

A Replication Study of “Openness, Country Size, and Government Size” (*Journal of Public Economics* 2009)

Public Finance Review

1-18

© The Author(s) 2018

Reprints and permission:

sagepub.com/journalsPermissions.nav

DOI: 10.1177/1091142118765786

journals.sagepub.com/home/pfr**Andrew Musau**¹ **Abstract**

Ram (*Journal of Public Economics*, 93, 213-218, 2009) questions the body of influential research suggesting that there is a negative association between country size and government size, and country size and openness, which may account for the positive association between openness and government size. Using data from the Penn World Table (PWT), he shows that while openness is positively related to government size, fixed-effects estimates show little evidence of the aforementioned negative associations. We replicate Ram’s results using his data set and a newer revised version of the same data set and find that the ensuing government size–openness association is dependent on the version of the PWT data and the composition of the sample. In addition, we find some evidence of a negative association

¹ Faculty of Economics and Organizational Sciences, Inland Norway University of Applied Sciences, Lillehammer, Norway

Corresponding Author:

Andrew Musau, Faculty of Economics and Organizational Sciences, Inland Norway University of Applied Sciences, Gudbrandsdalsvegen 350 (Nyhove, 4. etasje), 2624 Lillehammer, Norway.
Email: andrew.musau@inn.no

between country size and government size in the larger sample, but there remains no clear association between openness and country size.

Keywords

openness, government size, Penn World Table, fixed effects

There has been wide interest among public economists in exploring and explaining the relationship between a country's exposure to international trade (*openness*) and the scope of its government (*government size*). In an influential paper, Rodrik (1998) advanced the hypothesis that polities respond optimally to the greater macro risks associated with trade openness by putting in place policies of public employment and public transfer spending that provide insurance in the face of external shocks. The evidence buttressed in favor of this hypothesis was a positive partial correlation between government size and openness. However, Alesina and Wacziarg (1998) in response argued that this partial correlation was spurious and reflected the negative relationship between government size and country size, on the one hand, and between openness and country size, on the other hand: when controlling for country size (log population), the effect of openness on government size disappeared.¹ Subsequently, Ram (2009) showed that with country- and time-fixed effects, the various effects of country size on either openness or government size were weakened, and that country size could no longer be considered the mediating variable explaining the relationship between openness and government size.

Ram's analysis relied mainly on data from the Penn World Table (PWT) version 6.1 (Heston, Summers, and Aten 2002). The PWT is among the most widely used data sources for cross-country comparisons for the level and growth rate of gross domestic product (GDP) and other macroeconomic variables, resulting from the fact that it accounts for differences in relative prices. However, a number of researchers have raised questions regarding the reliability of newer versions of this data set as a result of data revisions over time. For example, Breton (2012) and Johnson et al. (2013) emphasize that estimates vary substantially across more recent versions of the data set. On the flip side, they acknowledge that the issue is not as pertinent if one uses low frequency data, for example, ten-year averages of variables. Such concerns warrant a replication of Ram's analysis to determine whether his estimation results are robust to the data revisions.

On the estimation side, empirical studies in macroeconomics employing fixed effects tend to find insignificant results with shorter samples, where

ordinary least squares (OLS), random effects, or between estimators find significant effects. Examples include the association between democracy and income (Acemoglu et al. 2008) and between growth and human capital (Benhabib and Spiegel 1994). A possible explanation underlying this is the fact that the fixed-effects estimator tends to exacerbate measurement error bias when the right-hand variables are time persistent. If results are driven by measurement error or other data problems, the impact becomes less severe with a longer time period because there is more variation within countries across time in the underlying signal. Even when differencing (which is what fixed effects does), the signal-to-noise ratio may remain sufficiently high to allow the coefficients being estimated to remain significant. For instance, in Acemoglu et al.'s (2008) study, a positive relationship between the two variables is restored even under fixed effects when lengthening the time period beyond the 1960 to 2000 period. More recent versions of the PWT provide us with access to such a longer time frame.

Using the same data set as Ram (PWT 6.1), we successfully replicate his estimation results. Following this, we use the more recent PWT version 7.1 (Heston, Summers, and Aten 2012), which contains data for 189 countries for the period 1950 to 2010, representing 35 more countries and ten additional years. The replication using the newer data set considers both Ram's 154 country sample over the years 1960 to 2000 and the full 189 country sample over the years 1960 to 2010, so as to establish whether differences in statistical inferences (if any) are due to data revision between the two versions of the PWT or the inclusion of more countries and years into the sample. We find that the resulting government size–openness association is dependent on the version of the PWT data and the composition of the sample. In particular, the positive coefficient of openness is insignificant when using the updated PWT data for Ram's sample, but significant when expanding the sample to additional countries and years. In addition, there is some evidence for Alesina and Wacziarg's hypothesized negative association between country size and government size in PWT 7.1, but there remains no clear association between openness and country size.

Replication

Replication Using PWT 6.1

The PWT version 6.1 contains in excess of twenty-five variables. However, to replicate Ram's results, we require only the following four variables: (1) government share of per capita GDP, (2) openness (percent in current

Table 1. Replication of Ram's (2009) Table 1 (Government Size–Country Size Regressions).

	Ram (2009)			Replication		
	Annual Data	Five-year Means	Ten-year Means	Annual Data	Five-year Means	Ten-year Means
Pooled Ordinary Least Squares (OLS)						
Constant	4.653*	4.757*	4.861*	4.653*	4.779*	4.876*
	(62.25)	(29.37)	(21.81)	(62.25)	(29.51)	(21.83)
LPOP	-0.080*	-0.084*	0.090*	-0.080*	-0.085*	-0.090*
	(-17.43)	(-8.62)	(-6.67)	(-17.43)	(-8.65)	(-6.64)
LRY	-0.139*	-0.144*	-0.151*	-0.139*	-0.146*	-0.153*
	(-18.84)	(-8.98)	(-6.89)	(-18.84)	(-9.12)	(-6.96)
R ²	0.11	0.13	0.15	0.11	0.13	0.15
N	5,117	1,027	509	5,117	1,027	509
Fixed effects						
LPOP	0.475*	0.441*	0.422*	0.475*	0.438*	0.420*
	(10.84)	(4.95)	(3.67)	(10.84)	(4.49)	(3.08)
LRY	-0.160*	-0.172*	-0.200*	-0.160*	-0.161*	-0.193*
	(-6.40)	(-3.30)	(-3.08)	(-6.40)	(-2.79)	(-2.54)
R ²	0.80	0.84	0.86	0.80	0.83	0.85
F-statistic	87.10*	24.16*	13.49*	87.10*	22.83*	12.82*
N	5,117	1,027	509	5,117	1,027	509

Note: Dependent variable is the log of government expenditure as a share of gross domestic product (GDP) and proxies "government size" (LGS). LPOP is the log of population and proxies "country size." LRY is the log of real GDP per capita in international dollars at constant prices. Numbers in parenthesis are *t*-statistics that are based on Huber–White consistent standard errors. Fixed-effects estimates are "two way" and permit the constant term to vary across countries and years (periods). Constant in fixed effects (FE) is not meaningful, and its estimates (as of country and time dummies) are not reported. *F*-statistics test the null of OLS being more appropriate than the fixed-effects format, and the null is rejected in all cases. All data are taken from PWT 6.1.

*Indicates .05 significance level.

prices), (3) population, and (4) real GDP per capita (chain-weighted index). Variables (1) to (3) are standard proxies for government size, openness, and country size, respectively, where openness is expressed as the ratio of trade (imports + exports) to GDP. Of the 168 countries that make up PWT 6.1, 14 countries had no observations on our variables of interest, reducing the sample to 154 countries. Additionally, we restricted the 1950 to 2000 time period to the forty-one-year period 1960 to 2000. We first replicated tables 1 to 3 in Ram (pp. 215–16) represented by the following equations:

Table 2. Replication of Ram’s (2009) Table 2 (Country Size–Openness Regressions).

	Ram (2009)			Replication		
	Annual data	Five-year means	Ten-year means	Annual data	Five-year means	Ten-year means
Pooled ordinary least squares (OLS)						
Constant	4.514* (71.28)	4.519* (32.96)	4.536* (24.50)	4.514* (71.28)	4.515* (32.81)	4.532* (24.32)
LPOP	−0.205* (−55.70)	−0.203* (−25.82)	−0.203* (−19.57)	−0.205* (−55.70)	−0.202* (−25.58)	−0.202* (−19.28)
LRY	0.158* (24.30)	0.158* (11.12)	0.155* (8.01)	0.158* (24.30)	0.156* (11.08)	0.154* (7.94)
R ²	0.44	0.45	0.48	0.44	0.45	0.48
N	5,117	1,027	509	5,117	1,027	509
Fixed effects						
LPOP	0.032 (1.09)	0.076 (1.35)	0.087 (1.26)	0.032 (1.09)	0.065 (1.04)	0.079 (0.95)
LRY	0.142* (7.81)	0.149* (4.20)	0.155* (3.34)	0.142* (7.81)	0.148* (3.79)	0.147* (2.67)
R ²	0.87	0.90	0.92	0.87	0.89	0.91
F-statistic	81.63*	24.56*	14.34*	81.63*	23.21*	13.43*
N	5,117	1,027	509	5,117	1,027	509

Note: Dependent variable is the log of ratio of trade (imports + exports) to gross domestic product (GDP) and proxies “openness” (LOPEN). LPOP is the log of population and proxies “country size.” LRY is the log of real GDP per capita in international dollars at constant prices. Numbers in parenthesis are t-statistics that are based on Huber–White consistent standard errors. Fixed-effects estimates are “two way” and permit the constant term to vary across countries and years (periods). Constant in FE is not meaningful, and its estimates (as of country and time dummies) are not reported. F-statistics test the null of OLS being more appropriate than the fixed-effects format, and the null is rejected in all cases. All data are taken from PWT 6.1.

*Indicates .05 significance level.

$$LGS_{it} = a_0 + a_1LPOP_{it} + a_2LRY_{it} + u_{1t}, \tag{1}$$

$$LOPEN_{it} = b_0 + b_1LPOP_{it} + b_2LRY_{it} + u_{2t}, \tag{2}$$

$$LGS_{it} = c_0 + c_1LOPEN_{it} + c_2LRY_{it} + u_{3t}, \tag{3}$$

where LGS_{it} is the log of government spending as a share of GDP in country *i* and year *t*, LPOP is the log of population, LOPEN is the log of ratio of

Table 3. Replication of Ram's (2009) Table 3 (Openness–Government Size Regressions).

	Ram (2009)			Replication		
	Annual data	Five-year means	Ten-year means	Annual data	Five-year means	Ten-year means
Pooled ordinary least squares (OLS)						
Constant	3.282* (42.91)	3.263* (19.18)	3.293* (13.90)	3.282* (42.91)	3.286* (19.34)	3.312* (13.94)
LOPEN	0.244* (17.07)	0.272* (8.46)	0.278* (6.02)	0.244* (17.07)	0.270* (8.41)	0.276* (5.97)
LRY	-0.176* (-23.54)	-0.185* (-11.42)	-0.193* (-8.68)	-0.176* (-23.54)	-0.187* (-11.52)	-0.194* (-8.71)
R ²	0.12	0.13	0.14	0.12	0.14	0.15
N	5,117	1,027	509	5,117	1,027	509
Fixed effects						
LOPEN	0.081* (4.51)	0.108* (2.63)	0.158* (2.72)	0.081* (4.51)	0.113* (2.57)	0.159* (2.39)
LRY	-0.245* (-10.46)	-0.256* (-5.23)	-0.292* (-4.79)	-0.245* (-10.46)	-0.246* (-4.57)	-0.283* (-4.02)
R ²	0.79	0.83	0.86	0.79	0.83	0.85
F-statistic	83.85*	23.27*	13.30*	83.85*	22.09*	12.68*
N	5,117	1,027	509	5,117	1,027	509

Note: Dependent variable is government consumption as percent of gross domestic product (GDP; LGS). LOPEN is the log of ratio of trade (imports + exports) to GDP and proxies "openness." LRY is the log of real GDP per capita in international dollars at constant prices. Numbers in parenthesis are t-statistics that are based on Huber–White consistent standard errors. Fixed-effects estimates are "two way" and permit the constant term to vary across countries and years (periods). Constant in FE is not meaningful, and its estimates (as of country and time dummies) are not reported. F-statistics test the null of OLS being more appropriate than the fixed-effects format, and the null is rejected in all cases. All data are taken from PWT 6.1.

*Indicates .05 significance level.

trade to GDP, LRY is the log of real GDP per capita, and u_{i1t} through u_{i3t} are the stochastic error terms.

The replication of Ram's annual estimates across all three equations was exact. We obtained the same sample size, coefficients, and test statistics. However, there is no straightforward way of obtaining five-year and ten-year averages from a forty-one-year sample period. The main issue is what to do with the extra year at the start or at the end of the period. Possibilities include dropping either year, leaving forty perfectly divisible years. Alternatively, one could incorporate either the first year or the last year into the

first averaged period or the last averaged period, respectively.² The strategy that gave us the same sample size and closest estimates to Ram was incorporating the observations of 1960, the first year of the sample, into the first averaged period. Missing data led to only one observation for 4 countries in the five-year averages sample, and 19 countries in the ten-year averages sample, and excluding these countries reduced the sample size to 150 and 135 countries, respectively. Needless to say, as the defined length of an average period increases, whatever assumption lies behind the averaging procedure should matter less and this proves true for our replication results, which in many cases exactly replicate Ram in the case of ten-year averages.

Tables 1 to 3 display our replication results alongside Ram's results for the government size–country size regression in equation (1), country size–openness regression in equation (2), and openness–government size regression in equation (3). The general conclusion is that OLS estimates support Alesina and Wacziarg in showing a negative association of country size with both openness and government size. However, fixed-effects results do not support Alesina and Wacziarg's hypothesis that country size is a mediating variable.

Tables 4 and 5 in Ram (2009) are a sensitivity check of fixed-effects estimates of the relationship between government size and country size, and country size and openness, respectively. Estimates are of ten-year averages of the following extensions of equations (1) and (2):

$$\begin{aligned} \text{LGS}_{it} = & d_0 + d_1\text{LPOP}_{it} + d_2\text{LRY}_{it} + d_3\text{LOPEN}_{it} + d_4\text{LURBAN}_{it} \\ & + d_5\text{DENSITY}_{it} + u_{i4t}, \end{aligned} \quad (4)$$

$$\text{LOPEN}_{it} = g_0 + g_1\text{LPOP}_{it} + g_2\text{LRY}_{it} + g_3\text{LGOV}_{it} + g_4\text{DENSITY}_{it} + u_{i5t}, \quad (5)$$

where LURBAN_{it} is the log of the ratio of urban population to total population in country i and year t , DENSITY_{it} is population (in thousands) per square kilometer in country i and year t , u_{i4t} and u_{i5t} are the stochastic error terms, and other variables as previously defined. Data on urbanization and population density are obtained from the World Bank (2015) Development Indicators database (<http://data.worldbank.org/data-catalog/world-development-indicators>). This data set does not include Taiwan, and both Belgium and Luxembourg do not have population density data prior to the year 2000. The city-state of Singapore has an urbanization rate of 100 percent across all years. Excluding these four countries reduces the ten-year sample to 493 observations, just six observations short of Ram's sample size of 499. Apart from the averaging issues that we previously

Table 4. Replication of Ram's (2009) Table 4 (Country Size—Government Size: Judging Sensitivity of Fixed-effects Estimates, Ten-year Means Sample).

	Ram (2009)					Replication				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
LPOP	0.555* (5.07)	0.432* (3.71)	0.418* (3.56)	0.272* (2.27)	0.258* (2.15)	0.545* (4.06)	0.429* (3.00)	0.416* (2.89)	0.280** (1.87)	0.267** (1.78)
LRY		-0.185* (-2.62)	-0.210* (-2.93)	-0.212* (-3.04)	-0.224* (-3.17)		-0.171* (-2.08)	-0.195* (-2.35)	-0.199* (-2.44)	-0.210* (-2.55)
LOPEN			0.155* (2.68)	0.133* (2.35)	0.137* (2.40)			0.155* (2.33)	0.137* (2.08)	0.141* (2.13)
LURBAN				0.207* (2.63)	0.213* (2.68)				0.191** (1.87)	0.197** (1.92)
DENSITY					0.101** (1.85)					0.084* (5.97)
R ²	0.854	0.857	0.860	0.862	0.863	0.849	0.854	0.855	0.857	0.857
F-statistic	14.14*	13.25*	13.03*	13.07*	12.86*	13.51*	12.84*	12.42*	12.44*	12.31*
N	499	499	499	499	499	493	493	493	493	493

Note: Dependent variable is the log of government expenditure as a share of gross domestic product (GDP) and proxies "government size" (LGS). LPOP is the log of population and proxies "country size." LRY is the log of real GDP per capita in international dollars at constant prices. LOPEN is log of ratio of trade (imports + exports) to GDP and proxies "openness." LURBAN is log of ratio of urban population to total population. DENSITY denotes population (in thousands) per square kilometer. Numbers in parenthesis are t-statistics that are based on Huber-White consistent standard errors. Fixed-effects estimates are "two way" and permit the constant term to vary across countries and years (periods). Constant in FE is not meaningful, and its estimates (as of country and time dummies) are not reported. F-statistics test the null of ordinary least squares being more appropriate than the fixed-effects format, and the null is rejected in all cases. Data on urbanization and population density are taken from World Bank (2015), and are for 1965, 1975, 1985, and 1995, which are the midpoints of each period. Data for the remaining variables are taken from PWYT 6.1.

*Indicates .05 significance level.

**Indicates .10 significance level.

Table 5. Replication of Ram's (2009) Table 5 (Country Size–Openness: Judging Sensitivity of Fixed-effects Estimates, Ten-Year Means Sample).

	Ram (2009)				Replication			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
LPOP	-0.013 (-0.19)	0.093 (1.33)	0.051 (0.73)	0.057 (0.81)	-0.020 (-0.25)	0.085 (1.00)	0.042 (0.50)	0.048 (0.55)
LYR		0.159* (3.18)	0.177* (3.51)	0.185* (3.59)		0.156* (2.61)	0.173* (2.90)	0.181* (2.98)
LGS			0.096* (2.56)	0.099* (2.61)			0.099* (2.22)	0.102* (2.27)
DENSITY				-0.066 (-1.04)				-0.062* (-3.91)
R ²	0.910	0.913	0.914	0.915	0.900	0.902	0.904	0.904
F-statistic	14.15*	12.73*	12.51*	12.18*	12.69*	11.49*	12.97*	11.28*
N	499	499	499	499	493	493	493	493

Note: Dependent variable is log of ratio of trade (imports + exports) to gross domestic product (GDP) and proxies "openness" (LOPEN). LPOP is the log of population and proxies "country size." LYR is the log of real GDP per capita in international dollars at constant prices. LGS is the log of government expenditure as a share of GDP and proxies "government size." DENSITY denotes population (in thousands) per square kilometer. Numbers in parenthesis are t-statistics that are based on Huber–White consistent standard errors. Fixed-effects estimates are "two way" and permit the constant term to vary across countries and years (periods). Constant in FE is not meaningful, and its estimates (as of country and time dummies) are not reported. F-statistics test the null of ordinary least squares being more appropriate than the fixed-effects format, and the null is rejected in all cases. Data on population density are taken from World Bank (2015), and are for 1965, 1975, 1985, and 1995, which are the midpoints of each period. Data for the remaining variables are taken from PWT 6.1.

*Indicates .05 significance level.

**Indicates .10 significance level.

highlighted, our replication results are equivalent to those of Ram. Across all specifications starting from the simplest in column 1, the results show no support for Alesina and Wacziarg's view that government size and openness are each negatively associated with country size.

Replication Using PWT 7.1: Ram's 154 Country Sample, 1960 to 2000, and Complete 189 Country Sample, 1960 to 2010

Before embarking on any sample extension, it is imperative to consider whether there is a data revision effect on statistical inferences concerning the association between openness and government size. Using version 7.1 of the PWT, which contains data for 189 countries for the period 1950 to 2010, we first restricted the sample to Ram's 154 country sample that covers the period 1960 to 2000. The variable names and International Organization for Standardization (ISO) country codes are the same across PWT 6.1 and PWT 7.1, and therefore replication of Ram's analysis was straightforward. Thereafter, we used the complete PWT 7.1 sample, only restricting the starting year to 1960, so that the sample covered the fifty-one-year period 1960 to 2010. Table 6 exhibits annual data, five-year means and ten-year means replication results for both samples (for equations [1]–[3] in this text corresponding to tables 1–3 in Ram).

A comparison of the size of Ram's sample across PWT 6.1 and PWT 7.1 clearly reveals that some missing data in the former were updated in the latter. The annual data sample size increases from 5,117 observations in PWT 6.1 to 5,463 when using PWT 7.1, whereas the five-year and ten-year averages samples increase from 1,027 and 509 to 1,099 and 554 observations, respectively. Including the additional decade of data further increases the annual sample to 8,223 observations, and the five-year and ten-year averages samples to 1,674 and 869 observations, respectively.³ For the association between government size and country size, the results in table 6 show a reversal of Ram's estimates in table 1 and some evidence in favor of Alesina and Wacziarg's view of the existence of a negative relationship between government size and country size. Whereas Ram finds a positive and highly significant association, the country size coefficients from PWT 7.1 using his 154 country sample over the years 1960 to 2000 are all negative (but not significant). Therefore, there is a noticeable shift in the coefficients resulting from the revision of data that were undertaken between PWT 6.1 and PWT 7.1. Considering the full 189 country sample over the

Table 6. Replication of Ram's (2009) Tables 1–3 Fixed-effects Estimates Using PWT 7.1: Comparison between Ram's 154 Country Sample over the Years 1960 to 2000 and the Complete 189 Country Sample Covering the Years 1960 to 2010.

	Ram's sample, 1960–2000			Full sample, 1960–2010		
	Annual Data	Five-year Means	Ten-year Means	Annual Data	Five-year Means	Ten-year Means
~ Log of government expenditure (share of gross domestic product [GDP])						
LPOP	−0.051 (−1.65)	−0.066 (−0.94)	−0.064 (−0.63)	−0.077* (−2.87)	−0.072 (−1.24)	−0.077 (−0.97)
LRY	−0.222* (−11.48)	−0.228* (−6.16)	−0.230* (−4.47)	−0.234* (−12.98)	−0.232* (−6.05)	−0.225* (−4.17)
R ²	0.86	0.89	0.91	0.83	0.86	0.88
N	5,463	1,099	554	8,223	1,674	869
F-statistic	151.51*	41.24*	24.19*	128.97*	34.19*	18.75*
~ Log of sum of imports and exports (share of GDP)						
LPOP	−0.030 (−0.88)	−0.000 (−0.00)	−0.019 (−0.20)	0.011 (0.45)	0.027 (0.50)	0.013 (0.18)
LRY	0.258* (13.04)	0.250* (5.87)	0.229* (3.65)	0.231* (14.20)	0.231* (6.42)	0.221* (4.29)
R ²	0.86	0.88	0.90	0.81	0.83	0.85
N	5,463	1,099	554	8,223	1,674	869
F-statistic	84.30*	23.06*	12.41*	82.50*	21.01*	10.91*
~ Log of government expenditure (share of GDP)						
LOPEN	0.006 (0.44)	0.021 (0.66)	0.038 (0.82)	0.078* (6.78)	0.098* (3.90)	0.110* (3.03)
LRY	−0.215* (−11.53)	−0.222* (−6.16)	−0.227* (−4.44)	−0.240* (−14.33)	−0.241* (−6.86)	−0.235* (−4.74)
R ²	0.86	0.89	0.91	0.83	0.86	0.88
N	5,463	1,099	554	8,223	1,674	869
F-statistic	162.02*	43.83*	25.68*	154.93*	41.26*	22.65*

Note: LPOP is the log of population and proxies “country size.” LRY is the log of real GDP per capita in international dollars at constant prices. Numbers in parenthesis are t-statistics that are based on Huber–White consistent standard errors. Fixed-effects estimates are “two way” and permit the constant term to vary across countries and years (periods). Constant in FE is not meaningful, and its estimates (as of country and time dummies) are not reported. F-statistics test the null of ordinary least squares being more appropriate than the fixed-effects format, and the null is rejected in all cases. All data are taken from PWT 7.1.

*Indicates .05 significance level.

years 1960 to 2010, the negative coefficient for country size becomes significant for annual data, but the significance disappears with temporal averaging. The effect of the data revision remains visible for the association between country size and openness, where the country size coefficients flip

sign from positive in table 2 to negative in table 6 when using Ram's sample in PWT 7.1 but revert back to positive when including the thirty-five additional countries and extra decade of data. As was the case with Ram's country size coefficients in table 2, those in table 6 are not significant but their sizes and that of their corresponding *t*-statistics are comparably small. For the important association between openness and government size, the data revision has the effect of rendering the positive and significant openness coefficients in table 3, not significant when using Ram's 154 country sample in PWT 7.1, but these revert back to significance when using the complete 189 country sample. In the latter, both the size of the coefficients and that of their corresponding *t*-statistics mirror those of Ram in table 3.

Table 7 repeats the estimation exercise in tables 4 and 5 using PWT 7.1 data, comparing estimates from Ram's 154 country sample over the years 1960 to 2000 to the full 189 country sample over the years 1960 to 2010. As was the case previously, Taiwan is not included in the World Bank data set, and Singapore has an urbanization rate of 100 percent across all years. Additionally, missing values for the population density variable led to only one observation for Belgium and Luxembourg, and therefore these four countries are excluded from both Ram's 154 country sample and the full 189 country sample. Considering the former, the ten-year means sample size increases from Ram's 499 observations in PWT 6.1 to 538 observations when using PWT 7.1. The number of observations in the full sample further increases to 839. In line with the results from table 6, the country size coefficients in the country size–government size regressions in table 7 lend even more support to Alesina and Wacziarg's proposition of the existence of a negative relationship between country size and government size. A lot of this can be attributed to the effect of the data revision across PWT versions which is evident by looking at the flip in Ram's country size coefficients from positive and significant in table 4 to negative for all but the simplest model in table 7. The negative country size coefficients become significant with the inclusion of urbanization and both urbanization and population density in the presence of openness. On the other hand, the country size coefficients remain insignificant in the openness–country size regressions in table 7, except for the simplest models where they are negative and significant at the .10 level. For the remainder, the coefficients are either positive or negative depending on the sample.

Table 7. Replication of Ram's (2009) Tables 4–5 Using PWT 7.1: Comparison between Ram's 154 Country Sample over the Years 1960 to 2000 and the Complete 189 Country Sample Covering the Years 1960 to 2010 (Country Size–Government Size and Openness–Country Size: Judging Sensitivity of Fixed-effects Estimates, Ten-year Means Sample).

	Ram's Sample, 1960–2000					Full Sample, 1960–2010				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
~ Log of government expenditure (share of gross domestic product [GDP])										
LPOP	0.073 (0.73)	-0.070 (-0.68)	-0.069 (-0.67)	-0.153 (-1.29)	-0.180 (-1.50)	0.040 (0.55)	-0.099 (-1.20)	-0.101 (-1.21)	-0.223* (-2.40)	-0.251* (-2.68)
LRY		-0.211* (-3.94)	-0.221* (-3.93)	-0.227* (-4.03)	-0.251* (-4.30)		-0.216* (-3.74)	-0.242* (-4.14)	-0.254* (-4.39)	-0.275* (-4.72)
LOPEN		0.040 (0.85)	0.040 (0.85)	0.028 (0.61)	0.040 (0.86)		0.112* (3.03)	0.112* (3.03)	0.094* (2.57)	0.101* (2.77)
LURBAN				0.116 (1.35)	0.132* (1.51)		0.208* (3.04)	0.208* (3.04)	0.208* (3.04)	0.227* (3.28)
DENSITY					0.065* (4.55)				0.094* (4.03)	0.094* (4.03)
R ²	0.905	0.910	0.910	0.911	0.912	0.865	0.872	0.874	0.877	0.879
F-statistic	23.98*	24.36*	24.34*	24.36*	24.39*	18.44*	18.36*	18.69*	19.03*	19.05*
N	538	538	538	538	538	839	839	839	839	839

(continued)

Table 7. (continued)

	Ram's Sample, 1960–2000				Full Sample, 1960–2010			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
~ Log of sum of imports and exports (share of GDP)								
LPOP	-0.175** (-1.75)	-0.011 (-0.11)	-0.008 (-0.08)	0.017 (0.16)	-0.125** (-1.75)	0.021 (0.28)	0.035 (0.46)	0.054 (0.70)
LRY		0.243* (3.62)	0.253* (3.71)	0.284* (4.13)		0.229* (4.16)	0.260* (4.56)	0.281* (4.88)
LGS		0.048 (0.85)		0.062 (1.09)			0.144* (3.09)	0.154* (3.28)
DENSITY				-0.095* (-9.49)				-0.103* (-5.68)
R ²	0.885	0.891	0.891	0.893	0.829	0.837	0.840	0.842
F-statistic	12.03*	11.28*	11.27*	11.24*	10.61*	9.84*	10.04*	9.98*
N	538	538	538	538	839	839	839	839

Note: LPOP is the log of population and proxies "country size." LRY is the log of real GDP per capita in international dollars at constant prices. LURBAN is log of ratio of urban population to total population. DENSITY denotes population (in thousands) per square kilometer. Numbers in parenthesis are *t*-statistics that are based on Huber-White consistent standard errors. Fixed-effects estimates are "two way" and permit the constant term to vary across countries and years (periods). Constant in FE is not meaningful, and its estimates (as of country and time dummies) are not reported. *F*-statistics test the null of ordinary least squares being more appropriate than the fixed-effects format, and the null is rejected in all cases. Data on urbanization and population density are taken from World Bank (2015), and are for 1965, 1975, 1985, 1995, and 2005, which are the midpoints of each period. Data for the remaining variables are taken from PWT 7.1.

*Indicates .05 significance level.

**Indicates .10 significance level.

Concluding Remarks

This replication study revisits Rodrik's (1998) claim that government spending plays a risk reducing role in open economies which had support in Ram's fixed-effects results. We show that the positive association between government size and openness is dependent on the version of the PWT data and the composition of the sample. In particular, the positive coefficient of openness is insignificant when using the updated PWT data for Ram's sample (154 countries, 1960 to 2000) but significant when expanding the sample to additional countries and years (189 countries, 1960 to 2010). This mixed result is evidenced in the literature where there is no uniform support for Rodrik's hypothesis. For example, Benarroch and Pandey (2008, 2012) find that bigger government Granger causes lower openness, but openness does not Granger cause government size. This remains true whether one considers aggregated government spending or specific expenditure components. Shelton (2007) observes that government expenditures associated with increased openness are not in categories that explicitly insure for risk.

We also find some evidence in favor of Alesina and Wacziarg's hypothesized negative association between country size and government size. While Ram finds a significant positive association between country size and government size, the country size coefficients using PWT 7.1 data are negative and attain significance in some instances. However, as was the case in Ram's analysis, the country size coefficients using PWT 7.1 data are not significant in the country size–openness regressions. Because Alesina and Wacziarg's hypothesis that country size mediates the positive relationship between openness and government size requires that there exists a negative association between country size and government size, and country size and openness, we replicate Ram's result that fixed-effects estimates do not support the joint hypothesis.

Whether newer versions of the PWT prove to be less reliable than the previous versions is an empirical question and one outside the scope of this article. At present, the aforementioned studies by Breton and Johnson et al. only point to differences in estimates across PWT 7.1 and earlier versions of the PWT, but they do not provide any conclusive evidence as to whether either is flawed. There will no doubt be researchers who will investigate this matter over the coming years and shed more light on it. However, the previous paragraphs emphasize that there is nothing final in the government size and openness debate, indicating the need to revisit this analysis some years down the line.

Acknowledgments

I would like to thank the Editor, Scott Findley, the Associate Editor for replication studies, Bob Reed, Jochen Jungeilges, and three anonymous referees for valuable comments and suggestions. Part of this article was written while I was a research fellow at the University of Agder. I am grateful for the financial support from the Competence Development Fund of Southern Norway.


Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Andrew Musau  <http://orcid.org/0000-0001-5980-6779>

Supplementary Material

Supplementary material for this article is available online.

Notes

1. Alesina and Wacziarg argue that large countries have a lower share of government expenditure in gross domestic product (GDP) since they can spread the cost of nonrival public goods over more heads relative to small countries. To the extent that market size influences productivity, large countries can “afford” to be closed while small countries have a greater incentive to be open. Additionally, they advance a more mechanical channel to the country size–openness relationship. In even the simplest model with any form of increasing returns or gains from specialization, smaller economies will have greater trade-to-GDP ratios. Rhode Island, for example, is much more open to the rest of the United States than New York, and both have the same trade policy toward the rest of the United States (i.e., free trade). The world as a whole (big) has a trade-to-GDP ratio equal to zero, while Hong Kong and Singapore (small) have trade volumes several times the size of their GDPs (i.e., they act as trade entrepôts).
2. A simple procedure of temporal averaging is to first define t -year periods $t \in \mathbb{Z}^+$ by the years that start or end them. This can be achieved using a floor or ceiling function, where $\text{period} = t \times \text{floor}(\text{year}/t)$ or $\text{period} = t \times \text{ceiling}(\text{year}/t)$. Thereafter, average over the defined t -year periods.

3. Considering Ram's sample, the annual data sample size increases from 5,117 observations in PWT 6.1 to 5,463 when using PWT 7.1. Whereas missing data led to only one observation for four countries in the five-year averages sample in the PWT 6.1, all countries have at least two observations in PWT 7.1 and none is excluded. Similarly, missing data led to only one observation for eleven countries in the ten-year averages sample in PWT 7.1, eight countries fewer compared to PWT 6.1. For the complete 189 country sample over the years 1960 to 2000, no country is excluded due to missing data both in the case of annual and averaged data. Due to the additional years of data, the annual sample increases to 8,223 observations, whereas the five-year averages and ten-year averages samples increase to 1,674 and 869 observations, respectively.

References

- Acemoglu, Daron, Simon Johnson, James A. Robinson, and Pierre Yared. 2008. "Income and Democracy." *American Economic Review* 98:808–42.
- Alesina, Alberto, and Romain Wacziarg. 1998. "Openness, Country Size and Government." *Journal of Public Economics* 69:305–21.
- Benarroch, Michael, and Manish Pandey. 2008. "Trade Openness and Government Size." *Economic Letters* 101:157–9.
- Benarroch, Michael, and Manish Pandey. 2012. "Trade Openness and Government Size." *Journal of Macroeconomics* 34:239–52.
- Benhabib, Jess, and Mark M. Spiegel. 1994. "The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-country Data." *Journal of Monetary Economics* 34:143–73.
- Breton, Theodore R. 2012. "Penn World Table 7.0: Are the Data Flawed?" *Economics Letters* 117:208–10.
- Heston, Alan, Robert Summers, and Bettina Aten. 2002. *Penn World Table Version 6.1. Center for International Comparisons of Production*. Baltimore, MD: Income and Prices at the University of Pennsylvania.
- Heston, Alan, Robert Summers, and Bettina Aten. 2012. *Penn World Table Version 7.1. Center for International Comparisons of Production*. Baltimore, MD: Income and Prices at the University of Pennsylvania.
- Johnson, Simon, William Larson, Chris Papageorgiou, and Arvind Subramanian. 2013. "Is Newer Better? Penn World Table Revisions and Their Impact on Growth Estimates." *Journal of Monetary Economics* 60:255–74.
- Ram, Rati. 2009. "Openness, Country Size, and Government Size: Additional Evidence from a Large Cross-country Panel." *Journal of Public Economics* 93:213–8.
- Rodrik, Dani. 1998. "Why Do More Open Economies Have Bigger Governments?" *Journal of Political Economics* 106:997–1032.

- Shelton, Cameron A. 2007. "The Size and Composition of Government Expenditure." *Journal of Public Economics* 91:2230–60.
- World Bank. 2015. *World Development Indicators Database* (Data Download February 7, 2015). Updated January 30, 2015. Accessed February 7, 2015. <http://data.worldbank.org/data-catalog/world-development-indicators>.

Author Biography

Andrew Musau is a senior research fellow at the Inland Norway University of Applied Sciences and a statistical consultant for the social science research institute Agderforskning. He obtained his PhD in Economics and Management from the University of Trento. His research interests are in behavioral and experimental economics, energy economics and macroeconomics.