How does gender quota shape gender attitudes?

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Introduction

- Taiwan experienced a significant improvement in female status in post-WWII era.
- Women in national parliament, 2021:
  - **Taiwan: 41.6%**
  - Japan: 9.9%; South Korea: 19%
- Gender wage gap, 2020:
  - **Taiwan: 14.8%**
  - Japan: 30.7%; South Korea: 30.4%
- Commonalities: Rapid econ growth; compulsory education; democratic transition.
- Uniqueness of Taiwan: Gender quota for political seats.

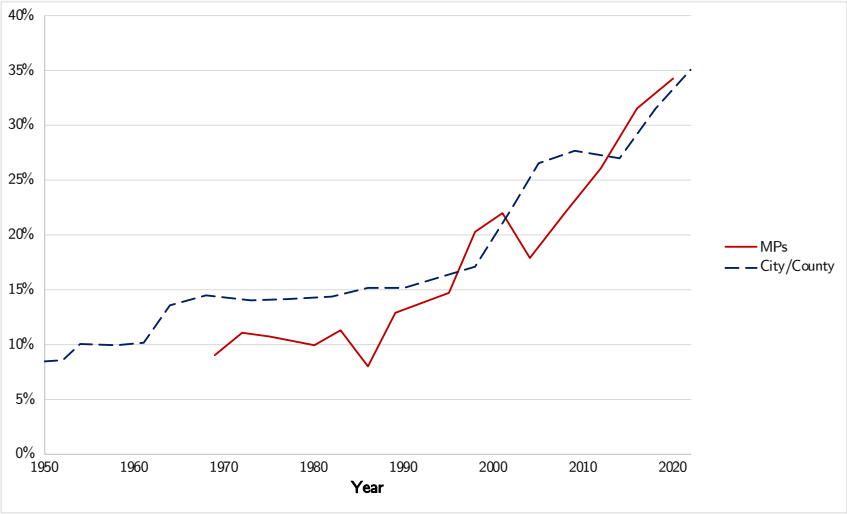


Figure 1: Proportion of female representatives in Taiwan

Goal of this paper

Evaluating the causal effect of the gender quota design on:

1. increasing female political representation
2. alleviating norms against women
3. women's gender attitudes and educational choice

Background: Gender quota in Taiwan

- City/county councilors are elected through SNTV system.
- Each council has multiple electoral districts.
- Each electoral district has multiple seats, some of them reserved for women.
- Since 2002, 1 seat reserved for every 4 seats.
- Prior to 2002, only 1 seat was reserved for districts with # of seats $\in [5, 14]$

This rule generated cross-sectional variations in the proportion of quota assigned to each district.

Table 1: Example for 2002

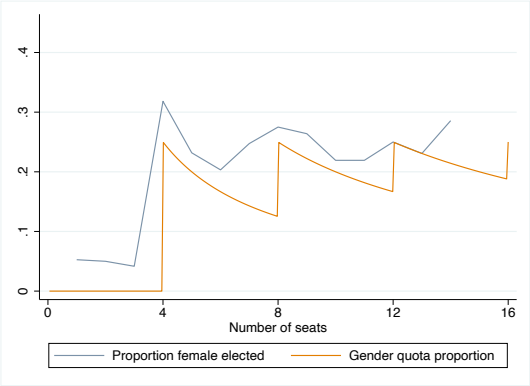
Seats	Quota	Proportion
1	0	0%
2	0	0%
3	0	0%
4	1	25.0%
5	1	20.0%
6	1	16.6%
7	1	14.3%
8	2	25.0%

Formalize

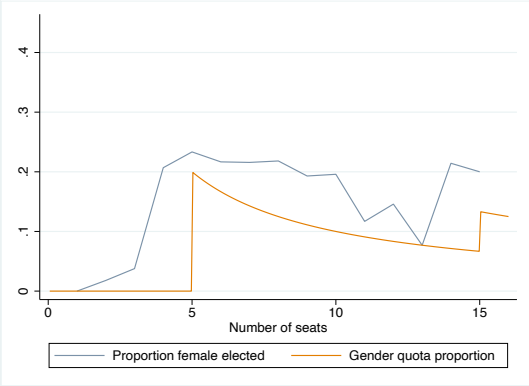
For electoral district d, election e, the gender quota proportion R_{de} was determined according to the following formula:

- $R_{de} = \text{GreatInt}\left(\frac{E_{de}}{4}\right) / E_{de},\ e \geq 2002$
- $R_{de} = \text{Round}\left(\frac{E_{de}}{10}\right) / E_{de},\ e \leq 1998$

where $e \in \{1994, 1998, 2002, 2005\}$, and E_{de} = number of seats in the electoral district.

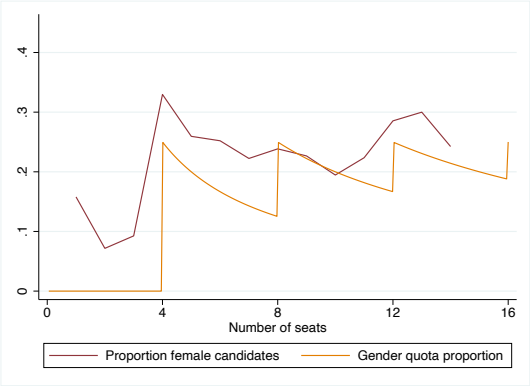


(A) 2002

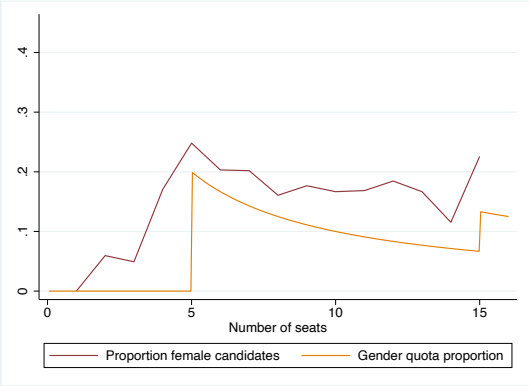


(B) 1998

Figure 2: Gender quota rule and proportion of actual seats won by women



(A) 2002



(B) 1998

Figure 3: Gender quota rule and proportion of female candidates running for elections

The assignment of gender quota

The assignment of gender quota proportion has the following features:

1. The quota proportion is a non-linear, zig-zag-shaped function of the number of seats.
2. The number of seats is exclusively determined by the relative population of an electoral district within the city/county.
3. Thus, the quota proportion is a **non-monotonic function of a district's relative population size within county**.

Identifying assumption

Conditional on the district's population size, the assignment of gender quota proportion is arguably exogenous (uncorrelated with pre-existing gender attitudes).

Thus, R_{de} serves as our instrumental variable.

Checking the determinants of IV

Table 2: Examining the determinants of gender quota

	(1) R_{de} 2002	(2) R_{de} 2005
Female vote share in previous election	−0.007	0.011
	(0.109)	(0.146)
Share of female candidates in previous election	0.370***	0.239**
	(0.140)	(0.114)
Population size (10^7)	2.346***	3.070***
	(0.548)	(0.648)
Mean dep. var.	0.147	0.144
Obs.	159	160
Adj. R^2	0.310	0.320

Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Impact of quota on the share of female councilors and candidates

For electoral district d of county c and election e, we consider:

$$F_{dce} = \alpha_1 + \beta_1 R_{dce} + \pi_1 P_{dce} + \rho_c + \sigma_e + u_{dce}$$

Table 3: The effects of the gender quota on proportion of elected female councilors and proportion of female candidates running for council elections

	(1) Proportion female elected	(2) Proportion female candidates
(R_{dce}) Gender quota proportion	1.01***	0.753***
	(0.080)	(0.077)
(P_{dce}) Population size (10^7)	−0.269	−0.605
	(0.69)	(0.60)
Mean dep. var.	0.186	0.184
Obs.	609	590
Adj. R^2	0.387	0.354

Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

The effects of gender quota

Son preference: $\mathbb{P}$(3rd child|sex1, sex2)

- A key aspect of gender attitude in East Asia.
- We propose a behavioral measure: $\mathbb{P}$(3rd child|sex1, sex2)
  - 4 sex compositions: $S = \{(D, D), (D, B), (B, D), (B, B)\}$
- If $\Delta \downarrow \mathbb{P}(\text{3rd child}|D, D) > \Delta \downarrow \mathbb{P}(\text{3rd child}|S - \{(D, D)\})$, then we say mothers are displaying weaker son preference.

Facts

1. High sex ratio for 3rd-parity birth after the legalization of abortion.
2. Mothers with 2 daughters have a shorter birth gap for 3rd-parity.

Data

Universal birth registry, 1978-2006.

Variables: Newborn's birth date, township, sibling sex, parents' ID, and characteristics (residence and education).

3rd-parity birth: Empirical specification

To estimate the effect of gender quota proportion (R_{dce}) on the propensity to have 3rd-parity birth Y_{idce}, we consider this OLS specification:

$$Y_{idce} = \alpha_1 + \beta_1 R_{dce} + \beta_2 R_{dce} \cdot BB_{idce} + \beta_3 R_{dce} \cdot BD_{idce} + \beta_4 R_{dce} \cdot DB_{idce}$$
$$\alpha_2 BB_{idce} + \alpha_3 BD_{idce} + \alpha_4 DB_{idce} + \pi P_{dce} + \mathbf{X}_i \gamma + \rho_c + \sigma_e + \varepsilon_{idce}$$

for mother i, electoral district d, county c, and election e.

- $Y_{idce} \in \{0, 1\}$ = mother has her 3rd birth in the electoral term of e
- R_{dce} = electoral district's gender quota proportion
- P_{dce} = electoral district's population size
- $\mathbf{X}_i$ = parent's age and education
- ρ_c = county dummies
- σ_e = election dummies

Table 4: Estimating the effects of gender quota on son preference

	(1)	(2)	(3)	(4)	(5)
	Dependent variable: Giving 3rd-parity birth				
	Full Sample	High School	Non-HS	Urban	Non-urban
($\hat{\beta}_1$) Gender quota proportion	−.126***	−.141***	−.117***	−.204***	−.115***
	(0.015)	(0.018)	(0.016)	(0.037)	(0.017)
($\hat{\beta}_2$) Two sons × Gender quota proportion	.174***	.202***	.158***	.272***	.162***
	(0.017)	(0.020)	(0.017)	(0.042)	(0.018)
($\hat{\beta}_3$) Son daughter × Gender quota proportion	.157***	.183***	.146***	.246***	.147***
	(0.015)	(0.019)	(0.015)	(0.038)	(0.016)
($\hat{\beta}_4$) Daughter son × Gender quota proportion	.152***	.166***	.15***	.22***	.144***
	(0.015)	(0.019)	(0.015)	(0.037)	(0.016)
Mean dep. var.	0.0609	0.0636	0.0583	0.0445	0.0654
Obs.	3,588,478	1,740,241	1,848,237	780,949	2,807,529
Adj. R^2	0.111	0.109	0.117	0.0839	0.116
F-test on marginal effect					
p-value of $H_0 : \hat{\beta}_1 + \hat{\beta}_2 = 0$	0.000	0.000	0.000	0.000	0.000
p-value of $H_0 : \hat{\beta}_1 + \hat{\beta}_3 = 0$	0.001	0.000	0.003	0.031	0.002
p-value of $H_0 : \hat{\beta}_1 + \hat{\beta}_4 = 0$	0.004	0.017	0.001	0.390	0.006

Standard errors are clustered at township-election level. * p<0.1, ** p<0.05, *** p<0.01.

Survey evidence: Self-reported son preference

- Data: Taiwan Social Change Survey, 2001 and 2006.
- Outcome: *the importance of having at least one son in order to continue the family bloodline*. 1 = important; 0 = neutral or unimportant.
- Specification: $Y_{idce} = \alpha_1 + \beta_1 R_{dce} + \beta_2 R_{dce} \cdot F_i + \beta_3 F_i + \pi P_{dce} + \mathbf{Z}_i\gamma + \rho_c + \sigma_e + \varepsilon_{idce}$

Table 5: Estimating the effects of gender quota on self-reported son preference

	(1) All Age	(2) Age 19-45	(3) Age > 45
Gender quota proportion	−0.0813	0.230	−0.526
	(.264)	(.313)	(.318)
Woman × Gender quota proportion	−0.494**	−0.384	−0.626*
	(.2)	(.288)	(.331)
Woman	−0.0671**	−0.0993**	−0.00758
	(.0305)	(.0463)	(.0505)
Mean dep. var.	0.46	0.356	0.594
Observations	3,697	2,077	1,620
Adj. R^2	0.131	0.0567	0.123

Standard errors are clustered at township-election level.
* p<0.1, ** p<0.05, *** p<0.01.

Mechanism

We propose and test the following 2 mechanisms:

1. **Gender role model**: The exposure to powerful female politicians changed women's gender attitudes, including son preference.
2. **Intra-household bargaining**: Women gained more power in household decision-making, realizing their changed son preference through the birth decision.

Gender role model: Girl's educational choice

- Data: University Entrance Test records, 2000 to 2003.
- Outcome: Taking up the entrance exam at 18 or not.

Table 6: Estimating the effects of gender quota on taking up college entrance test

	(1) Female	(2) Male
Gender quota proportion	0.0492**	0.0177
	(0.020)	(0.020)
Mean dep. var.	0.292	0.274
Observations	532,046	569,388
Adj. R^2	0.119	0.114

Standard errors are clustered at township-election level.
* p<0.1, ** p<0.05, *** p<0.01.

Gender role model: Girl's preference for college major

- Data: University Entrance Test records, 2002 to 2010.

Table 7: Estimating the effects of gender quota on preferences toward college majors

	(1)	(2)	(3)	(4)
	Proportion of applied programs in		Ranking of the 1st program in	
	Law	Political science	Law	Political science
($\hat{\beta}_1$) Gender quota proportion	−0.002	0.001	0.712	−0.220
	(0.0022)	(0.00081)	(1.42)	(2.21)
($\hat{\beta}_2$) Woman × Gender quota proportion	0.006**	0.002**	−3.113**	−3.336
	(0.0028)	(0.00079)	(1.47)	(2.26)
Mean dep. var.	0.025	0.0062	22.3	24.7
Observations	735,312	735,312	219,699	124,407
Adj. R^2	0.0045	0.0068	0.022	0.013
F-test on marginal effect				
p-value of $H_0 : \hat{\beta}_1 + \hat{\beta}_2 = 0$	0.034	0.0020	0.099	0.092

Standard errors are clustered at township-election level. * p<0.1, ** p<0.05, *** p<0.01.

Intra-household bargaining: Household decision-making

- Data: Survey on Social Development Trends, 1998 and 2002.
- Outcome: 1: Wife/wife+husband are decision makers; 0: Only husband is making decision

Table 8: Estimating the effects of gender quota on household decisions making

	(1) Expenditures	(2) Saving & finance	(3) Allocation of chores	(4) Parenting	(5) 1st prin. comp.
Gender quota proportion	−0.085	−0.123	−0.135**	−0.042	−0.574*
	(0.112)	(0.086)	(0.058)	(0.083)	(0.345)
Female × Gender quota proportion	0.184***	0.234***	0.078*	0.030	0.669***
	(0.069)	(0.065)	(0.047)	(0.057)	(0.258)
Mean dep. var.	0.833	0.895	0.938	0.882	0.158
Observations	17,358	17,013	17,358	16,384	16,039
Adj. R^2	0.015	0.042	0.00401	0.0556	0.0172

Standard errors are clustered at township-election level. * p<0.1, ** p<0.05, *** p<0.01.

Conclusions

- Gender quota generates powerful female politicians, altering women's gender attitudes
  - son preference ↓
  - take-up rate of university entrance exam ↑
  - preference for law & political science ↑
  - self-reported involvement in household decisions ↑
  - neonatal mortality →
- This is likely driven by the role model effect
- Changed preference realized in behaviors through household bargaining

Appendix

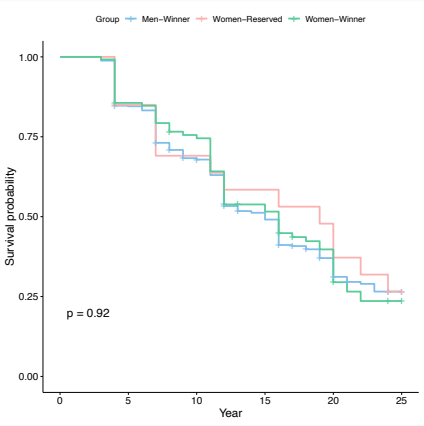


Figure 4: Kaplan-Meier survival curves for three different types of winners of the 1998 election

Table 9: Winners and losers of the 1998 council election by gender

	Winner	Winner (reserved)	Loser	Loser (replaced)	
Women	125	20	147	--	292
Men	693	--	798	20	1,511
Total	818	20	945	20	1,803

Table 10: Comparing the political career development of the reserved winners and other winners of the 1998 council election

	(1)	(2)
Woman (other winner)	0.977	1.024
	(0.125)	(0.133)
Woman (reserved winner)	0.903	1.010
	(0.247)	(0.279)
Age in 1998		1.020***
		(0.007)
Party membership: KMT		0.947
		(0.104)
Party membership: DPP		0.885
		(0.136)
Obs.	826	826
Nagelkerke pseudo R^2	0.00	0.01

High sex ratio for 3rd-parity birth

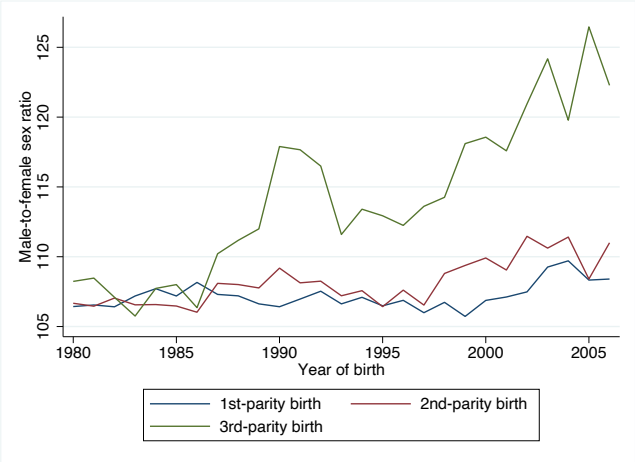


Figure 5: Male-to-female sex ratio at birth by birth order in Taiwan

Shorter birth gap for two-daughters-mothers (D, D)

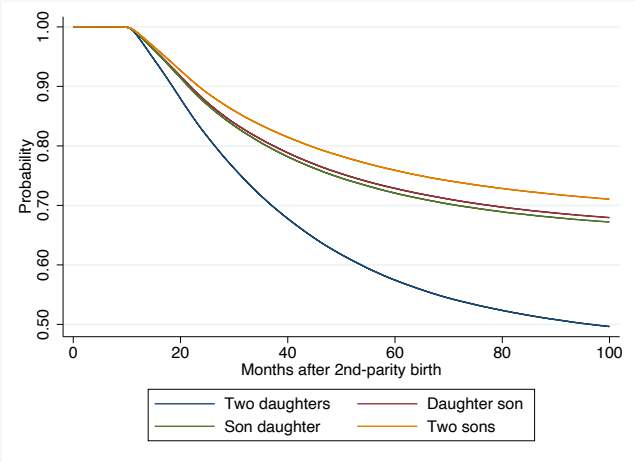


Figure 6: Kaplan-Meier survival curves for parents with two children to give the third-parity birth

Table 11: Estimating the effects of gender quota on the sex of third child

	(1)	(2)	(3)	(4)	(5)
	Dependent variable: The 3rd-parity child being a male				
	Full Sample	High School	Non-HS	Urban	Non-urban
($\hat{\beta}_1$) Gender quota proportion	.0984***	.064	.0915**	.275**	.0876***
	(0.032)	(0.040)	(0.047)	(0.11)	(0.033)
($\hat{\beta}_2$) Two sons × Gender quota proportion	−.0778*	−.138**	.0347	−.07	−.0756
	(0.046)	(0.061)	(0.064)	(0.14)	(0.049)
($\hat{\beta}_3$) Son daughter × Gender quota proportion	−.0785*	.0244	−.118*	−.174	−.0654
	(0.045)	(0.061)	(0.065)	(0.16)	(0.046)
($\hat{\beta}_4$) Daughter son × Gender quota proportion	−.107**	−.0836	−.0768	−.124	−.102**
	(0.043)	(0.059)	(0.063)	(0.14)	(0.045)
Mean dep. var.	0.539	0.547	0.530	0.544	0.537
Obs.	218,367	110,689	107,678	34,774	183,593
Adj. R^2	0.00473	0.00765	0.00200	0.00648	0.00448
F-test on marginal effect					
p-value of $H_0 : \hat{\beta}_1 + \hat{\beta}_2 = 0$	0.552	0.138	0.007	0.172	0.738
p-value of $H_0 : \hat{\beta}_1 + \hat{\beta}_3 = 0$	0.567	0.081	0.601	0.447	0.537
p-value of $H_0 : \hat{\beta}_1 + \hat{\beta}_4 = 0$	0.792	0.699	0.749	0.261	0.666

Standard errors are clustered at township-election level. * p<0.1, ** p<0.05, *** p<0.01.

Table 12: Estimating the effects of gender quota on neonatal mortality

	(1)	(2)
	Death per 1,000 newborns	
Gender quota proportion	−1.33	−1.22
	(0.85)	(0.84)
Girl × Gender quota proportion	1.59	1.59
	(1.00)	(1.00)
Girl	−0.726***	−0.711***
	(0.19)	(0.19)
2nd-parity birth		1.08***
		(0.083)
3rd-parity birth		2.08***
		(0.17)
Mean dep. var.	3.07	3.07
Observations	2,590,558	2,590,558
Adj. R^2	0.000537	0.000673

Table 13: List of law and political science programs

Law-related programs *ISCED-F 2013 field code: 0421 Law*
Department of Financial and Economic Law
Department of Government and Law
Department of Judicial Studies
Department of Law
Department of Law (Division of Economic and Financial Law)
Department of Law (Division of Financial & Economic Law)
Department of Law (Division of Judicial Studies)
Department of Law (Division of Law)
Department of Law (Financial and Economic Law Program)
Department of Law (Legal Institutions Program)
Bachelor Programme of Extension Education (School of Law)
Political-science-related programs *ISCED-F 2013 field code: 0312 Political sciences and civics*
Department of Global Politics and Economics
Department of Global Politics and Economics (English-taught Program)
Department of Government and Law
Department of International and Mainland China Affairs
Department of Political Economy
Department of Political Science
Department of Political Science, sub-division: international relations
Department of Political Science, sub-division: political theory
Department of Political Science, sub-division: public administration