

# The Effect of Legislature Size on Public Spending: A Meta-Analysis\*

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26 May 2021

## Abstract

In a seminal article, Weingast et al. (1981) argue that there is a positive relationship between legislature size and inefficiency in public expenditures. Their proposition is currently known as the “law of  $1/n$ ” and has been widely debated in political science and public administration. However, recent studies have questioned the validity of the theory. In this letter, we estimate the first meta-analysis of the relationship between the number of legislators and public spending. Based on a sample of 29 articles, we find no robust evidence for the effect of legislature size on government budgets. Yet the aggregate results show significant heterogeneity. While earlier studies provide moderate support for the “law of  $1/n$ ”, papers using causal inference methods consistently find a negative relationship between seats and spending. The available evidence also indicates that proportional representation and mixed voting systems are no more likely to overspend than majoritarian ones.

**Keywords:** distributive politics; law of  $1/n$ ; legislature size; meta-analysis; public spending

**JEL Classification Codes:** H21; H23; H50; H61

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\*The authors thank Guilherme Duarte, Robert Myles McDonnell, and David Skarbek for their constructive feedback. We also thank Cedric Antunes, Luis Castro, Giovanna França, Julia Oriente, and Lucas Mingardi for their excellent research assistance. Replication materials are available at <https://github.com/danilofreire/distributive-politics-meta-analysis>. We kindly acknowledge funding from the São Paulo State Science Foundation (FAPESP grant number 2018/00646-1).

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# 1 Introduction

Over the past decades, a large literature has examined the relationship between legislature size and public expenditure. Weingast et al. (1981) provided the general framework to analyse distributive politics. The authors argue that the larger the number of legislative districts ( $n$ ), the smaller the share of tax burden each one will bear ( $1/n$ ), thus legislators have an incentive to overspend in their districts and transfer the costs to the entire polity. Early studies that empirically tested the “law of  $1/n$ ”, as the theory is currently known, indeed found a positive correlation between the number of legislature seats and different measures of government spending, although their results were mainly based on US state legislatures and the effect was often limited to one house (e.g., Baqir 2002; Gilligan and Matsusaka 1995, 2001).

Later research, however, has questioned the validity of the “law of  $1/n$ ”. Primo and Snyder (2008) affirm that, due to spatial spillovers, a collection of small districts can supply public goods more efficiently than the central government. The authors conclude that a “reverse law of  $1/n$ ” may hold, wherein a higher number of legislators in small constituencies decrease the overall public spending. Similarly, Primo (2006) and Chen and Malhotra (2007) find that lower and upper chambers may have mixed effects on government spending, while Pettersson-Lidbom (2012) argues that the impact of larger chamber sizes is negative when using data from Finland and Sweden.

Since the wide range of empirical tests of the “law of  $1/n$ ” has produced conflicting results, scholars began to expand this research agenda and investigate how institutional factors condition the original formulation of the theory. For instance, authors such as Crowley (2019) and Pecorino (2018) accurately point out that collective action problems have been overlooked in the literature, and recent findings indicate that bicameralism (Maldonado 2013), intergovernmental competition (Crowley 2015), redistricting (Lee and Park 2018), and party ideology (Bjedov et al. 2014) can significantly impact the relationship between seats and spending. Moreover,

In this letter, we conduct the first meta-analysis that tests the generality of the “law of  $1/n$ ”. We select 30 articles that use quantitative methods to assess the impact of legislature size over government spending across several dimensions. Out of the 45 coefficients included in our article sample, 40% of them are positive and statistically significant, 22.2% are positive and statistically insignificant, 17.8% are negative and statistically insignificant, and 20% are negative and statistically significant. Although other studies aimed at solving this inconsistency, meta-analysis is the most appropriate tool, as it combines multiple outcomes into a single estimation and allows us to draw robust conclusions from the aggregated data (Cooper et al. 2019; Hedges and Olkin 1985). It can also identify potential sources of study heterogeneity, enabling researchers to assess threats to external validity and direct future efforts into more promising areas of academic inquiry (Doucouliagos and Ulubaşoğlu 2008).

We believe the scrutiny of the law expanded its initial scope in two directions. One group of scholars

investigates the original institutional framework for the presence of coalitions, supermajorities, veto powers, and spending limits, which the theory disregards. They suggest these dynamics strongly influence the  $1/n$  effect – specifically in U.S. majoritarian local legislatures, for which the law was conceived. Another sector of the scholarship overrides this institutional context. They find that the different political arrangements in national congresses, State legislatures, regional European governments, etc. produce more nuanced results. For instance, intergovernmental competition, the size ratio between assemblies, and strong executives demonstrated the effect of legislative size on public spending could be non-linear, asymmetrical, and even negative. While these trends evolved, causal inference tools became more sophisticated, allowing this inquiry to grow also in robustness. We address all of these developments in this study. We coded five different moderators that translate methodological advances in time, the similarity of the empirical cases to the original Weingast et al. (1981) framework, and key theoretical issues to identify sources of variation in the literature.

Aggregate results show that legislative size has no significant impact on public spending. Our meta-analysis estimates are exactly half positive, and half negative. Meta-regressions suggest that our study sample is highly heterogeneous, and effects differ substantially according to study specifications. In the broadest aggregation models, unicameralism supports the positive effect predicted by the law of  $1/n$ . Since most unicameral cases in our sample refer to local governments (municipalities or districts), this result supports the theory strictly in its original institutional framework. It also indirectly endorses studies that find odd results in bicameralism. As follows, meta-regressions confirm previous findings that larger upper chambers spend more in terms of per capita expenditure than lower chambers (Gilligan and Matsusaka 1995, 2001). Moreover, non-majoritarian voting systems decrease government spending as a percentage of GDP, and they do not have a relevant impact on the other measures of public expenditure, following the idea that the  $1/n$  effect grows weaker as the empirical cases distance from the original formulation of the law.

The meta-regressions also indicate that the  $1/n$  effect found in earlier studies might be sensitive to more robust estimation methods. While papers that employ conventional linear regressions often find a positive relation between legislature size and government budgets, recent studies using modern methods of causal inference, specially those with regression discontinuity designs, provide consistent evidence for a negative relation (Crowley 2019; De Benedetto 2018; Höhmann 2017; Lewis 2019). This goes in contrast with the original theory and supports the existence of a “reverse law of  $1/n$ ”. In summary, our results are in line with previous findings that lend partial support to the law of  $1/n$  (Chen and Malhotra 2007; Crowley 2015; Primo 2006). An assessment of the effects of collective action costs in these analyses is crucial to determine the full mechanism operating behind these results. Overall, our analysis does not provide robust support for the theory as originally conceived.

## 2 Data and Methods

We compiled our study sample in three search rounds. In the first round, we gathered data from three large academic databases (Scopus, Microsoft Academic, and Google Scholar) and looked for studies that were published in English and cited Weingast et al. (1981), as it is the foundational work in the literature on the “law of  $1/n$ ”. To ensure that our sample was comparable, we only selected papers that used quantitative methods to analyse data<sup>1</sup>. After this stage, we identified six measurements that the literature often employs to quantify government expenditure and legislature size. For government expenditure, our study sample uses (i) public expenditure as a share of GDP; (ii) public expenditure per capita; and (iii) the natural logarithm of public expenditure per capita as its main variables of interest. In regards to legislature size, the variables are (i) lower chamber size; (ii) natural logarithm of lower chamber size; and (iii) upper house size<sup>2</sup>.

In the second round, we did not require articles to cite Weingast et al. (1981) and used a keyword-based query on Google Scholar to broaden the scope of the first search. The search string contained terms strongly associated with the literature on the “law of  $1/n$ ” and was as follows: (“upper chamber size” OR “lower chamber size” OR “council size” OR “parliament size” OR “legislature size” OR “number of legislators” OR “legislative size”) AND (“spending” OR “expenditure” OR “government size”). We again restricted the search to articles written in English which employed quantitative methods. This search added two new results to our sample (CITE), but neither of them included variables beyond the six measures we had previously identified. In the third search round, we looked into the personal webpages of every author whom we had already included in our sample. The purpose of this manual search was to assess whether there was any working paper or unpublished manuscript that we had missed in the two former queries. All papers we found in the last search had already been included in our sample. Combined, the three searches produced a dataset of 30 studies as of the 10<sup>th</sup> of March 2021. Table 1 contains the full list of articles we analyse in this paper.

Table 1: Papers included in the meta-analysis, ordered by year of appearance

Author(s)	Journal	Country	Dependent Variable	Method	Institutional Design	Electoral System
Stein et al. (1998)	Unpub	Multiple (26)	PCTGDP	OLS	Mixed	NM
Baqir (1999)	Unpub	USA	logExpPC	OLS	Unicameral	M

<sup>1</sup>Since meta-analysis requires a single estimate per observation, we excluded articles that use interaction terms or quadratic specifications of our selected variables. Please refer to Section C in the Supplementary Material for a detailed description of the selection procedure. We also included two PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagrammes (Liberati et al. 2009) showing the number of resulting papers after each review step.

<sup>2</sup>There are a few important nuances concerning coding of these variables. Unicameralism, for example, is captured both by lower chamber size ( $n = 7$ ) and by log lower chamber size ( $n = 5$ ). Since much of the literature estimates how institutional designs affect this relationship, ours and many other articles use both lower and upper chamber sizes as main explanatory variables. We did not find any article that used the natural logarithm of upper chamber size in their models.

Table 1: Papers included in the meta-analysis, ordered by year of appearance

Author(s)	Journal	Country	Dependent Variable	Method	Institutional Design	Electoral System
Bradbury and Crain (2001)	JPubE	Multiple (37)	PCTGDP	PANEL	Mixed	NM
Bradbury and Crain (2001)	JPubE	Multiple (37)	ExpPC	PANEL	Mixed	NM
Gilligan and Matsusaka (2001)	NTJ	USA	ExpPC	PANEL	Bicameral	M
Baqir (2002)	PC	USA	logExpPC	OLS	Unicameral	M
Ricciuti (2003)	Unpub	Multiple (23)	ExpPC	PANEL	Mixed	NM
Mukherjee (2003)	CPS	Multiple (110)	PCTGDP	PANEL	Mixed	NM
Lledo (2003)	Unpub	BRA	PCTGDP	PANEL	Unicameral	NM
Ricciuti (2004)	RivPE	Multiple (75)	PCTGDP	OLS	Mixed	NM
Matsusaka (2005)	SPPQ	USA	ExpPC	IV	Bicameral	M
Primo (2006)	E&P	USA	ExpPC	PANEL	Bicameral	M
Erler (2007)	PC	USA	ExpPC	PANEL	Bicameral	M
Erler (2007)	PC	USA	PCTGDP	PANEL	Bicameral	M
Chen and Malhotra (2007)	APSR	USA	ExpPC	PANEL	Bicameral	M
Fiorino and Ricciuti (2007)	PC	ITA	ExpPC	IV	Unicameral	NM
MacDonald (2008)	PC	USA	logExpPC	OLS	Unicameral	M
Schaltegger and Feld (2009)	JPubE	CHE	ExpPC	PANEL	Unicameral	NM
Coate and Knight (2011)	AEJ	USA	logExpPC	OLS	Unicameral	M
Pettersson-Lidbom (2012)	JPubE	FIN & SWE	logExpPC	RDD	Unicameral	NM
Maldonado (2013)	SSQ	Multiple (92)	PCTGDP	OLS	Mixed	NM
Baskaran (2013)	EJPE	DEU	ExpPC	IV	Unicameral	NM
Kessler (2014)	JPE	USA	ExpPC	PANEL	Unicameral	M
Bjedov et al. (2014)	PC	CHE	ExpPC	PANEL	Unicameral	NM
Bjedov et al. (2014)	PC	CHE	PCTGDP	PANEL	Unicameral	NM
Lee (2015)	PC	USA	ExpPC	IV	Bicameral	M
Lee (2016)	PC	USA	ExpPC	IV	Bicameral	M
Drew and Dollery (2017)	UAR	AUS	logExpPC	PANEL	Unicameral	NM
Hömann (2017)	PC	DEU	logExpPC	RDD	Unicameral	NM
Lee and Park (2018)	PC	USA	ExpPC	PANEL	Bicameral	M
De Benedetto (2018)	Unpub	ITA	logExpPC	RDD	Unicameral	NM
Crowley (2019)	SEJ	USA	ExpPC	PANEL	Bicameral	M
Lewis (2019)	SCID	IDN	logExpPC	RDD	Unicameral	NM

Table 1: Papers included in the meta-analysis, ordered by year of appearance

Author(s)	Journal	Country	Dependent Variable	Method	Institutional Design	Electoral System
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**Note:** Journals: Unpub=Unpublished, JPE=Journal of Political Economy, EJPE=European Journal of Political Economy, PC=Public Choice, JPubE=Journal of Public Economics, JPriE=Journal of Private Enterprise, APSR=American Political Science Review, SEJ=Southern Economic Journal, UAR=Urban Affairs Review, SCID=Studies in Comparative International Development, SSQ=Social Science Quarterly, SPPQ=State Politics and Policy Quarterly, CPS=Comparative Political Studies, RivPE=Rivista di Politica Economica, E&P=Economics and Politics, NTJ=National Tax Journal. Country codes follow the ISO 3166-1 alpha-3 international standard. Dependent variable: ExpPC=Per capita expenditure, logExpPC=Natural logarithm of per capita expenditure, PCTGDP=Expenditure as a percentage of GDP. Method: OLS=Ordinary least squares, IV=Instrumental variables, Panel=Panel data/fixed effects, RDD=Regression discontinuity design. Electoral system: M=Majoritarian, NM=Non-majoritarian (mixed or proportional representation).

Our study sample reflects the development of the literature. Although the “law of  $1/n$ ” was first formulated in 1981, the empirical assessment of the theory only started a few years later, as dates of publishing range from 1998 to 2019. Most studies focus on the United States (14), but our sample also contains papers on Australia (1), Brazil (1), Germany (2), Indonesia (1), Italy (2), and Switzerland (2). Eight articles use cross-national data and analyse from 2 to 110 countries. Early studies used OLS and panel data methods to estimate the results, while studies from 2012 onward have also applied causal inference designs, such as instrumental variables and regression discontinuity models.

Regarding the dependent variables included in the sample, 16 studies employ public expenditure per capita, 9 papers use its natural logarithm, and 8 of them analyse the impact of legislature size on public expenditures as a percentage of GDP. This indicates that the area has refined the original formulation of  $1/n$  and tested the impact of larger legislatures on different measures of government spending. Our independent variables are lower chamber size (26), the natural logarithm of lower chamber size (7), and upper chamber size (12). These six variables formed a  $3 \times 3$  table, yet not all combinations were available in the data. We found no studies that correlate public expenditure per capita with either upper chamber size or the natural logarithm of lower house size. Thus, our meta-analysis contains seven of the nine possible variable combinations.

Table 2: Descriptive statistics of moderators

	[ALL] N=162	Other coefficients N=117	Main sample N=45
Independent Variables:			
K	47 (29.0%)	35 (29.9%)	12 (26.7%)
logN	33 (20.4%)	26 (22.2%)	7 (15.6%)
N	82 (50.6%)	56 (47.9%)	26 (57.8%)
Electoral system:			
Maj	73 (45.1%)	51 (43.6%)	22 (48.9%)
Non-Maj	89 (54.9%)	66 (56.4%)	23 (51.1%)

Table 2: Descriptive statistics of moderators (*continued*)

	[ALL]	Other coefficients	Main sample
Estimation method:			
OLS	49 (30.2%)	40 (34.2%)	9 (20.0%)
PANEL	83 (51.2%)	58 (49.6%)	25 (55.6%)
IV	19 (11.7%)	12 (10.3%)	7 (15.6%)
RDD	11 (6.79%)	7 (5.98%)	4 (8.89%)
Year	2008 (6.15)	2007 (5.96)	2009 (6.54)
Published work:			
No	17 (10.5%)	11 (9.40%)	6 (13.3%)
Yes	145 (89.5%)	106 (90.6%)	39 (86.7%)
Institutional Design:			
Bicameral	49 (30.2%)	32 (27.4%)	17 (37.8%)
Mixed	50 (30.9%)	38 (32.5%)	12 (26.7%)
Unicameral	63 (38.9%)	47 (40.2%)	16 (35.6%)

We also coded five moderators that may help us understand the heterogeneity in the reported results. We included them in our meta-regressions alongside an indicator for the type of independent variable used in the original study. The additional moderators are: 1) publication year; 2) paper publication in an academic journal; 3) estimation method; 4) institutional design; 5) electoral system. Since the literature on the “law of  $1/n$ ” is notably diverse, we added only moderators that either refer to important theoretical questions, such as the effect of the electoral system on public spending, or to essential characteristics of the publications themselves. Although more moderators exist in the literature (e.g., data aggregation level), they do not appear as often as necessary for their inclusion in the meta-regressions. Table 2 shows the descriptive statistics of the moderator variables.

A key methodological issue we had to address concerns the potential violation of an important assumption in a meta-analysis, that of effect size independence (Cheung 2014, 2019; Veroniki et al. 2016). In our study sample, authors frequently use similar datasets in their models, and almost all papers fit more than one regression with similar variables, what suggests that the assumption above does not hold. We use two procedures to tackle this problem. First, we created two sets of study coefficients to reduce the impact of multicollinearity in our estimations. The first group includes only the most rigorous models from each paper, that is, those estimated with the largest  $n$ , most control variables, and fixed effects if the authors added them. If the article employed a regression discontinuity design, we chose the coefficient from the optimal bandwidth or from the intermediate one. This sample encompasses 45 estimates, as 13 articles analysed two dependent or independent variables of interest<sup>3</sup>. Our second sample, in contrast, contains all the 162 effect sizes reported in the 30 papers. Here

<sup>3</sup>The papers that used more than one dependent or independent variable of interest are Baqir (1999); Bjedov et al. (2014); Bradbury

we focus on the results for our restricted sample as we consider them more robust, but the findings are very similar when we use the extended set.

Our second procedure consists of employing multilevel random effect models (Cheung 2014; Matthes et al. 2019) in all of our estimations. We add two extra levels to the regular meta-analysis, one including a unique publication ID for each paper, and another indicating the data source used in the original study. By adding these two levels, we account for within- and between-study variation, thus removing these sources of effect size dependency and improving the accuracy of the results. More information about the multilevel models can be found in Section H of the Supplementary Material.

### 3 Discussion

In this letter, we assess the empirical validity of the “law of  $1/n$ ”. Based on a sample of 30 publications on the topic, our meta-analyses show that there is no strong evidence that an increase in the number of legislators has a significant effect on public expenditures. If such effect exists, it is likely driven by an increase in  $k$ , the size of the upper legislature, as suggested by several studies in the literature (Baqir 2002; Bradbury and Crain 2001; Bradbury and Stephenson 2003; Chen and Malhotra 2007; Gilligan and Matsusaka 2001; Primo 2006). Instead, we find better evidence for the “reverse law of  $1/n$ ”, which posits that larger legislatures lead to lower government spending. This is mainly because studies using regression discontinuity designs, a method that has robust internal validity, consistently indicate a negative relationship between lower house size and the logarithm of expenditure per capita (Hömann 2017; Lewis 2019; Pettersson-Lidbom 2012).

The meta-regressions show that study characteristics have a considerable influence on reported results. Electoral system affects the relationship between legislature size and public expenditure, but the results are not replicable in all estimations. Publication year generates conflicting findings in our models. Nevertheless, the meta-regressions confirm that RDDs produce negative effects more frequently than OLS regressions.

Why is there no clear-cut evidence in favour or against the “law of  $1/n$ ”? A plausible reason may be that there are few incentives for the pure accumulation of knowledge in the social sciences, at least when compared to the benefits scholars may accrue when they challenge or add features to existing theories (Geddes 2003). This leads to a reduced number of replication studies in the field, although we have seen some positive changes in this respect, such as EGAP’s *Metaketa Initiative*.<sup>4</sup> For instance, in our sample, papers added supermajority rules (Lee 2015, 2016), redistricting (Baqir 2002; Lee and Park 2018), party ideology (Bjedov et al. 2014), coalition sizes (Baskaran 2013), term limits (Erler 2007), bicameralism (Ricciuti et al. 2004), and the interplay between upper and lower houses (Chen and Malhotra 2007) to the main theory, but a comprehensive procedural replication

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and Crain (2001); Chen and Malhotra (2007); Crowley (2019); Erler (2007); Gilligan and Matsusaka (2001); Lee (2016); Lee and Park (2018); Maldonado (2013); Primo (2006); Ricciuti et al. (2003); Ricciuti (2004).

<sup>4</sup>See <https://egap.org/our-work/the-metaketa-initiative> for further information.



of the findings using different samples is yet to be written. The addition of new features has the benefit of enriching the original theory with useful details, although it has the disadvantage of not providing a conclusive test to the “law of  $1/n$ ”.

Our analyses suggest three areas for further research. First, our study sample did not include articles that evaluate the association between the  $\log(n)$  and public expenditure per capita or between  $k$  and  $\log$  expenditure per capita. New work on that area might clarify some of the inconsistencies we find here. Second, despite the inclusion of several moderators in our models, aggregate results still show considerable heterogeneity. Domestic factors such as party dynamics or gerrymandering (Lee 2015; Mukherjee 2003; Gilligan and Matsusaka 2006) may prove useful in this regard. Finally, we highlight the need for more causal inference studies in the literature. Whenever possible, authors should leverage natural and quasi-experiments to assess whether the current results hold when tested with such research designs. These suggestions may help scholars and policy-makers to reach an optimal balance between sound fiscal policy and the demands for increased political representation.

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