Gender of firm decision-makers and within-firm wage disparity

Manthos D. Delis
Audencia Business School

Iftekhar Hasan
Fordham University
Bank of Finland

Maria Iosifidi
Montpellier Business School

Panagiotis N. Politsidis
Audencia Business School

Anthony Saunders
New York University

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What this paper is about

- We empirically examine the hypothesis that the gender of firm owners significantly affects within-firm inequality

- Using unique data for small firms, we find that female-owned firms have a smaller pay gap.

➢ Male-owned firms have a 2.5–3.0% larger pay gap. This is explained by:

  - ➢ Higher owner compensation.
  - ➢ Lower employee compensation.
  - ➢ Fewer employees in male-owned firms.

- Key Mechanisms

➢ Credit behavior influences the pay gap.

➢ Education, R&D, and innovation reduce gender differences.

➢ Stronger business ethics are associated with a smaller pay gap.

Why is this study important?

- Wage inequality has increased over the last 40 years.
- A growing part of this inequality comes from the pay gap between firm owners and employees.
- At the same time, female ownership of small firms has increased.
- Research Question:
  Does the gender of the owner affect the within-firm pay gap?
- Studying small firms, an underexplored area.
- Showing that owner gender affects the pay gap.
- Identifying credit behavior, innovation, and business ethics as the main mechanisms.

Why this is important

"Within-firm pay gap is more about money"

- Individuals care about relative pay
  - agents are concerned not only about material payoffs but also relative standings
  - Camerer and Thaler (1995 JEP) provide a survey of the literature

- Employees have aversion to inequity
  - Fehr and Schmidt (1999 QJE); Bolton and Ockenfels (2000 AER)

- Workers have a conception of fair wage and adjust their effort accordingly
  - actual-fair wage differential; cross-section wage differential
  - fair-wage effort hypothesis
  - Akerlof (1982 QJE); Akerlof and Yellen (1990 QJE)

- Job satisfaction and absenteeism; inclusiveness in workplace
  - Card, Mas, Moretti and Saez (2012 AER); Breza, Kaur and Shamdasani (2018 QJE); OECD (2021)

Introduction

Our premises

"Male and female decision makers have different backgrounds, connections, experience, personality traits, etc."

- these affect compensation dynamics and consequently, pay gap between them and their employees

Female decision makers can affect pay disparity through:

1) **Lower average firm owner compensation**

- Literature from large firms suggests that female directors receive lower compensation
  - Lower educational qualifications and less investment in R&D and firm growth.
  - Fewer training and career development opportunities.
  - Younger directors with shorter board tenure and less board experience.
  - These differences have reinforced the outdated perception that women lack sufficient human capital for leadership roles (Burke, 2000).

Our premises

Female decision makers can affect pay disparity through:

2) Higher average employee salary

- Employees receive higher compensation
  - female decision makers are caring and attentive to others' needs (gender-socialization theory)
  - more stakeholder-oriented and less likely to pursue personal goals (e.g., M&As)

    Adams, Licht and Sagiv (2011 SMJ); Matsa and Miller (2013 AEJ:AE)
  - associated with greater Corporate Social Responsibility (CSR), more ethical business practices, and less misconduct. McGuinness, Vieito and Wang (2017 JCF); Liu (2018 JCF); Wahid (2019 JBE)

- Taken together, **1)** and **2)** lead to our main hypothesis:

  "Within-firm wage disparity is lower in female-owned firms"
- Our analysis suggests that a change from a female to a male owner raises wage disparity by 3.0%
  - the effect is amplified by 1.4% if a female owner sells her firm to a male owner when the first dependent is added to her family

Data and Methodology

Data

- Data for small European firms for 2002-2016
  - obtain credit from a large North European bank (representative of euro area banks)
  - they have a majority owner
  - information on owner's gender, education, marital status, dependents, personal annual income/wealth, firm's credit score, numbers of employees, total personnel expenses, etc.
  - balanced firm-year panel of 234,420 observations, corresponding to 15,628 firms

- Ethics variables
  - discretionary accruals; CEO dismissal due to misconduct (Peters and Wagner, 2014 JF); commitment of fraud by misstating financial statements information (Bao, Ke, Li, Yu and Zhang, 2020 JAR)

Methodology

•Step 1: Estimate the effect of **gender** on the pay gap.

The Effect of Gender on the pay gap

- The **credit score** summarizes key information about the entrepreneur and the firm.
- The bank bases its lending decisions **only on the credit score**.
- Therefore, entrepreneurs with the **same credit score** are considered equally creditworthy.

- The bank has long-term relationships with firms reducing information asymmetry
- After controlling for the credit score, differences in firm quality or borrower risk are largely accounted for.
- Any remaining difference in the pay gap can therefore be interpreted as the **independent effect of gender**.

Methodology

- Step 2: Apply a **Staggered Difference-in-Differences (DID)** model.
- Owner gender changes at different times across firms.
- This reduces **omitted variable bias** and improves causal identification.

$$Pay\ gap_{it} = a_i + a_t + a_1 Gender_{it} + a_2 Controls_{it} + u_{it}.$$

- ***Pay gap:*** The natural logarithm of the ratio between the salary of the firm's owner and the mean employee salary
- mean employ salary: the ratio of personnel expenses to the total number of employees
- ***Gender:*** A binary variable equal to 1 if the firm's owner is male (0 for female)
- ***Controls:*** vector of control variables (owner- and firm-level characteristics)
- α_i: *controlling for the treatment dummy in each event (change in ownership from female to male)*
- α_t: *denote year fixed effects, controlling for the post dummy in each event*
- controlling for the credit score means controlling for all financial and managerial characteristics of the firms in our sample

Results

Table 3. The effect of owner's gender on the pay gap: Baseline results

The table reports coefficients and standard errors (in parentheses) from the estimation of equation 1. The dependent variable is *Pay gap* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by firm. Specifications 1 to 6 have different controls and fixed effects. Specifications 7 and 8 replicate specifications 3 and 4 but estimated with the model of Callaway and Sant'Anna (2021) and reports the average treatment effect (results on the control variables in specification 8 not reported, as Stata does not report them), as well as the p-value of the test for pre-trends (the null being that all pre-treatment equal to zero). Specification 9 replicates specification 4 using the Heckman's (1979) model described in the text. Each specification includes the fixed effects given in the lower part of the table. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Gender	0.029***	0.029***	0.028***	0.027***	0.026***	0.025***	0.030***	0.029***	0.033***
	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.012)
Education		0.029***		0.024***	0.026***	0.022***			0.026***
		(0.006)		(0.005)	(0.005)	(0.005)			(0.005)
Age		0.008***		0.007***	0.007***	0.007***			0.007***
		(0.002)		(0.002)	(0.002)	(0.002)			(0.002)
Dependents		-0.000		-0.000	0.000	0.000			-0.000
		(0.000)		(0.000)	(0.000)	(0.000)			(0.000)
Married		-0.002		-0.001	-0.002	-0.001			-0.001
		(0.002)		(0.001)	(0.002)	(0.001)			(0.001)
Wealth		0.019***		0.016***	0.018***	0.015***			0.018***
		(0.004)		(0.004)	(0.004)	(0.004)			(0.005)
Credit score	0.087***	0.084***	0.072***	0.069***	0.076***	0.064***			0.074***
	(0.021)	(0.020)	(0.020)	(0.019)	(0.020)	(0.019)			(0.020)
Firm size		0.012***		0.009***	0.011***	0.009***			0.010***
		(0.003)		(0.002)	(0.003)	(0.002)			(0.003)
Firm ROA		0.119***		0.086***	0.110***	0.082***			0.094***
		(0.028)		(0.027)	(0.028)	(0.026)			(0.030)
Firm leverage		3.343***		2.761***	3.033***	2.555***			2.857***
		(1.074)		(1.063)	(1.168)	(0.859)			(1.113)
Firm tangibility		0.114***		0.096***	0.103***	0.089***			0.091***
		(0.025)		(0.025)	(0.026)	(0.018)			(0.027)
Lambda									-0.157
									(0.222)
Observations	234,420	234,420	234,420	234,420	234,420	234,420	234,420	234,420	234,420
Adj. R-squared	0.658	0.664	0.694	0.695	0.701	0.699			
P-value							0.233	0.233	
Year effects	Y	Y	Y	Y	N	N	Y	Y	Y
Firm effects	N	N	Y	Y	Y	Y	Y	Y	Y
Year × industry effects	N	N	N	N	Y	N	N	N	N
Year × region effects	N	N	N	N	N	Y	N	N	N

Specification 9

- **Testing for Sample Selection Bias**
- Uses a **Heckman two-stage model**.
- First stage:
  - Estimates which firms borrow from the bank.
  - Uses bank branch density and distance to the nearest branch as instruments.
- Second stage:
  - Includes the inverse Mills ratio.
- **Lambda is not significant**, indicating **no evidence of sample selection bias**.
- Gender effect remains consistent.

Main Takeaway

- Results are stable across all specifications.
- Additional controls and fixed effects do not change the gender effect.
- Robustness checks confirm the findings.
- No evidence that sample selection drives the results.
- **Conclusion:** The estimated effect of owner gender on the pay gap is **robust and credible**.

Table 4. Triple difference regressions: Selling to male owners after observing a first dependent

The table reports coefficients and standard errors (in parentheses) from the estimation of equation 2. The dependent variable is *Pay gap* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by firm. Each specification includes the control variables in Table 2 and fixed effects given in the lower part of the table. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Gender	0.015***	0.014***	0.014***	0.013***
	(0.005)	(0.005)	(0.005)	(0.005)
First dependent	0.009	0.007	0.007	0.006
	(0.010)	(0.010)	(0.009)	(0.009)
Gender × First dependent	0.015***	0.015***	0.015***	0.014***
	(0.003)	(0.003)	(0.003)	(0.003)
Observations	234,420	234,420	234,420	234,420
Adj. R-squared	0.582	0.700	0.710	0.705
Control variables	N	Y	Y	Y
Year effects	Y	Y	N	N
Firm effects	Y	Y	Y	Y
Year × industry effects	N	N	Y	N
Year × region effects	N	N	N	Y

Table 5. The effect of owner's gender on pay gap: Placebo tests

The table reports coefficients and standard errors (in parentheses) from the estimation of equation 1, employing placebo tests on our baseline results reported in Tables 3 and 4. The dependent variable is *Pay gap* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by firm. In specifications 1 and 2, we artificially lag the changes in *Gender* by 1 year and 2 years. In specification 3, we drop the firm fixed effects and consider falsified *Gender* = 1 when there is an ownership change but gender states the same (*Gender* = 0 otherwise). In specifications 4 to 6, we conduct similar exercises to the previous three specifications using the triple differences model. Each specification includes the control variables of column 2 Table 3, and the fixed effects given in the lower part of the table. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Gender	0.013	0.003	0.010	0.005	0.001	0.004
	(0.009)	(0.009)	(0.008)	(0.005)	(0.005)	(0.006)
First dependent				0.008	0.004	0.002
				(0.010)	(0.010)	(0.010)
Gender × First dependent				0.003	-0.001	0.000
				(0.003)	(0.003)	(0.003)
Observations	234,420	234,420	234,420	234,420	234,420	234,420
Adj. R-squared	0.650	0.641	0.648	0.645	0.637	0.632
Controls	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	N	Y	Y	N

Purpose

Check whether the results are driven by ownership changes rather than gender.

Three placebo tests:

Assume the ownership change happened **earlier**.

Treat ownership changes **between owners of the same gender** as if they were gender changes.

Repeat the tests for the Triple Difference model.

Result: None of the placebo effects are significant.

Conclusion: The observed effect is due to **owner gender**, not ownership changes alone.

Components of the Pay Gap: what drives the pay gap?

Columns 1,2: The pay gap increases because **owners earn more while employees earn less**.

Column 3: The combined effect of **Gender + Gender × First dependent = 4.5%**, consistent with **Column 1**.

Column 4: The combined effect is **2.9%**, similar to the **3%** found in **Column 2**.

Columns 5,6: Female-owned firms appear to invest more in their workforce, supporting the idea that women are more caring and employee-oriented, even if this comes at the expense of profit maximization.

Table 6. Components of pay gap

The table reports coefficients and standard errors (in parentheses) from the estimation of equation 1 (first two specifications) or equation 2 (last two specifications). The dependent variable is *Pay gap* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by firm. Each specification includes the fixed effects and the control variables given in the lower part of the table. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) Owners' income	(2) Average employee income	(3) Owners' income	(4) Average employee income	(5) Employee expenses	(6) Number of employees
Gender	0.040***	-0.030**	0.036***	-0.021***	-0.014**	-0.026***
	(0.017)	(0.008)	(0.014)	(0.007)	(0.007)	(0.011)
First dependent			0.006*	-0.001		
			(0.004)	(0.003)		
Gender × First dependent			0.009**	-0.008***		
			(0.004)	(0.003)		
Observations	234,420	234,420	234,420	234,420	234,420	234,420
Adj. R-squared	0.628	0.744	0.630	0.744	0.611	0.807
Control variables	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y

Mechanisms

The difference is driven by **application behavior (confidence)**, not by banks treating men and women differently.

Table 7. Access to credit and probability of loan application

The table reports marginal effects and standard errors clustered by individual (in parentheses) from the estimation of the probability that individuals apply for a loan during our sample period. Dependent variable is the binary variable *Apply for credit*, and all variables are defined in Table 1. The first two specifications are a regression discontinuity design. Both specifications are estimated using a linear probability model. The second specification uses only observations around the 0 cutoff point of the credit score, obtained from cross validation. The ***, **, and * marks denote statistical significance at the 1%, 5%, and 10% levels.

	Apply for credit 1	Apply for credit 2	Access to credit 3
Income	0.032***	0.036***	0.268***
	(0.004)	(0.004)	(0.006)
Wealth	-0.002	-0.002*	0.013***
	(0.002)	(0.001)	(0.003)
Education	0.029***	0.031***	0.025**
	(0.007)	(0.008)	(0.012)
Age	0.003***	0.003***	0.000
	(0.000)	(0.000)	(0.000)
Dependents	0.001	0.002	0.001
	(0.003)	(0.003)	(0.002)
Firm size	0.006***	0.007***	-0.001
	(0.002)	(0.002)	(0.003)
Leverage	0.317***	0.389***	-0.147***
	(0.052)	(0.061)	(0.041)
ROA	0.024**	0.026***	0.069***
	(0.010)	(0.009)	(0.015)
Cash	-0.946***	-1.035***	0.765**
	(0.311)	(0.307)	(0.315)
Applications	0.002***	0.002***	0.057***
	(0.000)	(0.000)	(0.007)
Credit score	0.298***		
	(0.029)		
Gender	0.012***	0.014***	-0.005
	(0.002)	(0.003)	(0.004)
Year fixed effects	Yes	Yes	Yes
Regional fixed effects	Yes	Yes	Yes
Observations	234,420	5,040	5,040

Table 8. Mechanisms

The table reports coefficients and standard errors (in parentheses). The dependent variable is *Pay gap* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by firm. Specification 1 uses *Access to credit* as a key explanatory variable and specification 2 uses *Apply for credit*. Each specification includes the fixed effects and the control variables given in the lower part of the table. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Gender	0.018**	0.015*	0.022**	0.032***	0.028***	0.023***	0.022***
	(0.008)	(0.008)	(0.009)	(0.010)	(0.010)	(0.007)	(0.007)
Access to credit (Apply for credit)	0.062***	0.071***					
	(0.011)	(0.015)					
Higher education			0.014***		0.016***		
			(0.003)		(0.004)		
Firm R&D				0.024***	0.017***		
				(0.005)	(0.006)		
Discretionary accruals						0.007	
						(0.006)	
Accounting revisions							0.009*
							(0.005)
Gender × Access to credit (Apply for credit)	0.024***	0.038***					
	(0.007)	(0.010)					
Gender × Higher education			0.012***		0.010**		
			(0.004)		(0.005)		
Gender × Firm R&D				-0.019***	-0.016***		
				(0.005)	(0.005)		
Gender × Higher education × Firm R&D					-0.007***		
					(0.002)		
Gender × High firm accruals						0.012**	
						(0.005)	
Gender × Accounting revisions							0.016***
							(0.006)
Observations	234,420	234,320	234,420	234,420	234,420	234,420	234,420
Adj. R-squared	0.762	0.814	0.697	0.698	0.699	0.698	0.696
Control variables	Y	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y	Y

Key Results Access to credit/Apply for credit:

- Male-owned firms with a higher probability of applying for credit have a 3.8% larger pay gap.
- The main driver is confidence to seek credit, rather than access to credit itself.
- Female entrepreneurs apply for credit less often, which explains an important part of the smaller pay gap.

Education (Specification 3)

- Owners with **higher education** tend to have a larger pay gap.
- The gender effect remains positive and significant.
- **Education** increases the gender effect on the pay gap.

Innovation (Specification 4)

- Firms with **high R&D investment** show a much smaller gender effect.
- Male and female owners behave more similarly in innovative firms.
- Investment in **skilled employees** helps reduce the pay gap.

Education + Innovation (Specification 5)

- The gender effect is stronger for **highly educated owners**.
- However, it becomes much weaker in **high R&D firms**.
- **Innovation** reduces the gender effect by encouraging investment in skilled workers and higher employee pay.

Business Ethics

Examine whether **business ethics** explain the relationship between **gender** and the **pay gap**.

How Business Ethics is Measured

- Two accounting-based indicators:
  - **High discretionary accruals**
  - **Accounting revisions**
- Higher values indicate **weaker business ethics**.

- **Main Findings**
- In firms with **weaker business ethics**, the gender effect on the pay gap is **stronger**.
- The pay gap increases:
  - **+1.2%** for firms with high discretionary accruals.
  - Even more for firms with frequent accounting revisions.

- **Key Takeaway**
- **Stronger business ethics reduce the pay gap.**
- Female entrepreneurs are associated with **more ethical business behavior**, helping explain their smaller within-firm pay gap.

Conclusion

Conclusions

Main Findings

•Female owners are associated with a **smaller pay gap** between owners and employees.

•This happens because:

- Female owners receive **lower compensation**.
- Employees receive **higher average wages**.

•Results are robust across multiple tests.

Key Mechanisms

•**Credit behavior:** Female entrepreneurs apply for credit less often.
•**Business ethics:** Stronger ethical behavior is linked to a smaller pay gap.
•**Innovation:** In highly innovative (R&D) firms, the gender effect is much weaker because these firms invest more in skilled employees.

Takeaway: Female ownership contributes to a more equal distribution of compensation within firms.

Thank you very much!

Background slides

Table 1. Data and variable definitions

Variable	Description
A. Dimension of the data	
Entrepreneurs	Loan applicants who have an exclusive relationship with the bank, are majority owners (own more than 50%) of a firm, and personally manage their firms. They apply to the bank for one or more business loans during the period 2002-2016 and the loan is either originated or denied. Due to the exclusive relationship, the bank holds information on the applicants even outside the year of loan application.
Firms	The firms that individuals are majority owners and sole managers (these firms do not have a board of directors). A 28% of these firms are owned and managed by female entrepreneurs. We observe 511 cases in our sample, where there is a change in the owner's gender. The panel of firms is balanced.
Year	The years covering the period 2002-2016.
B. Variables	
Pay gap	The natural logarithm of the ratio between the salary of the firm *i*'s owner in year *t* (named *Owner's income*) and the mean employee salary in firm *i* calculated from the ratio of personnel expenses to the total number of employees (named *Average employee income*). The owner's total income is reported by the loan applicant to the bank and includes dividends (if any). The mean employee salary comes from the financial statements of the firm, as also reported to the bank.
Gender	A binary variable equal to one if the firm's owner is male, and zero if the firm's owner is female.
Owner's wealth	The natural logarithm of the euro amount of the firm's owner total wealth other than the assets of the firm and minus total debt.
Education	An ordinal variable ranging between 0 and 5 if the individual completed the following education. 0: No secondary; 1: Secondary; 2: Post-secondary, non-tertiary; 3: Tertiary; 4: MSc, PhD or MBA.
Higher education	A binary variable equal to one if the firm's owner has tertiary education and higher, and zero otherwise.
Age	The owner's age.
Dependents	The owner's number of dependents.
Married	A binary variable equal to one if the owner is married, and zero otherwise.
Credit score	The credit score of the applicant, as calculated by the bank. There is a 0 cutoff: positive values indicate that the loan is granted and negative values indicate that the loan is denied. The credit score includes both hard and soft information on the firm, facilitating the bank's decision to grant the loan or not.
Access to credit	A binary variable equal to one if the loan is originated (positive credit score), and zero if the loan is potentially rejected (negative credit score).
Apply for credit	A binary variable equal to one if an entrepreneur observed in our sample applies for credit in year t and zero if he/she does not apply for credit in that year.
Firm size	The natural logarithm of total firm's assets.
Firm leverage	The ratio of firm's total debt to total assets.
Firm capital	The ratio of firm's total capital expenditure to total sales.
Firm ROA	The ratio of firm's after- tax profits to total assets.
Firm tangibility	The ratio of firm's tangible assets to total assets.
Firm R&D	A binary variable equal to one if the firm's R&D expenses to total expenses are above the sample's median, and zero otherwise.

Table 2. Summary statistics

The table reports summary statistics (number of observations, mean, standard deviation, minimum and maximum values) for all variables used in the estimations concerning the SMEs sample. All variables are defined in Table 1.

	Obs.	Mean	Std. dev.	Min.	Max.
Pay gap	234,420	0.63	0.72	-0.09	1.96
Gender	234,420	0.72	0.45	0.00	1.00
Owner's income	234,420	11.07	1.40	9.80	12.74
Average employee income	234,420	10.44	2.11	9.33	13.04
Wealth	218,792	12.18	0.56	7.80	14.29
Education	234,420	2.96	1.01	0.00	5.00
Higher education	234,420	0.491	0.47	0.00	1.00
Age	234,420	48.98	15.88	21.82	76.04
Dependents	234,420	3.49	2.29	0.00	7.00
Married	234,420	0.47	0.50	0.00	1.00
Credit score	234,420	0.70	1.36	-2.95	2.10
Access to credit	234,420	0.83	0.37	0.00	1.00
Apply for credit	234,420	0.25	0.43	0.00	1.00
Firm size	234,420	9.83	0.80	2.50	12.32
Firm leverage	234,420	0.21	0.02	0.13	0.92
Firm capital	234,420	0.101	0.242	0.00	1.83
Firm ROA	234,420	0.08	0.10	-0.39	0.53
Firm tangibility	234,420	0.56	0.14	0.24	0.84
Firm R&D	234,420	0.21	0.29	0.00	1.00

Form of the triple differences model

$$Pay\ gap_{it} = a_i + a_t + a_1 Gender_{it} + a_2 First\ dependent_{it} + a_3 Gender_{it} \times First\ dependent_{it} + a_4 Controls_{it} + u_{it}. \quad (2)$$

End