The Maternal Mortality on Women Seats in National Parliaments

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Reis-Joao/TermProjectJoaoVictoria: This GitRepo contains the Term Project of João Reis and Victoria Mosby to the course Data Analysis 4, CEU (github.com)

Policy Proposal in Context: Literature Review

Two pieces of literature came to the forefront during the initial brainstorming for this assignment: an article analysing women in politics, and another examining the effect of women on the economy.

In "Women as Policy Makers: Evidence from a Randomized Policy Experiment in India", authors Chattopadhyay, Raghabendra, and Duflo analyse the causal relationship of political seats for women and public goods; concluding that local councils in India that include women create policies that improve public goods based on gender. In this experiment, one-third of local council seats were reserved randomly for women. What they discovered was that councils with women leaders invested more in drinking water, whereas male leaders invested on roads.

Linda Scott's *The Double X Economy: The Epic Potential of Empowering Women* is founded on the basis that gender inequality is the cause of poverty. The author states that it is not that poverty simply causes gender inequality and the poor treatment of women, but that the reverse is the case and provides the data to prove the causal relationship concluding that the best way to alleviate poverty is through the empowerment of women. In this book, Scott includes research in varying parts of the world and in many sectors, such as how female entrepreneurship in Africa affected households and communities, such as the effect of increasing female income on education. It also investigated policies in developed countries concluding that a lack of women in leadership lead to stagnating or worsening economic outcomes.

These works led to us analysing the relationship between women leaders and how they affect maternal mortality. We wanted to see if the inclusion of women in national leadership would influence a gender-related policy, such as maternal mortality, as was seen in the case of "Women as Policy Makers".

Does an increase in women in national leadership reduce maternal morality?

For our project we sought to understand how women in leadership affected gender related issues. Initially we considered women's unemployment however, we wanted to narrow our search on a variable that would have fewer external influences, choosing a uniquely female issue: maternal mortality. As women constitute nearly half (sometimes slightly more than 50%) of the population, it is imperative to develop policies with women in mind. If what is written in the Double X Economy is indeed true, then the implementation of policies for women, can help to address humanitarian issues such as domestic violence and human trafficking, but it can also promote economic growth, especially for developing countries. What we see is that women in leadership positively affect public goods as seen from our study in India but, what we are seeing from our research question is whether increasing women in leadership can save the lives of women, and specifically mothers. According to Long, about 80 countries have a goal of having at least 30% of seats held by women and there is discussion about whether the United States should implement this strategy. In Europe, women hold roughly 37% of seats, whereas in the U.S., women only hold around 24%. Our proposal then, is to have quotas for women in national leadership to ensure that there are policies promoting gender related issues and governments that reflect the population more accurately.

Acknowledging the Anomaly – Upward Trend in a Developed Country

In Double X Economy, one of the laws examined by Scott was *Phipps, et al. v. Wal-Mart Stores, Inc.* a sex-discrimination class action lawsuit. Even in developed countries such as the United States, a class-action lawsuit was filed against Walmart for its treatment of female employees. This case, which went to the Supreme Court, ruled that the nearly 90,000 women affected by the practices did not constitute a class and therefore cases had to be done on an individual basis. Class action lawsuits are typically for minority or underprivileged groups that would not have the means to afford legal representation. Many of these women were working in traditionally lower paying jobs or in departments that refused to allow them the opportunity for career or economic advancement. The United States, as stated in Scott's book, is one of only 4 countries, to not have maternal leave.

Additionally, without gender-based policies in place, the economy of developed countries could be at risk. A major issue companies face, which has been exacerbated by the Covid-19 pandemic, is workforce retention. In an article by Parker and Horowitz, a study highlighting reasons for why workers quit their job, included aspects such as "low pay", "no opportunities for advancement", and even "because of child care issues" which are all aspects that affect women, with the former two emphasized in the Walmart sex-discrimination case, and the latter in Scott's book.

The policies of the United States are not in favour of women, touching approximately 165 million lives, and perhaps the low representation of only one in 4 are reflective of this upward trend in maternal mortality. We highlight these cases to show that quotas are needed to ensure that positions are reserved for women, as without discussions on gender-based issues, even developed countries are at risk for regression.

Possible Mechanisms and Confounders

As previously stated, our mechanism is straight forward: the literature suggests that women in decision making processes are more sensitive to certain struggles, and so will press for policies that try to solve those same problems. That is particularly true when we speak about very specific women struggles that, by their nature, only women are capable of fully understanding. In our models, the national parliaments, and the policies taken there, are the mechanism through which women, being present, can change the maternal healthcare.

As confounders, we decided to add GDP per capita, female unemployment, birth rate, and female population. We believe that those confounders are country and time specific and are correlated with both maternal mortality and proportion of seats held by women, not being part of our wanted mechanism. Countries with higher GDP are expected to have both a lower maternal mortality and more women in positions of power, just by the fact that they are likely to be in later stages of development. Higher levels of female unemployment and birth rates are usually linked to societies where women have a secondary role, and therefore it is harder to see them in the policymaking process, and at the same time they are more vulnerable during and after pregnancy. Finally, we wanted to control for female population, as if something makes it increase or decrease abnormally, it is likely related to a condition for women within society, thus closely related to both maternal mortality and women representation in the parliaments.

Data Cleaning and Modelling Decisions

As formerly stated, we have decided to study the impact of women in policymaking positions on the maternal mortality rate. To achieve this, we have downloaded the following data for the 2000-2017 period from the World Bank Data. This period was chosen since there were no observations for maternal mortality before 2000 nor after 2017.

Two main variables:

- Maternal mortality ratio (modelled estimate, per 100,000 live births)
- Proportion of seats held by women in national parliaments (%)

Four possible confounders:

- GDP per capita, PPP (constant 2017 international $)
- Unemployment, female (% of female labour force) (modelled ILO estimate)
- Birth rate, crude (per 1,000 people)
- Population, female

After downloading the data, we cleaned and balanced the data to transform it into Panel Data. In here, it is worth to mention some details. First, we divided both maternal mortality ratio and birth rate by 10. Both variables were expressed as permille, but for interpretation purposes percentage seemed like a better scale. Second, we have dropped some observations whose coverage in the mentioned variables was low. For the countries that were missing only one observation, we inputted the average of the previous and following year (for more information, consulting Stata Do-file in GitHub repo). Finally, before starting our regressions, we have generated and labelled all the possible variables necessary to do it (natural logarithms and first differences), and we did a summary of those same variables to verify that there were no observable anomalies. By curiosity, we also drew a twoway tsline (a line graph where the x axis is the time variable) with both maternal mortality and women seats in national parliaments, to have a general idea of the expected relationship between both, and to once again verify that nothing strange was happening with the data (those graphs can be accessed in the GitHub repository, or by running the Stata code). The countries used in the graphs were arbitrary (based on our curiosity), and one can change it at their pleasure.

After the data management, and believing on its credibility, we started our regressions. Before we present and discuss the results, we would like to argue for some decisions we have taken. First, we have estimated the models logging only the GDP per capita and the total population. We have done it since all the other variables are in percentages. Variables in percentages are possible to log, and we will do that in our robustness tests, but we argue that interpretations make more sense when those variables are not logged (since a percentage change of a percentage variable is hard to directly interpret in terms of magnitude, while a percentage point change is straightforward). Second, we have weighted all our regressions. We have done that since our research question is based on the women's condition, and how their mortality when giving birth is affected by women in decision centres. Then, accounting for the different dimensions of the countries, and not treating them as single units, seemed more logical to us. We used the female total population to do our weights. One can still access the unweighted regressions through our Stata code.

We are going to compute OLS, First-Differences, Fixed Effects and Long Effects models, all using the maternal mortality and women seats as dependent and independent variables, respectively. The various models, plus the confounders we have chosen, will ideally help us to get closer to the causality we aim to measure (whether women are more sensitive to women struggles in the moment of influencing public policies, in our case especially concerning maternal healthcare).

Results and Discussion

We started by computing two OLS regressions to verify the cross correlation between the dependent and independent variable, in both the beginning and the end of the period:

1. **Cross-section OLS for one year**

$$MaternalMortality_i^E = \alpha + \beta\, WomenSeats_i + \theta\, Confounders_i$$

VARIABLES	(1) Year = 2000 Maternal Mortality ratio (%)	(2) Year = 2017 Maternal Mortality ratio (%)	(3) Year = 2000 Maternal Mortality ratio (%)	(4) Year = 2017 Maternal Mortality ratio (%)
women_seats	-0.628	-0.328*	0.275	-0.127
	(0.335)	(0.149)	(0.213)	(0.097)
birth_rate_percentage			20.152**	13.544**
			(2.497)	(2.112)
female_unemployment			-0.149	-0.021
			(0.243)	(0.164)
ln_gdp_per_capita			-5.908*	-2.961
			(2.549)	(1.905)
ln_female_population			1.078	0.803
			(1.039)	(0.623)
Constant	33.121**	21.974**	12.011	5.801
	(5.178)	(3.785)	(34.908)	(24.027)
Observations	148	148	147	148
R-squared	0.024	0.032	0.664	0.629

Standard errors in parentheses
** p<0.01, * p<0.05

As it is possible to observe in the table above, and on the contrary of what we were expecting, there is no clear association between maternal mortality and women seats. The only significant coefficient from the previous regressions (at a 5% level of significance) comes from the regression of 2017 without confounders, equalling -0.328. It means that in 2017, countries with 1 percentage point higher proportion of women seats in national parliaments were expected to have, on average, less 0.328 percentage points on the maternal mortality ratio (%). In the same regression, the intercept equals 21.974, meaning that in 2017, countries with no women represented in national parliaments were expected to have 21.974% maternal mortality rate. Nevertheless, when adding the confounders, the coefficient loses its significance, meaning that part of that correlation was captured by those same (expressed) confounders. The addition of confounders also radically improved the R-squared, that was very low in the first two models, meaning that a bigger part of the variation in the dependent variable is captured by the model.

2. First difference model

$$\Delta MaternalMortality_{it}{}^{E} = \alpha + \beta \Delta WomenSeats_{it} + \gamma \Delta WomenSeats_{i,t-k} + \theta \Delta Confounders_{it}$$

VARIABLES	(1) FD With No Lags FD Maternal Mortality ratio (%)	(2) FD With 2 Lags FD Maternal Mortality ratio (%)	(3) FD With 4 Lags FD Maternal Mortality ratio (%)	(4) FD With No Lags FD Maternal Mortality ratio (%)	(5) FD With No Lags FD Maternal Mortality ratio (%)
d_women_seats	-0.032	-0.046	-0.058	-0.023	-0.036
	(0.023)	(0.028)	(0.032)	(0.015)	(0.021)
L.d_women_seats		-0.052	-0.055		-0.035
		(0.028)	(0.034)		(0.023)
L2.d_women_seats		-0.036	-0.052		-0.032
		(0.025)	(0.031)		(0.021)
L3.d_women_seats			-0.044		-0.033
			(0.026)		(0.018)
L4.d_women_seats			-0.012		0.006
			(0.024)		(0.016)
d_birth_rate_percentage				4.742*	5.820*
				(2.074)	(2.239)
d_female_unemployment				0.013	-0.012
				(0.031)	(0.030)
d_ln_gdp_per_capita				-5.270*	-5.345*
				(2.228)	(2.249)
d_ln_female_population				-62.808**	-54.211**
				(9.283)	(8.416)
Constant	-0.617**	-0.559**	-0.497*	0.428**	0.422**
	(0.180)	(0.184)	(0.192)	(0.140)	(0.156)
Observations	2,516	2,220	1,924	2,515	1,924
R-squared	0.004	0.025	0.045	0.379	0.424

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

On the basic FD model (without lags and confounders), we can observe the following coefficients:

$\alpha = -0.617 \rightarrow$ it is the trend in the maternal mortality ratio. In years or in countries where the proportion of women seats has not changed, maternal mortality ratio was expected to decrease by 0.617 percentage points. This coefficient is significant at 1% significance level.

$\beta = -0.032 \rightarrow$ the average change in Maternal Mortality ratio is expected to be 0.032 percentage points lower in countries that, during the same period, have experienced a 1 percentage point higher change in the proportion of seats occupied by women in national parliaments. In other words, either we compare the same country in different years, or different countries in the same year, maternal mortality ratio is expected to change 0.032 percentage points less when the proportion of women seats increases by 1 percentage point more. Although this coefficient has the expected sign, it is very small, and it is not significant at any level. As one can see for the added regressions, the coefficient of interest does not become statistically significant at any level when we added lags and confounders.

3. Fixed effects model with time and country fixed effects

$$MaternalMortality_{it}{}^{E} = \alpha_i + \beta WomenSeats_{it} + \theta Confounders_{it}$$

VARIABLES	(1) Fixed Effects Maternal Mortality ratio (%)	(2) Fixed Effects Maternal Mortality ratio (%)
women_seats	-0.370	-0.223
	(0.223)	(0.121)
birth_rate_percentage		12.036**
		(3.192)
female_unemployment		0.017
		(0.131)
ln_gdp_per_capita		-6.236*
		(2.956)
ln_female_population		-50.649**
		(8.988)
Constant	27.994**	984.261**
	(3.038)	(173.579)
Observations	2,664	2,663
R-squared	0.404	0.723
Number of countryid	148	148

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

First, we can observe that Stata just give us one constant in the output, even though fixed effects assumes a different constant for each cross-sectional observation (country, in this case). That is due to the high number of constants that it would represent. So, the constant reported by Stata is the sum between a constant term and the average of each country fixed effect (and so not meaningful). Second, we have the coefficient for each year in the time (we did not put them in the table, due to their length, but one can observe it in our GitRepo). Their individual coefficient is not our concern, but we can see that both significance and value have decreased with time. Since those coefficients capture the effect of time in the maternal mortality ratio (it might capture the impact of unknown or unobserved confounders), we can say that maternal mortality ratio has been decreased in the last few years, controlling for all the explicit variables. Finally, our β coefficient equals -0.370. It means that, where and when the proportion of women seats in national parliaments is higher by 1 percentage point compared to its mean within countries, maternal mortality ratio is expected to be 0.370 percentage points lower than its mean within those same countries. In other words, if we compare two observations, the one with 1 percentage point higher proportion of women seats in national parliaments compared to its country specific mean has, on average, 0.370 percentage points smaller maternal mortality ratio, compared to their country specific mean. Once again, unfortunately, such coefficient is not significant at 1% or 5%, even when confounders were added (in fact, adding confounders diminished its absolute value, although also diminished its standard error). Nevertheless, the confounders, with exception of female unemployment, were all significant at 1%.

4. Long difference model

Finally, we computed a Long Difference Model. A Long Difference Model is a model based on the difference between two observations that distance each other a reasonable long period. In this case, we used the difference between the 2017 and the 2000 observations. The model comes as:

$$[MaternalMortality_{i,2017} - MaternalMortality_{i,2000}]^E = \alpha + \beta\,[WomenSeats_{i,2017} - WomenSeats_{i,1995}] + \theta[Confounders_{i,2017} - Confounders_{i,2000}]$$

VARIABLES	(1) Long Difference Model LD Maternal Mortality ratio (%)	(2) Long Difference Model LD Maternal Mortality ratio (%)
ld_women_seats	-0.384	-0.183
	(0.365)	(0.198)
ld_birth_rate_percentage		15.516**
		(3.720)
ld_female_unemployment		0.267
		(0.341)
ld_ln_gdp_per_capita		-6.588*
		(2.861)
ld_ln_female_population		-49.383**
		(9.034)
Constant	-8.204	11.176**
	(4.689)	(3.581)
Observations	2,664	2,646
R-squared	0.044	0.611

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

$\alpha = -8.204 \rightarrow$ on average, the change in the maternal mortality ratio between 2000 and 2017, had the women seats been constant in the same period, would be -8.204 percentage points. It is curious to observe that this coefficient just becomes significant when we add confounders, but its value jumps to 11.176 (what we would not expect – a positive constant in this context).

$\beta = -0.384 \rightarrow$ the average change in the maternal mortality ratio between 2000 and 2017 is expected to be 0.384 percentage points smaller in countries that, during the same period, have experienced a 1 percentage point higher change in the proportion of women seats in the national parliaments. In other words, either we compare the same country in different years, or different countries in the same year, the maternal mortality ratio between 2000 and 2017 is expected to have changed 0.384 percentage points less when the proportion of women seats increased by 1 percentage point more in the same period. The coefficient is still statistically insignificant, even when added the confounders (that are once again statistically significant except for female unemployment).

Conclusion

After the above results, one can think our initial idea is disposable, and that women seats do not help to improve maternal healthcare. We argue against it. Despite not having encouraging results, we believe that with better data (mainly a longer period of analysis, and a better proxy variable to women in decision making positions), with variables measures differently and with more confounders, a causality argument can still be drawn. In fact, our robustness tests are promising. When we compute log-log models (Appendix), both FE and LD models give us a statistically significant coefficient at 5%, showing the potential elasticity between the variables. Besides that, the p-value of our coefficient of interest, even when not statistically significant, was very often within the 0.05 and 0.2 range that, (due to aesthetic reasons, we have omitted the p-value on the graphs but they can be found in the code= although we did not report it as significant, does not fully discard the possibility of a significant coefficient in case one proceeds to deeper research.

We would also like to mention that, during one of our robustness tests, the FE regression without clustered errors gave us a coefficient significant at any level, while the FE regression with clustered errors give a coefficient only significant at 15%. Nevertheless, we believe that the clustered errors regression is the right one, since it is very likely that different countries have different unobservable variables that are affecting the female unemployment (i.e., there exists a correlation between each cluster and the value of our dependent variable and that each cluster has different specific average treatment effect).

Finally, as the professor said, one should consider a zero result as a result. We embrace our findings, not as a tool to discard the need of women in position powers to improve public policies, but rather as a start to study such important causality.

References

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Appendix

1) Log-Log Regressions

VARIABLES	(1) Year = 2000 Natural Logarithm of Maternal Mortality ratio (%)	(2) Year = 2017 Natural Logarithm of Maternal Mortality ratio (%)	(3) Year = 2000 Natural Logarithm of Maternal Mortality ratio (%)	(4) Year = 2017 Natural Logarithm of Maternal Mortality ratio (%)
ln_women_seats	-0.772**	-0.691**	-0.063	-0.233*
	(0.181)	(0.224)	(0.075)	(0.107)
ln_birth_rate_percentage			1.957**	1.682**
			(0.161)	(0.242)
ln_female_unemployment			0.076	0.120
			(0.064)	(0.077)
ln_gdp_per_capita			-0.554**	-0.662**
			(0.074)	(0.110)
ln_female_population			0.002	0.024
			(0.031)	(0.036)
Constant	3.890**	3.557**	5.601**	6.878**
	(0.444)	(0.680)	(0.969)	(1.312)
Observations	143	146	142	146
R-squared	0.114	0.062	0.874	0.808

Standard errors in parentheses
** p<0.01, * p<0.05

VARIABLES	(1) FD With No Lags FD Maternal Mortality ratio (%)	(2) FD With 4 Lags FD Natural Logarithm of Maternal Mortality ratio (%)	(3) FD With No Lags FD Natural Logarithm of Maternal Mortality ratio (%)	(4) FD With 4 Lags FD Natural Logarithm of Maternal Mortality ratio (%)
d_ln_women_seats	-0.007	-0.019	-0.008	-0.019
	(0.008)	(0.010)	(0.007)	(0.010)
L.d_ln_women_seats		-0.011		-0.013
		(0.008)		(0.008)
L2.d_ln_women_seats		-0.013		-0.016*
		(0.007)		(0.008)
L3.d_ln_women_seats		-0.014*		-0.017*
		(0.006)		(0.006)
L4.d_ln_women_seats		0.003		0.001
		(0.006)		(0.006)
d_ln_birth_rate_percentage			0.083	0.006
			(0.102)	(0.124)
d_ln_female_unemployment			-0.012	-0.011
			(0.009)	(0.009)
d_ln_gdp_per_capita			-0.300**	-0.277**
			(0.091)	(0.103)
d_ln_female_population			-0.240	-0.347
			(0.339)	(0.369)
Constant	-0.035**	-0.033**	-0.019	-0.017
	(0.005)	(0.006)	(0.010)	(0.010)
Observations	2,461	1,854	2,460	1,854
R-squared	0.001	0.008	0.064	0.062

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

VARIABLES	(1) Fixed Effects Natural Logarithm of Maternal Mortality ratio (%)	(2) Fixed Effects Natural Logarithm of Maternal Mortality ratio (%)
ln_women_seats	-0.048	-0.093*
	(0.042)	(0.040)
ln_birth_rate_percentage		0.066
		(0.383)
ln_female_unemployment		0.033
		(0.052)
ln_gdp_per_capita		-0.391*
		(0.155)
ln_female_population		-0.178
		(0.324)
Constant	2.378**	9.044
	(0.080)	(6.608)
Observations	2,616	2,615
R-squared	0.688	0.748
Number of countryid	148	148

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

VARIABLES	(1) Long Difference Model LD Maternal Mortality ratio (%)	(2) Long Difference Model LD Maternal Mortality ratio (%)
ld_ln_women_seats	-0.077	-0.205*
	(0.110)	(0.100)
ld_ln_birth_rate_percentage		0.151
		(0.439)
ld_ln_female_unemployment		0.149
		(0.118)
ld_ln_gdp_per_capita		-0.547**
		(0.173)
ld_ln_female_population		-0.211
		(0.313)
Constant	-0.570**	-0.037
	(0.138)	(0.229)
Observations	2,556	2,538
R-squared	0.009	0.323

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

2) Clustered vs Simple Standard Errors

VARIABLES	(1) Clustered SE Maternal Mortality ratio (%)	(2) Simple SE Maternal Mortality ratio (%)
women_seats	-0.370	-0.370**
	(0.223)	(0.028)
Constant	27.994**	27.994**
	(3.038)	(0.539)
Observations	2,664	2,664
R-squared	0.404	0.404
Number of countryid	148	148

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