Universidad EAFIT
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Escuela de Economía y Finanzas

Documentos de trabajo

Economía y Finanzas

Centro de Investigación
Económicas y Financieras

No. 16-07
2016

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Correa-Martínez, Wendy; Jetter, Michael

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Centro de Investigaciones Económicas y Financieras
Universidad EAFIT

Isolating causality between gender and corruption: An IV approach[1]

Wendy Correa Martínez[2] Michael Jetter[3]

Abstract

We address the persistent reverse causality problem in estimating the causal effect of female labor force participation (FLFP) on corruption. Employing plow usage as an instrumental variable, an increase in FLFP by one standard deviation is suggested to improve the Corruption Perceptions Index (CPI, ranging from zero to ten) by 0.52 points. This effect is stronger than a one standard deviation change of education levels, government size, or ethnic fractionalization.

Keywords: corruption, gender

JEL codes: C26, C36, D73, J16

1. Introduction

Studies have suggested a greater participation of women in society to be correlated with lower corruption levels (Dollar et al., 2001; Swamy et al., 2001). Consistent with these findings, numerous governments have turned to policies intended to raise the participation of women in politics and the workforce, such as gender quotas or gender equality laws. However, the gender-corruption link remains inherently plagued by simultaneity concerns. Corrupt societies may themselves prevent women from entering the labor force (e.g., "old boy networks," see Sundström, 2011, for a discussion). Thus, isolating a causal relationship remains difficult in a standard regression framework.

This paper employs plow usage as an instrumental variable, predicting the FLFP rate. Following Alesina et al. (2013), usage of the plow centuries ago has been shown to affect FLFP today, but is likely unrelated to other contemporary characteristics, such as economic development or corruption. Indeed, the instrument proves to be a strong predictor of FLFP and the link between gender and corruption is confirmed once simultaneity concerns are addressed.

[1]We are grateful to Alejandra Montoya Agudelo for excellent comments and discussions.

[2]Universidad EAFIT, email: wcorrea@eafit.edu.co

[3]University of Western Australia & IZA (Bonn), 8716 Hackett Drive, Crawley WA, Australia. Tel: +61 (457) 871-496. Email: mjetter7@gmail.com

2. Data and Methodology

Our data comes from standard sources for cross-country variables, displayed in Table 1. Following the majority of the associated literature, we use the Corruption Perceptions Index (CPI), derived from surveys and private risk assessments, to measure corruption.[4] We control for the standard set of covariates that have consistently been linked to corruption (Treisman, 2000; Serra, 2006).

Table 1: Summary statistics for all 159 countries. Variables constitute country averages from 1998 – 2011

Variable	**Mean**	**(Std. Dev.)**	**Source**
CPI	3.99	(2.05)	Transparency International
Female labor force participation rate (FLFP, 0 – 100)	56.67	(17.25)	Alesina et al. (2013)
GDP/cap (employing Ln)	9,443	(14,731)	World Bank
Population size in million (employing Ln)	39.53	(139.16)	World Bank
Primary education (years)	5.64	(0.90)	World Bank
Government size (% of GDP)	15.66	(5.64)	World Bank
Federal (0/1)	0.14	(0.35)	Treisman (2000)
Common law (0/1)	0.21	(0.41)	Treisman (2000)
British origin (0/1)	0.22	(0.42)	Treisman (2000)
Ethnic fractionalization (0 – 1)	0.46	(0.26)	Alesina et al. (2003)
Instrumental Variables			
Plow usage (0 – 1)	0.54	(0.47)	Alesina et al. (2013)
Large animals (0 – 1)	0.94	(0.19)	Alesina et al. (2013)
Economic complexity	6.23	(1.42)	Alesina et al. (2013)
Political hierarchies	3.3	(1.05)	Alesina et al. (2013)
Agricultural suitability (0 – 1)	0.54	(0.32)	Alesina et al. (2013)
Tropical climate (0 – 1)	0.74	(0.42)	Alesina et al. (2013)
Plow, positive crops (0 – 1)	0.505	(0.404)	Alesina et al. (2013)

Variables defining FLFP and the associated instrumental variables are taken from Alesina et al. (2013). Specifically, we employ those historical variables as instruments that have been shown to influence FLFP today: plow usage, the presence of large animals, economic complexity, political hierarchies, agricultural suitability, and tropical climate. Alesina et al. (2013, pp.470/471) explain that in plow-using societies, "[m]en tended to work outside the home in the fields, while women specialized in activities within the home. This division of labor then generated norms about the appropriate role of women in society." As a result, cultural beliefs about the role of women persist until today, generating a negative relationship between traditional plow usage and FLFP.

[4] Measurement of the CPI changes after 2011, making values incomparable to previous observations.

Further, Alesina et al. (2013) provide evidence that plow usage has affected cultural beliefs independent of surrounding institutions and economic development. For example, US immigrants from plow-using countries continue to hold their beliefs about gender roles, even after living under foreign institutions and economic conditions. These results provide robust intuitive support for the instruments' validity and excludability. In addition, our empirical results are accompanied by the corresponding test statistics.

3. Empirical Findings

3.1. Results from OLS Estimations

Table 2 displays results from conventional OLS regressions. Beginning with a univariate framework, we subsequently add control variables.

Table 2: OLS results from analyzing the correlates of corruption levels (CPI), using averages from 1998 – 2011 for all variables.

	(1)	(2)	(3)	(4)
Dependent variable: CPI (mean = 3.99)				
FLFP	0.029***	0.029***	0.028***	0.027***
	(0.005)	(0.005)	(0.005)	(0.005)
Ln(GDP/cap)	1.071***	1.062***	1.024***	0.949***
	(0.053)	(0.055)	(0.051)	(0.058)
Ln(Pop size)		-0.077	-0.009	-0.057
		(0.047)	(0.045)	(0.042)
Primary education (years) & government size			yes	yes
Control variables^a				✓
N	159	159	159	159
R^2	0.741	0.745	0.787	0.800

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. ^{a}Includes federal state, common law, British origin, and ethnic fractionalization rates.

FLFP is positively associated with the absence of corruption – a result that is statistically relevant on the one percent level. After incorporating all controls, the coefficient reduces marginally to 0.027. Taken literally, a one standard deviation increase in the FLFP rate would relate to a 0.47 point increase of the CPI, roughly equivalent to the difference between corruption in Spain (CPI of 6.66) and Japan (7.11).

3.2. Results from IV Estimations

However, if simultaneity is indeed present between FLFP and corruption, the results from Table 2 should not be interpreted as causal. For example, countries that exhibit strong levels of corruption may actively prevent women from entering the workforce, retaining patriarchal structures. In that case, reverse causality would bias the coefficient on FLFP in Table 2 upwards.

Table 3 introduces the variables associated with plow usage as instruments for FLFP. Column (1) presents the most basic estimation, where the suggested determinants of FLFP from Alesina et al. (2013) are used to predict the share of women in the labor force. In addition, we control for income levels – arguably the most persistent determinant in this literature (Treisman, 2007). The derived coefficient for FLFP retains its positive sign and magnitude with a value of 0.029. The respective econometric tests confirm the validity of the instrumental variables (e.g., F-values over 10 are considered strong instruments, following Stock and Yogo, 2005). Further, overidentification does not seem to be an issue.

Adding the corresponding control variables in columns (2) and (3) solidifies this result and the respective coefficient related to FLFP remains at 0.031. Thus, a one standard deviation of FLFP would increase the CPI by 0.53 points. As a comparison, this estimated coefficient is stronger than an increase in GDP per capita by 33 percent.

Columns (4) and (5) turn to a three-stage-least-squares (3SLS) approach, simultaneously estimating corruption and FLFP. This allows us to further control for potential reverse causality concerns, as corruption levels may influence FLFP. The final estimation further instruments plow usage by the variable "plow-positive" from Alesina et al. (2013, page 472), who acknowledge that "[t]he benefit of using the plow differed depending on the types of crops cultivated." Consequently, estimating a system with three equations addresses potential concerns about plow usage not being an excludable instrument when estimating the effect of FLFP on corruption. However, the derived coefficient for FLFP remains virtually unchanged.

Note that, in the 3SLS estimations, testing for joint significance of the corresponding instruments in the FLFP equation returns an F-value of 8.31 – just under the respective threshold of ten (Stock and Yogo, 2005). A closer look reveals that the variable *large animals* is not statistically significant on conventional levels in the first-stage estimations in equations (4) and (5). Re-estimating these equations without that variable returns virtually the same coefficient for FLFP (0.030, not displayed) with the F-test for weak instruments producing a value of 10.15.

4. Conclusions

Using historical plow prevalence as a plausible instrument for FLFP today, our analysis is able to alleviate simultaneity concerns in estimating the causal effect of FLFP on corruption. After simultaneity is addressed, the positive relationship between FLFP and corruption remains powerful, with the respective coefficient settling on a value of 0.003.

Table 3: Results from IV and 3SLS regressions, using averages from 1998 – 2011 for all variables.

	(1)	(2)	(3)	(4)	(5)	(6)
	IV Results			3SLS Results		
Panel A: Estimating CPI (mean = 3.99)						
FLFP	0.029***	0.032***	0.031***	0.032***	0.031***	0.030***
	(0.010)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ln(GDP/cap)	1.071***	1.029***	0.953***	1.028***	0.953***	0.953***
	(0.054)	(0.050)	(0.057)	(0.049)	(0.056)	(0.056)
Control set 1[a]		✓	✓	✓	✓	✓
Control set 2[b]			✓		✓	✓
F-test joint insignificance of IVs[c]				14.66***	13.42***	13.42***
Panel B: Estimating FLFP (mean = 56.67)						
Plow usage	-13.169***	-12.014***	-11.711***	-14.063***	-14.216***	-23.820***
	(3.886)	(4.225)	(4.316)	(3.322)	(3.314)	(4.376)
CPI				-1.180	-1.107	-0.548
				(0.840)	(0.827)	(0.813)
Control set 3[c]	✓	✓	✓	✓	✓	✓
F-test joint insignificance of IVs[d]	11.38***	11.69***	10.39***	8.31***	8.31***	8.31***
Weak IV test (Wald-statistic)[e]	8.86***	15.51***	15.20***			
Kleibergen-Paap weak IV test[f]	33.92***	34.94***	32.74***			
Overidentification test (p-value)[g]	0.49	0.17	0.17			
Panel C: Estimating plow cultivation (mean = 0.50)						
Plow, positive crops						0.913***
						(0.056)
F-test joint insignificance of IVs						333.66***
N	159	159	159	159	159	159
R^2	0.741	0.785	0.799	0.785	0.799	0.800

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. [a]Includes population size, primary education (years), and government size. [b]Includes federal state, common law, British origin, and ethnic fractionalization rates. [c]Incldues the presence of large animals, economic complexity, political hierarchies. [c]IVs are regressors exclusively used to estimate the CPI. [d]IVs are regressors exclusively used to estimate FLFP. [e]Following Magnusson (2010), the *weakiv* command is applied in Stata. [f]Following Kleibergen and Paap (2006) and Kleibergen and Schaffer (2007), the *ranktest* command produces the Kleibergen-Paap statistic. [g]Results from overidentification tests following 2SLS regression (using the *overid* command in Stata).

This result is consistent throughout a number of alternative estimations, suggesting a higher FLFP rate may indeed decrease corruption levels. Nevertheless, given the time-invariant structure of our instrumental variables, we are unable to control for other, potentially confounding forms of endogeneity, such as measurement error or omitted variables.

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