez's (2015) observation that some innovations, especially those involving goods and services, can more effectively leverage gender diversity benefits due to the greater range of activities and interactions across different areas, which harnesses the combined perspectives and skills of both genders. Conversely, organizational and market innovations—less frequently pursued in both service and manufacturing firms in the sample—are typically less complex, making this combination of perspectives less critical.

These findings align with existing research, which suggests that a balanced gender composition in management teams improves firms' innovation performance (Ritter-Hayashi et al., 2019; Ruiz Jiménez and Fuentes, 2016; Torchia et al., 2011). This effect is especially significant in technological innovation across both manufacturing and service sectors. Among control variables, R&D investment consistently shows a positive, significant effect, while the use of intellectual property protections (IP) is another key indicator, highlighting its importance in shaping firms' innovation focus.

The second analysis focuses on gender diversity among employees directly involved in production processes, supervisory roles, and non-production activities — including professional, support, administrative, and sales roles (SP_gd). Results show that gender diversity in this area is relevant only for technological innovation in the overall sample. In the manufacturing sector, it has a significant positive impact on both innovation types, while in services, it remains significant only for technological innovation.

Overall, the results suggest that while gender diversity positively impacts innovation performance across various roles, diversity within the total workforce has the greatest effect on a firm's innovation outcomes, more so than diversity limited to management teams. Additionally, the impact of gender diversity in production and non-production roles underscores that, although innovation decisions are often made at higher organizational levels, innovation itself is a distributed process across all firm areas. Thus, characteristics associated with female employees that enhance innovation likelihood hold value at all organizational levels.

Robustness check

To verify the robustness of the results regarding the relationship between gender diversity and innovation performance, the models were re-estimated without the R&D investment control variable. This approach allows for assessing the net effect of gender diversity on the likelihood of innovation, independent of resources allocated specifically to R&D, which are closely linked to innovation outcomes. Table 4 corroborates the previous findings on the impact of gender diversity on both technological and non-technological innovations. While some changes in marginal effects are observed, significance remains consistent. Notably, a higher representation of women in the total workforce appears to enhance both technological and non-technological innovation in firms that utilize intellectual property mechanisms.

Table 4. Effect of gender diversity on firms' propensity to innovate: robustness check

	Model 1: TWF_gd		Model 2: MT_gd		Model 3. SP_gd	
	INNTEC	INNnoTEC	INNTEC	INNno-TEC	INNTEC	INNnoTEC
TWF_gd_hat	0.95*** (0.22)	0.38ɻ (0.20)				
MAGAC_gd_hat			0.51*** (0.11)	0.15 (0.10)		
OtherAc_gd _hat					0.62*** (0.12)	0.20ɻ (0.11)
Age	-0.003 (0.01)	0.02ɻ (0.01)	-0.002 (0.01)	0.02ɻ (0.01)	0.01 (0.01)	0.03* (0.01)
Export	0.011 (0.02)	0.03ɻ (0.02)	0.002 (0.02)	0.03 (0.08)	0.003 (0.02)	0.03 (0.02)
Group	0.003 (0.03)	-0.02 (0.02)	-0.01 (0.03)	-0.02 (0.02)	0.02 (0.02)	-0.02 (0.02)
Use_ IP	0.42*** (0.03)	0.25*** (0.02)	0.41*** (0.03)	0.25*** (0.02)	0.41*** (0.03)	0.25*** (0.02)
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
Size	Yes	Yes	Yes	Yes	Yes	Yes
Obser	1979		1979		1.979	
Log pseudolikelihood	-1704.22		-1701.97		-1699.67	

Note: Marginal effects of explanatory variables on the propensity to innovate are reported. Robust standard errors in parentheses, ɻ $p > 0.10$ * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

5. Conclusions and implications

This study examines the role of gender diversity in enhancing innovation performance in Caribbean developing economies. Our findings confirm that a more balanced gender distribution within firms, along with other internal factors such as R&D investment, can enhance a firm's innovation capabilities and adaptability in dynamic markets. However, the impact of gender diversity varies by organizational area. Firms with more equitable gender distribution across the total workforce and within both production and non-production roles benefit more from women's participation than those with diversity concentrated solely in upper management. This finding aligns with studies suggesting that innovation's cross-functional nature is best supported by diversity throughout the organization, as a wider mix of skills and perspectives promotes greater innovation potential.

Additionally, gender diversity shows a stronger effect on technological innovations than on non-technological innovations across both manufacturing and service sectors. In the services sector, gender diversity measures were non-significant for non-technological innovation. This outcome is particularly relevant for Caribbean economies, where services dominate the economic structure. Such differences may stem from certain innovation types, particularly those involving goods and services, being better positioned to harness the benefits of gender diversity (Fernández, 2015).

These findings have significant implications for both business and public policy in developing economies. Given gender diversity's positive effect on innovation, firms may benefit from policies that encourage broader female participation in the workforce and specifically in innovation activities. Such insights support programs aimed at increasing women's employment, retention, and advancement within firms.

Furthermore, since greater gender diversity can offer competitive advantages, firms should foster inclusive workplace cultures that integrate gender diversity across all areas, especially those related to innovation. Recommended actions include adopting best practices, implementing training programs, and developing supportive policies. Policymakers can also play a role by promoting programs that motivate firms to increase female workforce participation, particularly in traditionally male-dominated sectors, fostering both gender equity and innovation.

Initiatives in entrepreneurship and capability-building could help shape policies that combine innovation with gender equity. For example, supporting women-led start-ups in knowledge-based fields across both manufacturing and services or those positioned in global or regional value chains, can enhance innovation-driven competitiveness. Such initiatives would not only strengthen firms through gender diversity but also contribute to more socially sustainable innovation systems in developing economies.

Finally, one limitation of this study is that the IFPG survey data does not allow for longitudinal comparisons. Additionally, the dataset does not provide

the number of each type of innovation developed by sample firms, limiting further estimates of innovation performance.

References

Ain, Q. U., Yuan, X., and Javaid, H. M. (2021). The impact of board gender diversity and foreign institutional investors on firm innovation: evidence from China. European Journal of Innovation Management, February. https://doi.org/10.1108/EJIM-10-2020-0439

Alsos, G., Ljunggren, E., and Hytti, U. (2013). Gender and innovation: State of the art and a research agenda. International Journal of Gender and Entrepreneurship, 5 (3), 236–256. https://doi.org/10.1108/IJGE-06-2013-0049

Álvarez, I., Castillo, Y. (2023) Gender Diversity, Innovation, and Open Innovation in the Caribbean Region. Inter-American Development Bank. Competitiveness, Technology and Innovation Division. Series IDB-TN-2695

Arun, T. M., Joseph, R. P., and Ul Akram, M. (2020). Entrepreneur's gender and firm innovation breadth: An institution-based view of SMEs inan emerging market context. International Journal of Innovation Management, 24(7). https://doi.org/10.1142/S1363919620500681

Bogers, M., Foss, N. J., and Lyngsie, J. (2018). The "human side" of open innovation: The role of employee diversity in firm-level openness. Research Policy, 47(1),218–231. https://doi.org/10.1016/j.respol.2017.10.012

Blundell, R. and Powell, J.L. (2003). Endogeneity in nonparametric and semiparametric regression models. Econometric Society Monographs, 36, 312–357.

Campbell, K., and Mínguez-Vera, A. (2008). Gender diversity in the boardroom and firm financial performance. Journal of Business Ethics, 83 (3), 435–451. https://doi.org/10.1007/s10551-007-9630

Castellacci, F. (2020). Paradigmas tecnológicos, regímenes y trayectorias: industria manufacturera y de servicios en una nueva taxonomía de patrones sectoriales de innovación. In D. Suárez, A. Erbes, and F. Barletta (Eds.), Teoría de la innovación: evolución, tendencias y desafíos. Herramientas conceptuales para la enseñanza y el aprendizaje (Ediciones, pp. 303–340).

Chen, R., Tong, J. Y., Zhang, F., and Zhou, G. (2021). Do female directors enhance R&D performance? International Review of Economics and Finance, 74(November 2020), 253–275. https://doi.org/10.1016/j.iref.2021.03.003

Cohen, W. M. and Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. Administrative Science Quarterly, 35 (1),128–152.

Compete Caribbean. (2021). Innovation, Firm Performance and Gender Survey. https://www.competecaribbean.org/docs/ifpg-survey/index.html

Díaz-García, C., González-Moreno, A., and Sáez-Martínez, F. J. (2013). Gender diversity within R&D teams: Its impact on radicalness of innovation.

Innovation: Management, Policy and Practice, 15(2), 149–160. https://doi.org/10.5172/impp.2013.15.2.149

Dohse, D., Goel, R. K., and Nelson, M. A. (2019). Female owners versus female managers: Who is better at introducing innovations? Journal of Technology Transfer, 44(2), 520–539. https://doi.org/10.1007/s10961-018-9679-z

Fernández. J. (2015). The impact of gender diversity in foreign subsidiaries' innovation outputs". International Journal of Gender and Entrepreneurship, 7 (2),148 - 167 Permanent link to this document: http://dx.doi.org/10.1108/IJGE-07-2014-0022

Galbreath, J. (2011). Are there gender-related influences on corporate sustainability? A study of women on boards of directors. Journal of Management and Organization, 17(1), 017–038. https://doi.org/10.1017/s1833367200001693

Gallego, J. M., and Gutiérrez Urdaneta, L. H. (2018). An integrated analysis of the impact of gender diversity on innovation and productivity in manufacturing firms: Prepared for Interamerican Development bank. http://dx.doi.org/10.18235/0000987%0Ahttps://publications.iadb.org/en/publication/12930/integrated-analysis-impact-gender-diversity-innovation-and-productivity

Garcia Martinez, M., Zouaghi, F., and Garcia Marco, T. (2017). Diversity is strategy: the effect of R&D team diversity on innovative performance. R and D Management, 47(2), 311–329. https://doi.org/10.1111/radm.12244

Hambrick, D. C. (2007). Upper Echelons Theory: An Update. The Academy of Management Review, 32(2), 334–343. http://www.jstor.org/stable/20159303%5Cnhttp://about.jstor.org/terms

Kafouros, M., Love, J. H., Ganotakis, P., and Konara, P. (2020). Experience in R&D collaborations, innovative performance and the moderating effect of different dimensions of absorptive capacity. Technological Forecasting and Social Change,150 (119757). https://doi.org/10.1016/j.techfore.2019.119757

Ljundggren, E., Alsos, G. A., Amble, N., Ervik, R., Kvidal, T., and Wiik, R. (2010). Gender and innovation: Learning from regional VRI projects., In Nordland Research Institute, Norway (Issue 2)

Lundvall, B-Å. (Ed.) (2010). National systems of innovation - towards a theory of innovation and interactive learning. Anthem Press.

Medina, L., and Álvarez, I. (2022). WHO invents what? Women's participation in patenting activity in Spain. International Journal of Gender and Entrepreneurship, 14(3), 397-416 https://doi.org/10.1108/IJGE-11-2021-0185

Miller, T., and Del Carmen Triana, M. (2009). Demographic diversity in the boardroom: Mediators of the board diversity-firm performance relationship. Journal of Management Studies, 46(5), 755–786. https://doi.org/10.1111/j.1467-6486.2009.00839.x

Moore, W., Presbitero, A. F., and Rabellotti, R. (2017). The gender gap in the Caribbean: The performance of women-Led firms", Dohnert, S., Crespi, G.,

and A. Maffioli. A. (Eds.), Exploring firm-level innovation and productivity in developing countries: The perspective of Caribbean Small States, IDB

Mukarram, S. S., Ajmal, T., and Saeed, A. (2018). Women directors' propensity towards risk in technology firms. Corporate Governance (Bingley), 18(2), 353–367. https://doi.org/10.1108/CG-09-2017-0213

Østergaard, C. R., Timmermans, B., and Kristinsson, K. (2011). Does a different view create something new? the effect of employee diversity on innovation. Research Policy, 40(3), 500–509. https://doi.org/10.1016/j.respol.2010.11.004

Pololi LH, Civian JT, Brennan RT, Dottolo AL, Krupat E. (2013). Experiencing the culture of academic medicine: gender matters, a national study. J Gen Intern Med. 28(2):201-7. doi: 10.1007/s11606-012-2207-1

Protogerou, A., Caloghirou, Y., and Vonortas, N. S. (2017). Determinants of young firms' innovative performance: Empirical evidence from Europe. Research Policy, 46 (7), 1312–1326. https://doi.org/10.1016/j.respol.2017.05.011

Ritter-Hayashi, D., Vermeulen, P., and Knoben, J. (2019). Is this a man's world? The effect of gender diversity and gender equality on firm innovativeness. PLoS ONE, 14(9), 1–19. https://doi.org/10.1371/journal.pone.0222443

Romero-Martínez, A. M., Montoro-Sánchez, Á., and Garavito-Hernández, Y. (2017). El Efecto De La Diversidad De Género Y El Nivel Educativo En La Innovación. Revista de Administración de Empresas, 57(2), 123–134. https://doi.org/10.1590/s0034-759020170202

Ruiz-Jiménez, J. M., Fuentes-Fuentes, M. del M., and Ruiz-Arroyo, M. (2016). Knowledge Combination Capability and Innovation: The Effects of Gender Diversity on Top Management Teams in Technology-Based Firms. Journal of Business Ethics, 135(3), 503–515. https://doi.org/10.1007/s10551-014-2462-7

Santos, G., Marques, C. S.,and Ratten, V. (2019). Entrepreneurial women's networks: the case of D'Uva – Portugal wine girls. International Journal of Entrepreneurial Behaviour and Research, 25(2), 298–322. https://doi.org/10.1108/IJEBR-10-2017-0418

Sevilla, M. P., Luengo-Aravena, D., and Farías, M. (2023). "Gender gap in STEM pathways: the role of secondary curricula in a highly differentiated school system—the case of Chile". International Journal of STEM Education, 10(1), 58.

Siravegna, M. (2021). The gender gap across the wage distribution in Chile. Georgetown University Job Market Papers

Sugimoto, C. R., Ni, C., West, J. D., and Larivière, V. (2015). The academic advantage: Gender disparities in Patenting. PLoS ONE, 10(5), e0128000

Swede, G. (2003). Poetic innovation. In L. V. Shavinina (Ed.), The International Handbook on Innovation (pp. 471–484). Oxford: Pergamon, Elsevier Science.

Teruel, M., and Segarra-Blasco, A. (2017). The Link between Gender Diversity and Innovation: What Is the Role of Firm Size? International Review of Entrepreneurship, 15 (3),319–340.

The World Bank. (2020). Cerrar las brechas de género en América Latina y el Caribe. https://documents1.worldbank.org/curated/es/565721583482001337/pdf/Closing-Gender-Gaps-in-Latin-America-and-the-Caribbean.pdf

Tong, J., and Zhang, F. (Frank). (2021). Do Capital Markets Punish Managerial Myopia? Evidence from Myopic R&D Cuts Abstract. Financial and Quantitative Analysis, 71790602.

Torchia, M., Calabrò, A., Gabaldon, P., and Kanadli, S. B. (2018). Women directors contribution to organizational innovation: A behavioral approach. Scandinavian Journal of Management, 34(2), 215–224. https://doi.org/10.1016/j.scaman.2018.02.001

WIPO (2023). Global innovation index, 2023. https://www.wipo.int/global_innovation_index/es/2023/

World Economic Forum. (2021). Global Gender Gap Report. In Encyclopedia of Family Studies (Issue March). https://doi.org/10.1002/9781119085621.wbefs350

Xie, L., Zhou, J., Zong, Q., and Lu, Q. (2020). Gender diversity in R&D teams and innovation efficiency: Role of the innovation context. Research Policy, 49(1). https://doi.org/10.1016/j.respol.2019.103885

Annex A. Castellacci's taxonomy

Sector category	Description	Sub-sectors	Correspondence with IFPG sectors
Advanced knowledge providers	Characterized by high technological capacity and a significant ability to create and manage complex technological knowledge.	KBS Knowledge-based services	Computers and electronics, ICT, tourism-related ICT, activities of head offices, management consultancy activities; office administration, office support, and other business support activities
		SMS Specialized manufacturing supplier	Manufacturing of electrical equipment, machinery, and other equipment
Mass production of goods	Producing final goods and intermediate products used in other sectors. These are characterized by their ability to develop new products and processes internally.	SBM Science-based manufacturing	Coke and refined products, chemicals and chemical products, pharmaceutical, medicinal, chemical, and botanical products
		SIM Scale-intensive manufacturing	Plastics and rubber and other non-metallic mineral products; basic metals, fabricated metal products (except machinery); vehicles and transportation equipment
Support infrastructure services	Producing mostly intermediate products and services. These have a limited capacity to develop new knowledge internally	PIS Physical infrastructure services	Electricity, gas, steam, and air-conditioning supply; water supply, sewage-waste management and remediation activities, construction, wholesale and transportation, and storage (excluding passenger transportation)
Personal goods and services	These are characterized by lower technological content and a relatively limited capacity to develop new products and processes internally.	SDM Supplier-dominated manufacturing	Agriculture, mining and quarrying, food, beverage, tobacco, textiles, garments and leather products, wood products (except furniture), paper products, printing and recorded media, furniture, and other manufacturing
		PDoS Provider-dominated services	Retail, crafts, souvenirs, vendors, tourism retail, passenger transportation, accommodation, food and beverage service activities, real estate, other services, tour operations, travel agencies, education, health services, cultural activity providers, recreational activity providers, attraction sites, and other personal service activities

Annex B. Effect of gender diversity on innovation performance in manufacturing firms

	Model 1: TWF_gd		Model 2: MT_gd		Model 3. SP_gd	
	INNTEC	INNnoTEC	INNTEC	INNnoTEC	INNTEC	INNnoTEC
TWF_gd_hat	1.21** (0.40)	1.17** (0.39)				
MT_gd_hat			0.47** (0.15)	0.36* (0.16)		
SP_gd					0.59** (0.18)	0.59** (0.19)
Inv_R&D	1.63E-06** 5.83E-07)	1.29E-06*** 3.11E-07	1.56E-06* (6.01E-07)	1.24E-06*** (3.19E-07)	1.61E-06** (5.84E-07)	1.28E-06*** (3.11E-07)
Age	-0.02 (0.02)	-0.01 (0.02)	-0.03 (0.02)	-0.02 (0.02)	-0.01 (0.02)	-0.001 (0.02)
Export	8.17E-06 (0.027)	0.04 (0.03)	-0.02 (0.03)	0.03 (0.03)	0.01 (0.03)	0.03 (0.03)
Group	-0.02 (0.04)	-0.06 (0.04)	-0.02 (0.04)	-0.05 (0.04)	0.002 (0.04)	-0.03 (0.36)
Use_ IP	0.41*** (0.05)	0.19 *** (0.03)	0.41*** (0.05)	0.20*** (0.03)	0.41*** (0.05)	0.19*** (0.03)
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
Size	Yes	Yes	Yes	Yes	Yes	Yes
Obs	851		851		851	
Logpseudolikelihood	-674.17		-675.33		-673.55	

Note: Marginal effects of explanatory variables on the propensity to innovate are reported. Robust standard errors in parentheses, ɻ $p > 0.10$ * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Annex C. Effects of gender diversity on innovation performance in service firms

	Model 1: TWF_gd		Model 2: MT_gd		Model 3. SP_gd	
	INNTEC	INNnoTEC	INNTEC	INNnoTEC	INNTEC	INNnoTEC
TWF_gd_hat	0.81*** (0.26)	0.01 (0.25)				
MT_gd_hat			0.49*** (0.14)	-0.01 (0.13)		
SP_gd					0.67*** (0.14)	-0.02 (0.14)
Inv_R&D	6.10E-06*** (1.45E-06)	1.82E-06** 5.62E-07	6.37E-06*** (1.52E-06)	1.82E-06** (5.62E-07)	6.33E-06*** (1.47E-06	1.82E-06** (5.61E-07)
Age	0.0002 (0.02)	0.05** (0.02)	0.004 (0.02)	0.05** (0.02)	0.02 (0.02)	0.04** (0.02)
Export	0.04 (0.02)	0.04 (0.02)	0.03 (0.02)	0.04 (0.03)	0.03 (0.02)	0.04 (0.02)
Group	0.01 (0.03)	-0.01 (0.03)	- 0.008 (0.03)	-0.01 (0.03)	0.01 (0.03)	-0.01 (0.03)
Use IP	0.33*** (0.04)	0.26*** (0.03)	0.33*** (0.04)	0.26*** (0.03)	0.32*** (0.04)	0.26*** (0.03)
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
Size	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1128		1128		1128	
Logpsuedolikelihood	-924.45		-922.62		-918.13	

Note: Marginal effects of explanatory variables on the propensity to innovate are reported. Robust standard errors in parentheses, ɟ $p > 0.10$ * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Annex D. List and definition of variables

Variable name and abbreviation	Definition
Technological innovation (INNTEC)	Dummy variable equals to 1 if the firm introduced a product or process innovation between 2017 and 2020; otherwise, it is set to 0. Product innovation refers to goods or services with new or significantly improved features offered to customers. Process innovation involves new or significantly improved methods, equipment, or skills to deliver the service, primarily focusing on implementing new equipment, software, and specialized techniques or procedures.
Non-technological innovation (INNnoTEC)	Dummy variable equals to 1 if the firm introduced an organizational or market innovation between 2017 and 2020; otherwise, set to 0. Organizational innovation refers to the first use of new methods in business practices, workplace organization, or external relations, primarily focused on people and work organization. Market innovation involves adopting a new marketing concept that significantly changes the design of an existing product.
Total Work Force gender diversity (TWF_gd)	Continuous variable that measures gender diversity in total work force through the Blau Index Value. This variable includes employees doing management activities, employees involved directly in the production process or at a supervisory level (and whom management considers to be skilled), and employees involved in production processes (but whom management considers to be unskilled).
Management Team gender diversity (MT_gd)	Continuous variable measuring gender diversity in management activities, calculated using the Blau Index. This variable includes employees involved in management functions such as employee supervision, leadership, strategic planning, improvement initiatives, and organizational growth.
Skilled production and non-production activities gender diversity (SP_gd)	Continuous variable measuring gender diversity among skilled production and non-production workers, calculated using the Blau Index. This variable includes only employees directly involved in the production process or at a supervisory level, classified by management as skilled.
R&D investment (Inv_R&D)	Average investment in product and process innovation over the past three years, calculated per employee.
Age of the firm (Age)	Log of the firm's age, calculated as the number of years since its founding.
Exports (Export)	Dummy variable is equal to 1 if the firm exports, and 0 if otherwise.
Part of a company group (Group)	Dummy variable is equal to 1 if belongs to a larger company, and 0 if otherwise.
Use_IP	Dummy variable is equal to 1 if firms obtained or successfully implemented some mechanism to protect their intellectual property between 2017 and 2020, and 0 if otherwise (including all mechanisms of IFPG: patents, trademarks, industrial design, copyright, denomination of origin, utility model, Non-Disclosure Agreement (NDA) with employees, and Non-Disclosure Agreement (NDA) with clients/suppliers / other outside parties).
Castellaci sector (Sector)	Dummy variable is equal to 1 if firms are in a determinate sector according to Castellaci's taxonomy (see Annex A).
Country	Dummy variable is equal to 1 if the firm is located in a determinate country.
Size	Dummy variable to each of four groups (Size1: firms with fewer than 10 employees; Size2: from 11 to 49 employees; Size3: from 50 to 249 employees; Size4: over 250 employees).
Size _con	Logarithm of total employees.
Mean of gender diversity in total work force (mTWF_gd)	Mean of TWF_gd over Sector.
Mean of gender diversity in managerial activities (meMAGAC_gd)	Mean of MAGAC_gd over Sector.
Mean of gender diversity in production and non-production activities (mSP_gd)	Mean of SP_gd over Sector.