Does government size affect per-capita income growth? A Hierarchical meta-regression analysis

Sefa Awaworyi Churchill[1], Mehmet Ugur[3] , Siew Ling Yew[2]

[1, 2]Department of Economics, Monash University, Australia
[3]Business School, University of Greenwich

MAER-Net 2015 Colloquium
10-12 September 2015
Institute of Economic Studies, Prague

Does government size affect per-capita income growth?

1. **Does government size matter for growth?**
2. **Theoretical/empirical setup in the research field**
3. **Review methodology: inclusion/exclusion/metrics**
4. **Meta-regression methodology**
5. **MRA findings**
6. **Discussion**

1. Does government size matter for growth?

- Theory is ambiguous:
  - Big government is bad for growth :
    - Crowding-out effects (Landau, 1983; Engen and Skinner, 1992)
    - Distortionary taxes (De Gregorio, 1992).
    - Incentives for rent seeking and corruption (Hamilton, 2013; Gould and Amaro-Reyes, 1983; Mauro, 1995).
  - Big government is good for growth :
    - Investment in human capital (health and education); building and maintaining a sound infrastructure (Kormendi and Meguire, 1985; Ram, 1986; De Witte and Moesen, 2010)
    - Multiplier effect (Keynesian framework of AD/AS)
  - Type of expenditure matters (Poot, 2000; Nijkamp and Poot, 2004)
- Yet:
  - Policy paradigm since early 1980s is in favour of small government
  - Austerity has ruled the day after the crisis
- Hence: where does the balance-of-evidence lie?

2. Theoretical/empirical setup in the research field

Primary studies augment the neo-classical growth model with government size (G), as indicated below:

$$Y_{it} = Ae^{\lambda t} K_{it}^{\alpha} L_{it}^{\beta} e^{u_{it}} \qquad (1)$$

Dividing with labour (L), taking logs and first-differencing, the empirical model is usually of the form:

$$\Delta y_{it} = \Delta\lambda t + \alpha \Delta k_{it} + \beta \Delta l_{it} + \varepsilon_{it} \qquad (2)$$

Here, y and k are log GDP and capital per-labour-unit, and l is log labour (used to test for returns to scale).

The model is augmented with a measure of government size (g)

$$\Delta y_{it} = \Delta\lambda t + \alpha \Delta k_{it} + \beta \Delta l_{it} + \gamma \Delta g_{it} + \varepsilon_{it} \qquad (3)$$

Coefficient of interest: γ

Include studies where the dependent variable is per-capita GDP growth and the independent variable is government expenditures (or consumption) as a ratio of GDP.

3. Review methodology: Inclusion/exclusion, metric, etc

- Consider reporting guidelines (Stanley et al., 2013)
- Electronic search in five databases (JSTOR, EconLit, Business Source Complete, Google Scholar and ProQuest)
- Use keywords for government size and growth, Including:
  - total government expenditures, government consumption, government spending, outlays, public spending, public expenditures, public consumption, GDP, per capita income, growth, economic performance, and economic activity Conduct manual search by examineing the references of key reviews and studies that examine the government size-growth relationship
- Manual search in key reviews and seminal articles
- Include studies where the dependent variable is per-capita GDP growth and the independent variable is government expenditures (or consumption) as a ratio of GDP.
- Include journal articles, working papers, book chapters
- Calculate PCCs - Given the variety of the metrics with which the dependent variable (per-capita GDP) are measured

3. Review methodology: Inclusion/exclusion, metric, etc

- Time period: 1980-2014
- Included studies: 87 primary studies reporting 769 estimates
- Observations: 411 'effect estimates' for total government expenditures; 388 estimates for government consumption.
- Data type: cross-section, panel and time series (few)
- Data periods: cascading decades (80+; 90+; etc)
- Estimation method: IV, non-IV
- Country type: developed (DC), less developed (LDC)
- Publication type, date: journal articles, WPs, book chapters, reports, cascading decades

4. Meta-regression methodology

- Partial correlation coefficients and their standard errors, using:

$$r_i = t_i / \sqrt{t_i^2 + df_i} \qquad \text{and} \quad se_{ri} = \sqrt{(1 - r_i^2)/df_i}$$

- Fixed-effect and random-effect weighted means by study, using:

$$\bar{X}_{fee} = \sum r_i (1/se_{ri}^2) / \sum (1/se_{ri}^2)$$ (Descriptive summary)

- PET/FAT/PEESE (Precision-weighted)

$$t_{ij} = \alpha + \beta(1/se_{rij}) + v_{0j} + v_{1j}(1/se_{rij}) + \varepsilon_{ij} \qquad \text{(PET/FAT)}$$
$$t_{ij} = \alpha(se_{ri}j) + \beta(1/se_{rij}) + v_{0j} + v_{1j}(1/se_{rij}) + \varepsilon_{ij} \qquad \text{(PEESE)}$$

(Hierarchical model with random intercepts and slopes, chosen on the basis of LR tests)

- Multivariate meta-regression analysis (MRA), using

$$t_{ij} = \alpha_0 + \beta_0 (1/se_{rij}) + \sum \beta_k Z_k (1/se_{rij}) + v_{0j} + v_{1j}(1/se_{rij}) + \varepsilon_{ij},$$

where Z is vector of moderating variables.

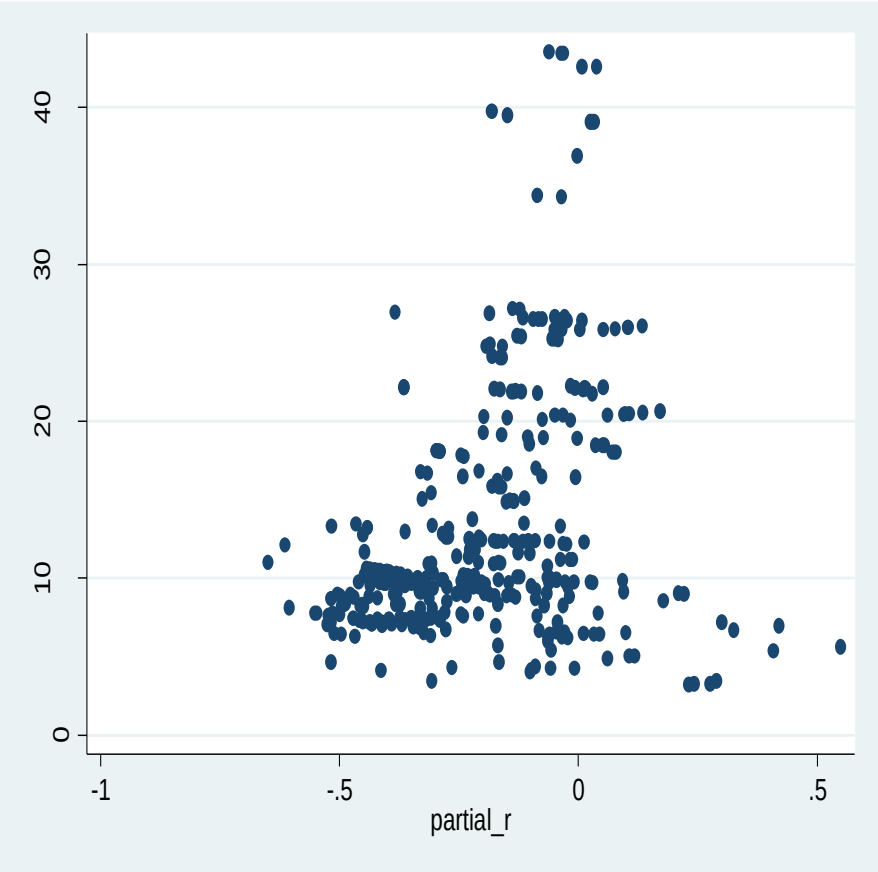
(Hierarchical model with random intercepts and slopes, chosen on the basis of LR tests)

5. Meta-analysis Findings: Descriptive

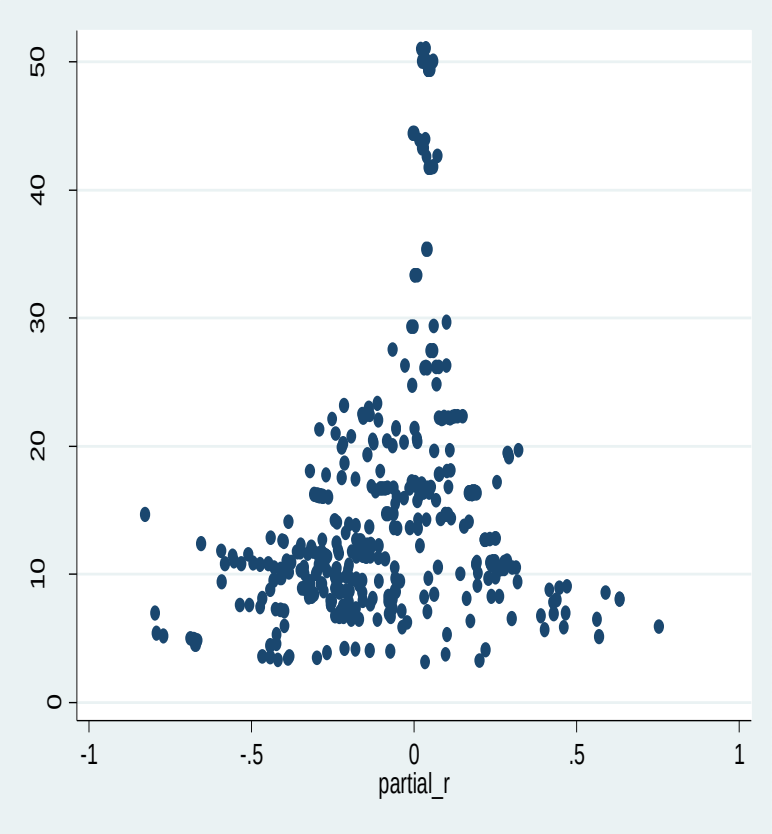
- Descriptive evidence (FEWMs): Heterogeneous, with the following breakdown:
  - Gov. expenditures
    - 17 studies (32% of reported estimates) = NS
    - 26 studies (49% of reported estimates) = - (significant)
    - 10 studies (19% of reported estimates) = + (significant)
    - Overall = -0.0083 (too small to be prcaticlally significant)
  - Gov. consumption
    - 14 studies (30% of reported estimates) = NS
    - 31 studies (68% of reported estimates) = - (significant)
    - 1 study(2% of reported estimates) = + (significant)
    - Overall = -0.1204 (small / medium effect)

5. MRA Findings: Controlling for selection bias

Funnels



Government consumption



Government expenditures

5. MRA Findings: Controlling for selection bias

Government consumption and growth

PET-FAT-PEESE Results

		PET-FAT			PESEE	
	(1)	(2)	(3)		(4)	(5)
VARIABLES	Entire Dataset	Developed	LDCs		Entire Dataset	Developed
Precision	-0.0474***	-0.0862**	-0.0091		-0.0996***	-0.1397***
	(0.0182)	(0.0403)	(0.0320)		(0.0141)	(0.0260)
Bias (Const.)	-1.5525***	-1.1544*	-1.4529**			
	(0.3595)	(0.6206)	(0.7231)			
Std. error					-2.7107	-2.3687
					(2.0915)	(3.0106)
Observations	388	105	70		388	105
No of studies	46	19	14		46	19

5. MRA findings: Controlling for selection bias

Total government expenditures and growth

PET-FAT-PEESE Results

	PET-FAT			PEESE
	(1)	(2)	(3)	(4)
VARIABLES	Entire Dataset	Developed	LDCs	Developed
Precision	-0.0317	-0.1311***	-0.0700	-0.1397***
	(0.0193)	(0.0459)	(0.0467)	(0.0316)
Bias (Const.)	-0.5963	0.0275	1.0715	
	(0.4042)	(0.7804)	(0.7519)	
Std. Error				4.9584
				(3.3918)
Observations	411	165	139	165
Number of studies	53	28	22	28

Adverse effects in developed countries only
Bias in consumption evidence only

5. Meta-analysis findings: Sources of heterogeneity

Total government expenditures and growth

PET-FAT-PEESE Results

VARIABLES	(1) General Model	(2) Specific Model
Precision	-0.0641	0.0397
	(0.1510)	(0.0880)
Theoretical and econometric dimensions		
Control for Endogeneity (IV)	**0.0669*** **	**0.0649*** **
	(0.0203)	**(0.0203)**
Time Series	-0.2058	
	(0.1298)	
Cross Section	-0.1145	
	(0.1224)	
Endogenous Growth Model	0.3526	
	(0.2751)	
Data Average (=>5 years)	0.0028	
	(0.0829)	
Data Average*Panel Data	-0.0338	
	(0.0799)	
Population	-0.1892***	-0.1739***
	(0.0707)	(0.0605)
Initial GDP	-0.1837***	-0.1733***
	(0.0422)	(0.0375)
Investment	-0.0677*	-0.0574*
	(0.0374)	(0.0347)

5. Meta-analysis findings: Sources of heterogeneity

Total government expenditures and growth

PET-FAT-PEESE Results

Data Characteristics		
Data Period (1960+)	0.0254	
	(0.0317)	
Data Period (1970+)	0.0234	
	(0.0508)	
Data Period (1980+)	-0.0201	
	(0.0687)	
Data Period (1990+)	0.0091	
	(0.0618)	
Data Period (2000+)	-0.1065	-0.1232*
	(0.0946)	(0.0698)
Developed	**-0.0304***	**-0.0312****
	(0.0171)	**(0.0159)**
Publication Characteristics		
Journal Rank	0.0225	
	(0.0484)	
Journal	**0.2243*****	**0.1894*****
	(0.0670)	**(0.0483)**
Publication Year (1990+)	-0.0632	-0.0921*
	(0.0824)	(0.0540)
Publication Year (2000+)	-0.0634	-0.0839*
	(0.0721)	(0.0430)
Publication Year (2010+)	0.1697**	0.1682***
	(0.0770)	(0.0451)
Constant	1.1650**	0.7136
	(0.5104)	(0.4440)
Observations	411	411
Number of groups	53	53

5. Meta-analysis findings: Sources of heterogeneity

Government consumption and growth
PET-FAT-PEESE Results

VARIABLES	(1) General Model	(2) Specific Model
Precision	0.0737	0.1776
	(0.1509)	(0.1256)
Theoretical and econometric dimensions		
Control for Endogeneity (IV)	**0.0256**	
	(0.0243)	
Time Series	0.0140	
	(0.1701)	
Cross Section	**-0.2740*** **	**-0.2328*** **
	(0.0627)	**(0.0579)**
Endogenous Growth Model	**-0.1376** **	**-0.1226** **
	(0.0608)	**(0.0603)**
Data Average (=>5)	-0.0232	
	(0.0304)	
Data Average*Panel	0.1320*	0.1029*
	(0.0733)	(0.0634)
Population	-0.0765***	-0.0713***
	(0.0268)	(0.0243)
Initial GDP	0.0256	
	(0.0234)	
Tax	-0.0373	
	(0.0228)	
Investment	0.0937***	0.0908***
	(0.0200)	(0.0194)

5. Meta-analysis findings: Sources of heterogeneity

Government consumption and growth
PET-FAT-PEESE Results

Data Characteristics		
Data Period (1960+)	-0.0687	-0.0837**
	(0.0468)	(0.0425)
Data Period (1970+)	-0.0985**	-0.1216***
	(0.0462)	(0.0402)
Data Period (1980+)	-0.1214**	-0.1487***
	(0.0530)	(0.0475)
Data Period (1990+)	-0.2309***	-0.2760***
	(0.0686)	(0.0501)
Developed	-0.0138	
	(0.0180)	
Publication Characteristics		
Journal Rank	-0.0761***	-0.0866***
	(0.0287)	(0.0265)
Journal	**0.2115*** **	**0.2040*** **
	(0.0440)	**(0.0424)**
Publication Year (1990+)	0.0531**	0.0408*
	(0.0241)	(0.0231)
Publication Year (2000+)	0.1915***	0.1921***
	(0.0389)	(0.0360)
Publication Year (2010+)	-0.1669***	-0.1822***
	(0.0359)	(0.0312)
Constant	-1.1041***	-1.0963***
	(0.2932)	(0.2747)
Observations	388	388
Number of groups	46	46

6. Discussion

- **Reported effect is more likely to be negative when:**
  - Data is specific to developed countries
  - Estimation is based on cross-section data (averaged over est. period)
  - The effect relates to government consumption (rather than total expenditures)
- **Reported effect is less adverse when:**
  - Endogeneity is controlled for
  - Primary studies are journal articles
- **There is partial evidence that:**
  - More adverse effects are published in higher-ranked journals
  - More adverse effects are more likelyt ot be reported from endogenous growth models
- **Model specification matters – but the effect on reported estimates varies.**
- **'Starting year of data** – inconsistent effects
- **Year of publication year** – inconsistent effects

6. Discussion

- **Government size – growth relationship is likely to be non-linear (more adverse effects at higher levels of development)**
  - Armey curve hypothesis (Armey, 1995): inverted-U relationship between government size and growth. Government size may be characterised by decreasing returns. (Government is bigger in developed countries)
  - Distortionary effect of higher taxes (Agell, 1996) (Taxes are higher in developed countries)
  - Hence the effect of government size and growth estimated with **linear specifications** may be **biased** (see also, Barro, 1990).

- **Cross-section estimates fail to take account of country-specific fixed effects**
  - First-differencing of averaged data eliminates fixed effects in the growth rate, but G/GDP as measure of government size is still subject to country-specific fixed effects

- **Government size is endogenous to both GDP level and GDP growth**
  - Wagner's law: government size (expenditures and consumption) increases with level of GDP
  - Hence: the 'looking glass problem' (Roodman, 2008)
  - Automatic stabilisers (government expenditures/consumption increases when growth falters)