

# Appendix

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## Search criteria

### Search terms

XXXX

### Searched databases

XXXX To Catarina: name and URL of database searched

### Summary total results

XXXX To Catarina: put here results per database, cross-matching, anything else

### Exclusion criteria

**Exclusion title and abstract** XXXX To Catarina: what criteria for first round exclusions?

**Exclusion reading** XXXX To Catarina: criteria second round exclusions

**Exclusion analysis** For the articles that passed the first two filters, we looked into the tables and the reported coefficients. We kept articles in this step based on two criteria:

1. Matched treatment variable:
  - N: Number Legislators Lower House
  - logN: Log Number Legislators Lower House
  - K: Number Legislators Upper House
2. Matched outcome variable:
  - ExpPC: Expenditure Per Capita
  - logExpPC: Log Expenditure Per Capita
  - PCTGDP: Percent GDP Public Expenditure

### PRISM

- Number of articles matching the search criteria: XXXX
- Number of articles excluded after title and abstract: XXXX
- Number of articles excluded after reading: XXXX
- Number of articles excluded before analysis: 3
- Number of articles excluded during the analysis: 0

We have 26 articles in the meta-analysis.

## **Meta-analysis dataset**

The meta-analytic data is comprised of two datasets. The first dataset has the main coefficients that were reported in the paper. XXXX (Copiar da parte de métodos).

## **Adding articles**

## Descriptive statistics

Study Year

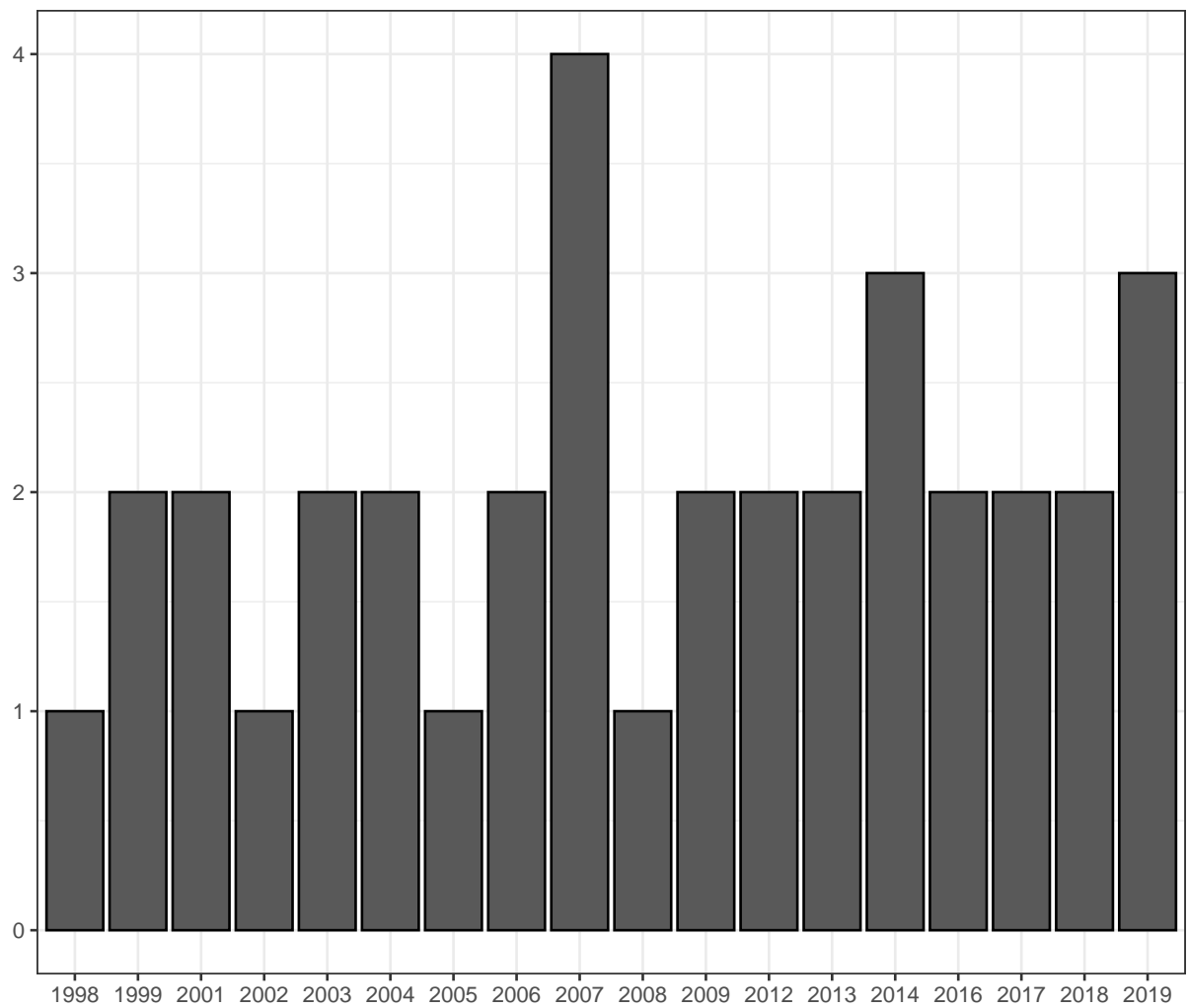


Figure 1: Study Year Frequencies

**Published?**

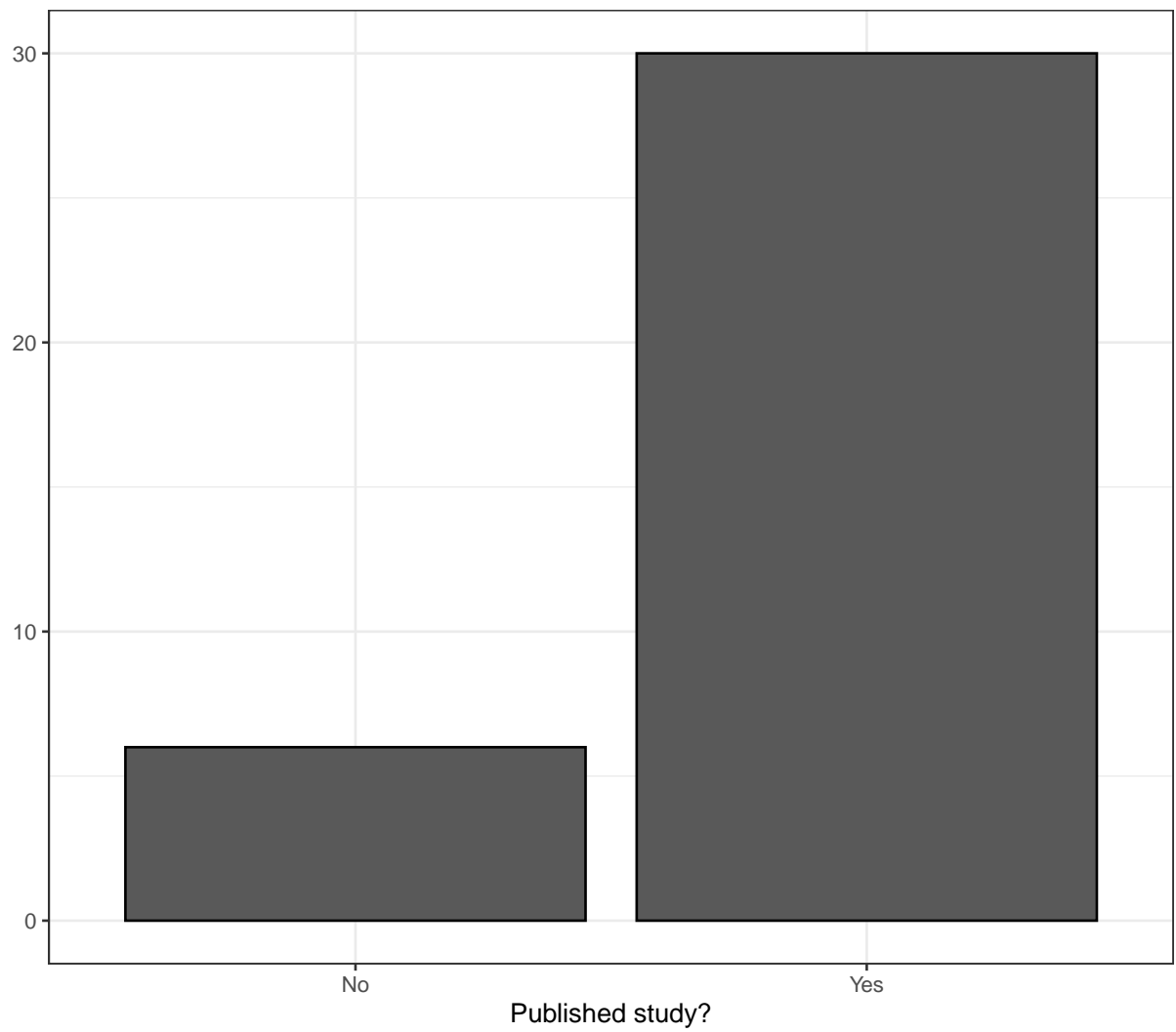


Figure 2: Was the study published?

## Dependent variables

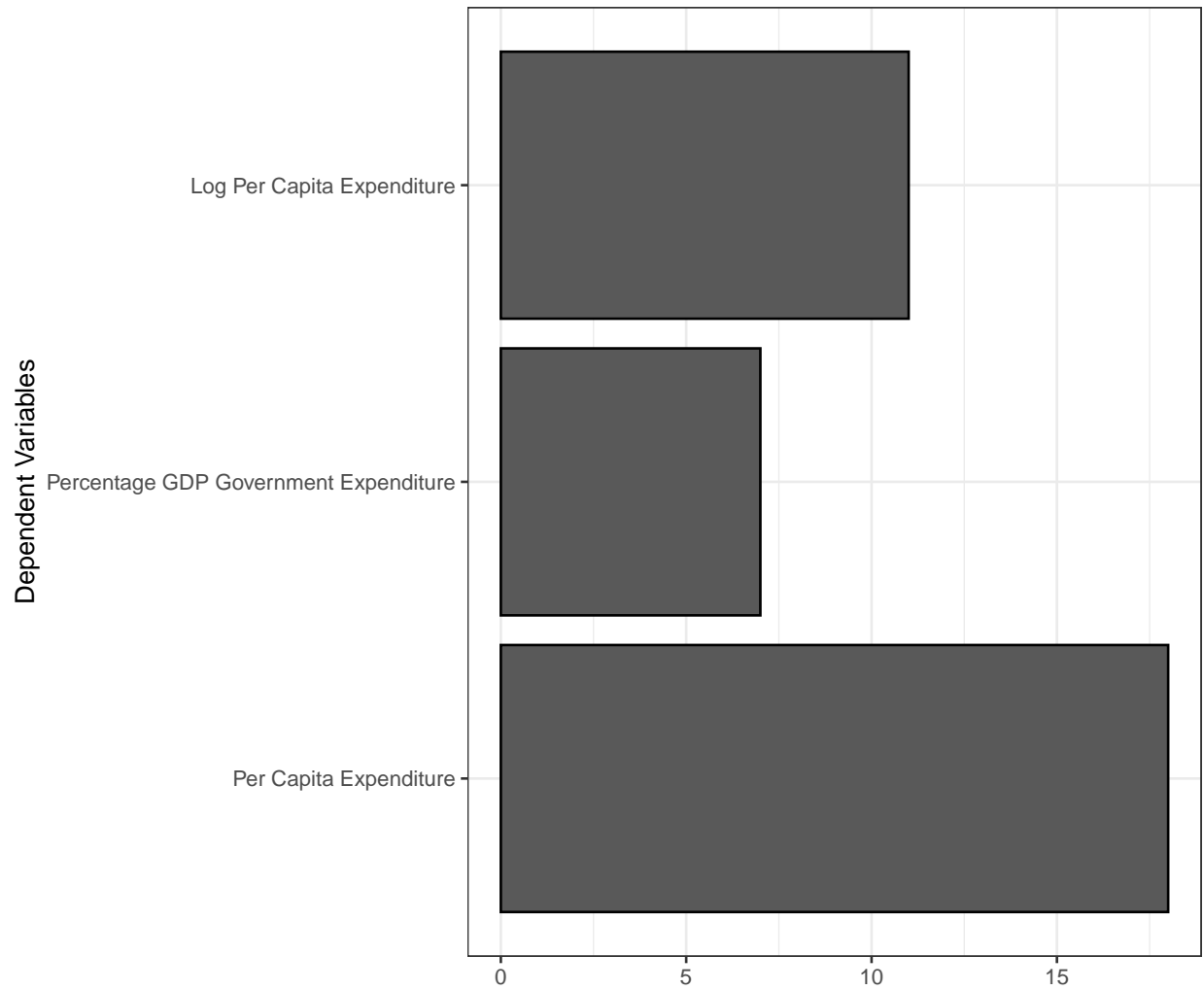


Figure 3: Dependent variables across the law of  $1/n$  studies

## Independent variables

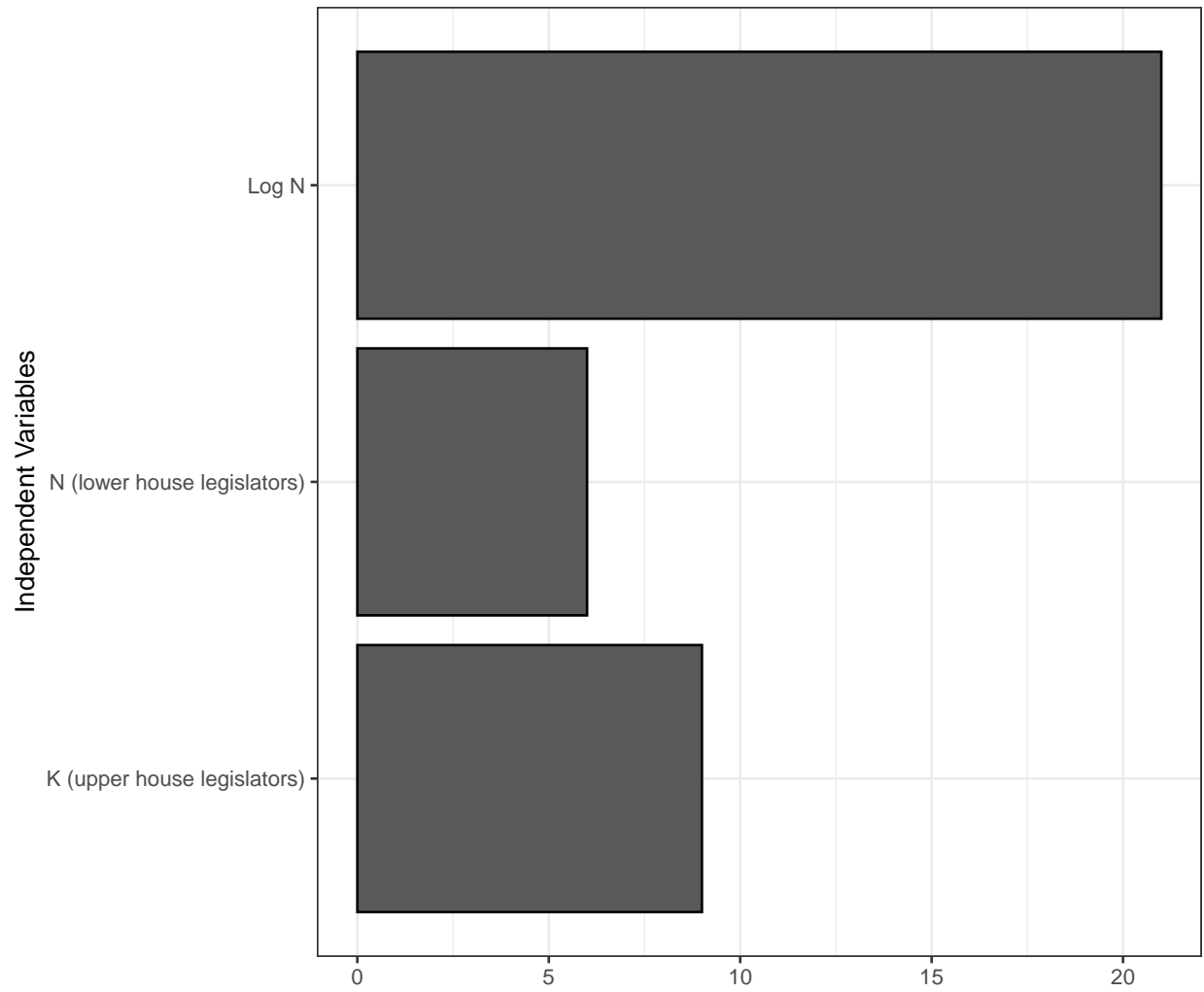


Figure 4: Independent variables across the law of  $1/n$  studies

## Histogram Coefficients

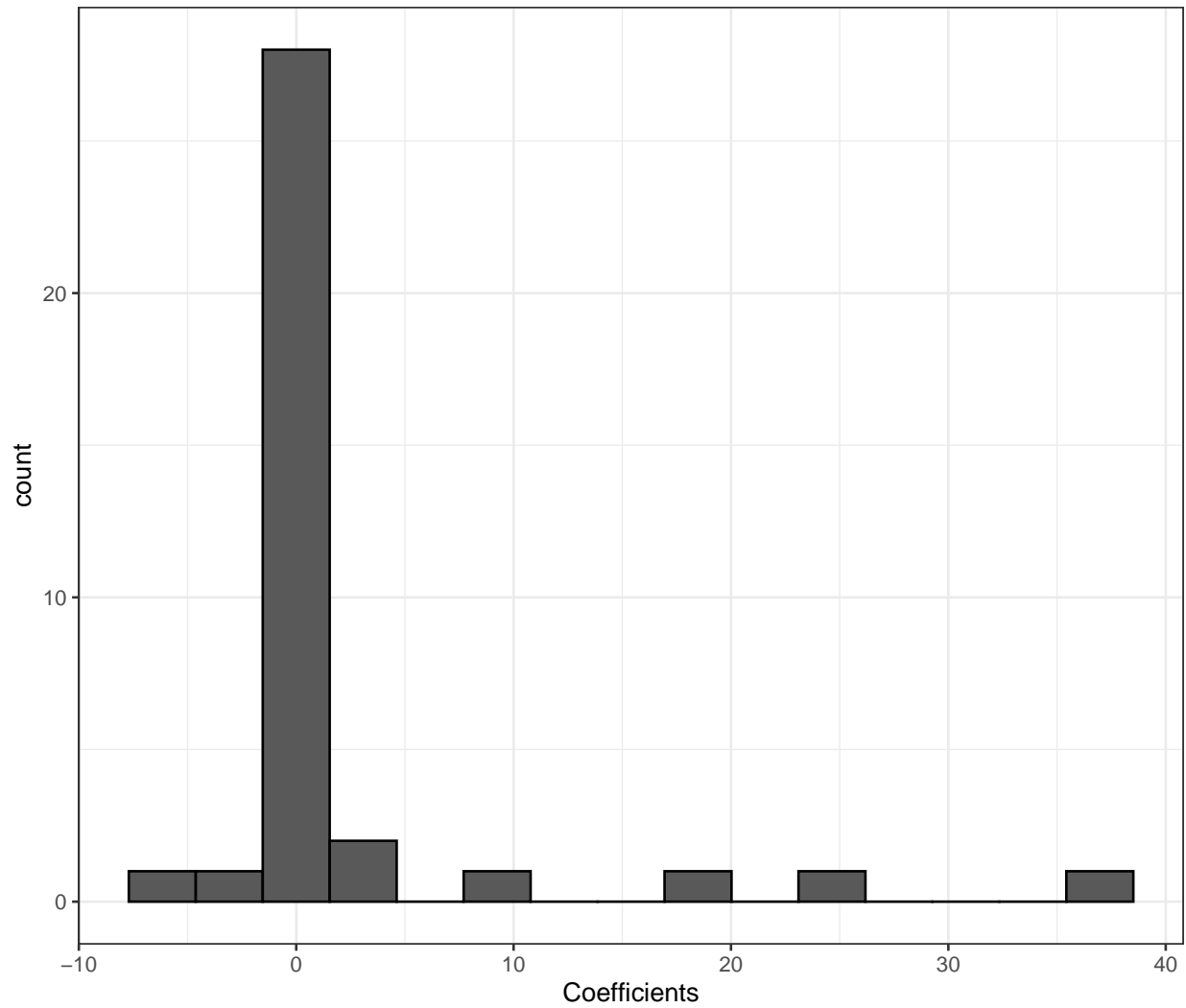


Figure 5: Histogram Coefficients



## Histogram Standard Errors

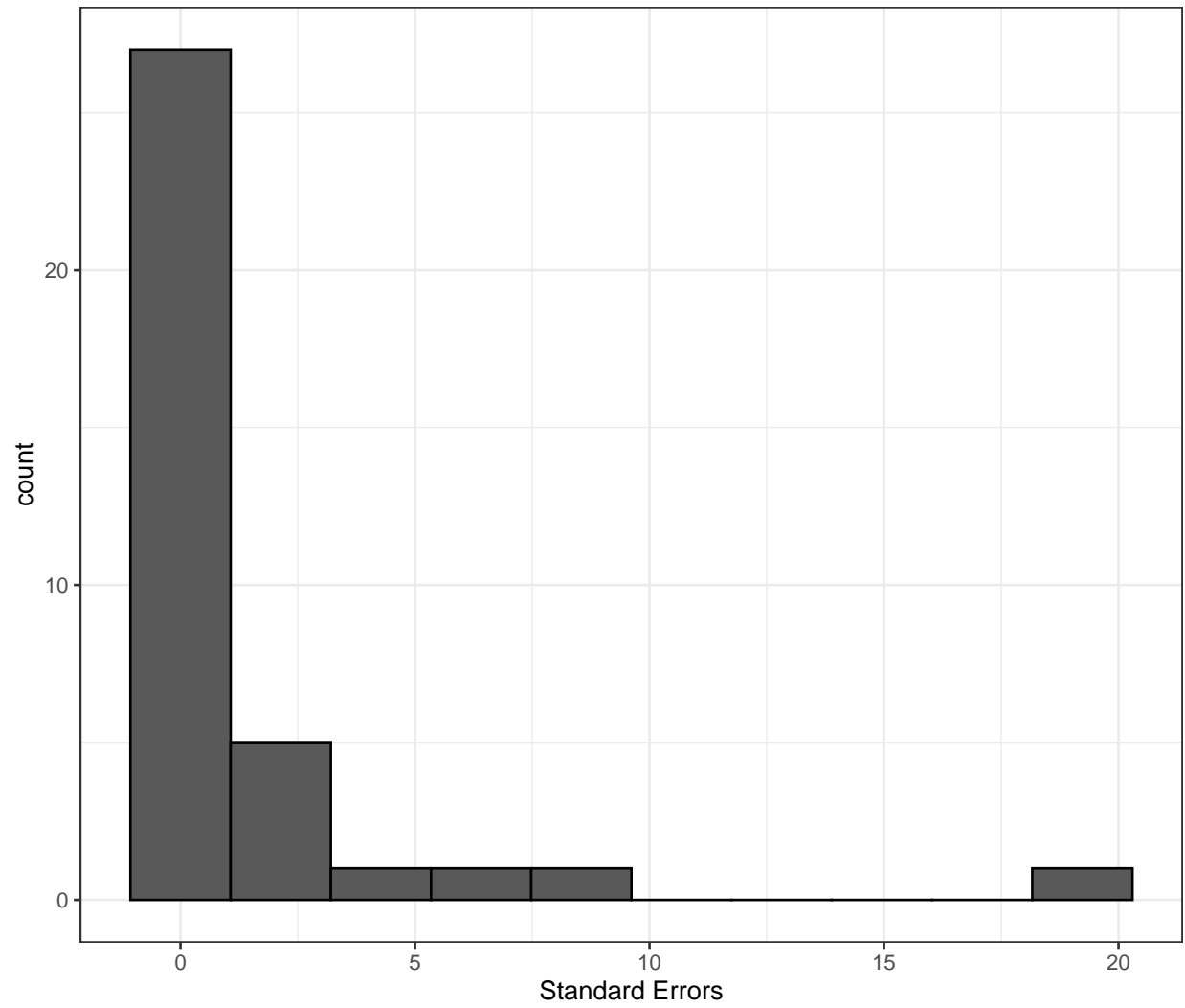


Figure 6: Histogram Standard Errors

## Sign Coefficients

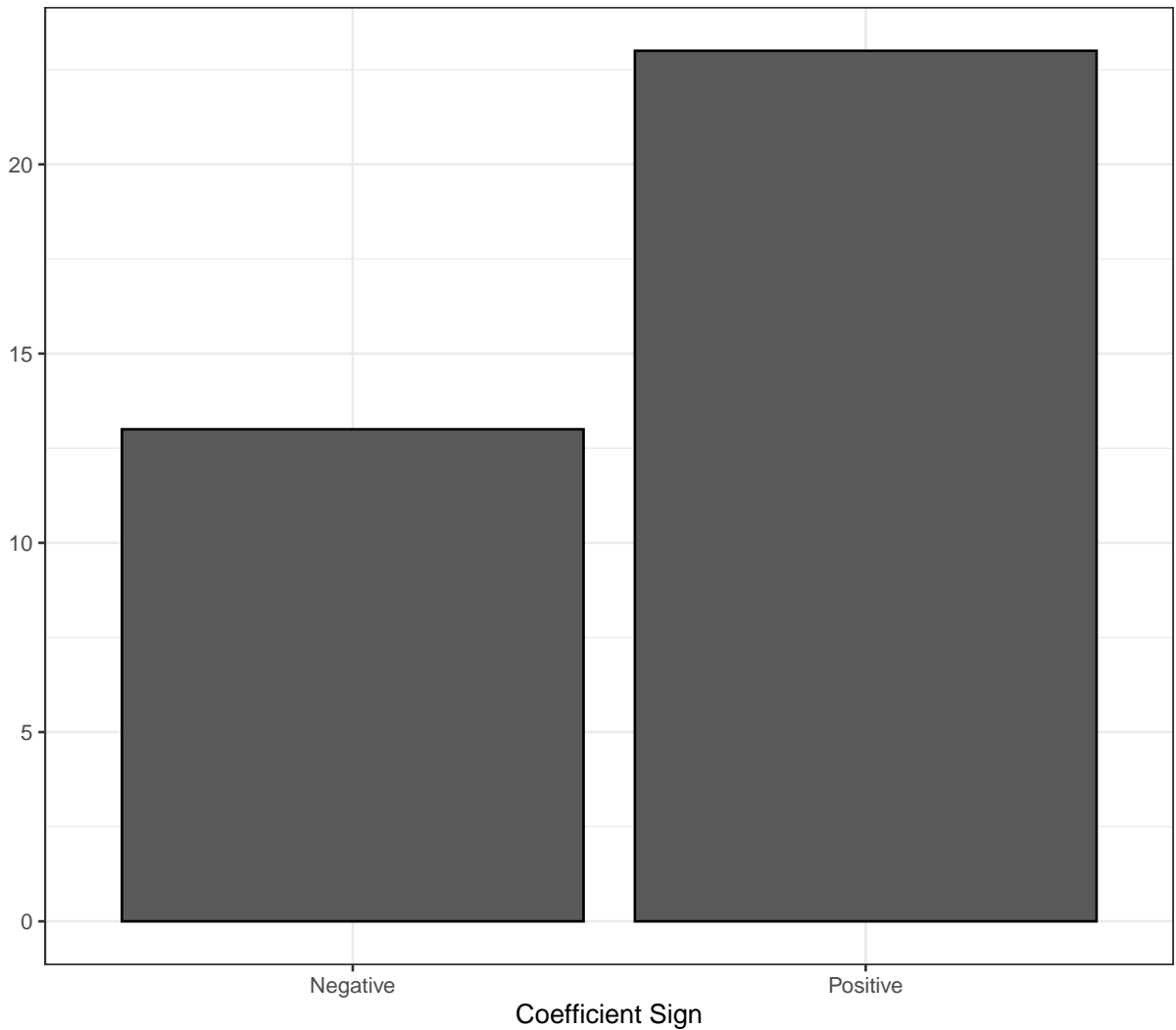


Figure 7: Coefficient Sign?

A general test of the theory would be to study whether the coefficients are positive or negative. Note that the law of  $1/n$  would pose that we should have a positive influence of legislature size on expenditure. To test this theory, we run a Binomial One-Proportion Z-test. For the number of legislators in the lower house (N), the results follow below.

```
##
## Exact binomial test
##
## data: table(aux$scoef)[1] and sum(table(aux$scoef))
## number of successes = 11, number of trials = 21, p-value = 1
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
##  0.2978068 0.7428694
## sample estimates:
## probability of success
```

```
##                0.5238095
```

Therefore, the most elementary test we could run, a sign direction test, tells us that the law of  $1/n$  does not hold for our sample. For the number of legislators in the upper house (K), the results follow below.

```
##
## Exact binomial test
##
## data:  table(aux$scoef)[1] and sum(table(aux$scoef))
## number of successes = 1, number of trials = 9, p-value = 0.03906
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
##  0.002809137 0.482496515
## sample estimates:
## probability of success
##                0.1111111
```

Here, the law of  $1/n$  holds. However, the effect goes in a direction different from the predicted in the law of  $k/n$  paper.

## Electoral system

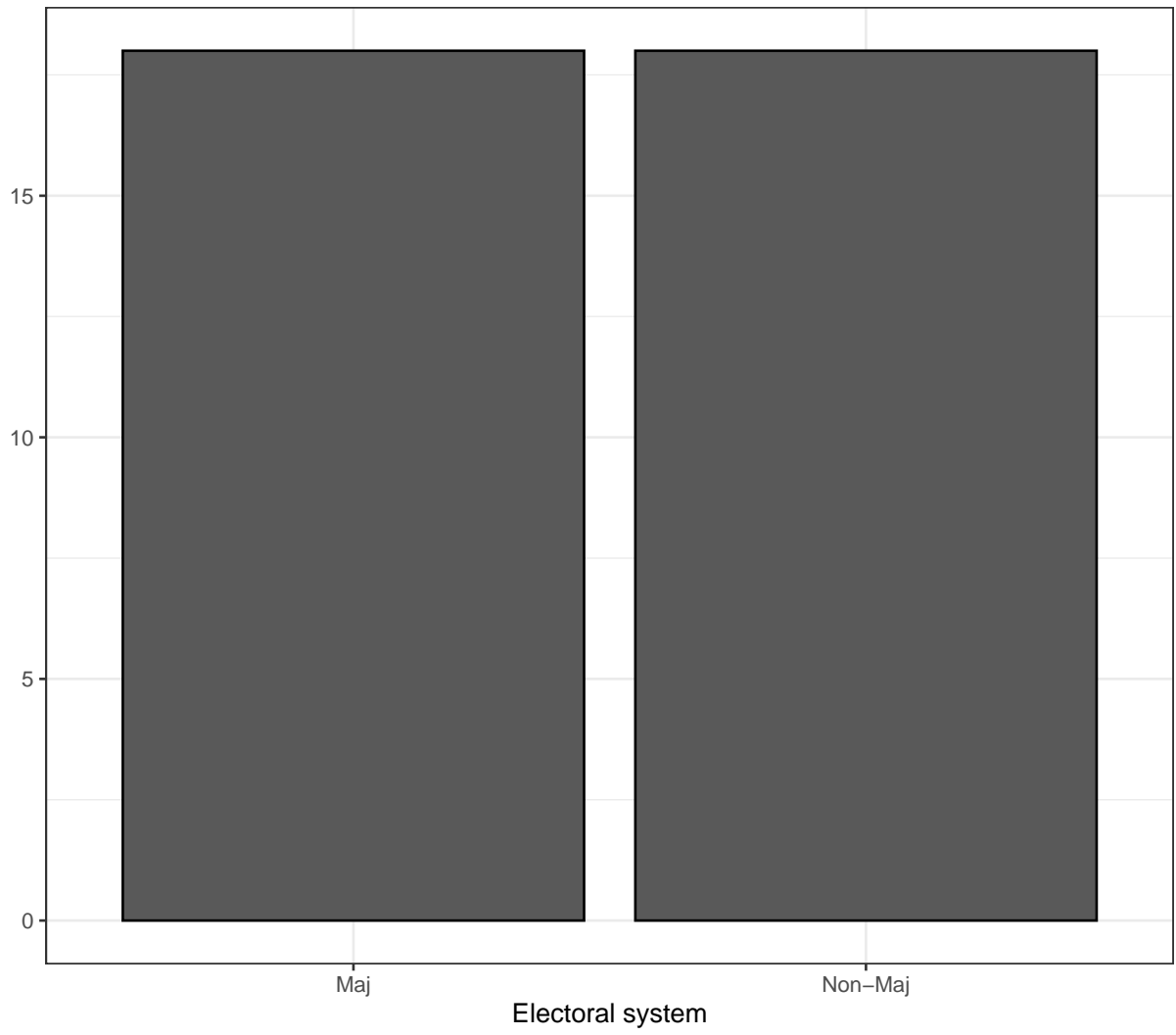


Figure 8: Electoral system

## Electoral system x Sign Coefficient

```
##  
##           Maj Non-Maj  
## Negative    5      8  
## Positive   13     10  
  
##  
## Pearson's Chi-squared test with simulated p-value (based on 2000  
## replicates)  
##  
## data:  table(dat$scoef, dat$elecsys2)  
## X-squared = 1.0836, df = NA, p-value = 0.4883
```

## Independent Variable x Sign Coefficient

```
##
##           K logN  N
##   Negative  1    1 11
##   Positive  8    5 10
##
## Pearson's Chi-squared test with simulated p-value (based on 2000
## replicates)
##
## data:  table(dat$scoef, dat$indepvar2)
## X-squared = 5.8309, df = NA, p-value = 0.05797
```

## Dependent variables x Independent variables

```
##
##           ExpPC logExpPC PCTGDP
##   Negative      6        3      4
##   Positive     12        4      7
##
## Pearson's Chi-squared test with simulated p-value (based on 2000
## replicates)
##
## data:  table(dat$scoef, dat$depvar2)
## X-squared = 0.19858, df = NA, p-value = 1
```

## Descriptive Stats of Moderators

Moderator	Freq	Pct
Depvar: ExpPC	18	50%
Depvar: logExpPC	7	19.44%
Depvar: PCTGDP	11	30.56%
Indepvar: K	9	25%
Indepvar: logN	6	16.67%
Indepvar: N	21	58.33%
Published: No	6	16.67%
Published: Yes	30	83.33%
Electoral System: Maj	18	50%
Electoral System: Non-Maj	18	50%
Method: OLS	13	36.11%
Method: PANEL	17	47.22%
Method: IV	3	8.33%
Method: RDD	3	8.33%
Aggregate Level: Local	7	19.44%
Aggregate Level: States	21	58.33%
Aggregate Level: Countries	8	22.22%
Location: Country	29	80.56%
Location: World	7	19.44%
Year	2009.33 (Mean)	2008.5 (Median)



## Meta-analysis

We combined the three independent variables (N, logN, and K) with the levels of the three dependent variables (ExpPC, logExpPC, PCTGDP). This formed a 3x3 possibility for our analysis.

### ExpPC x N

```
##                               SMD          95%-CI %W(random)
## Crowley (2019)                -0.3510 [-1.8112;  1.1092]      5.3
## Lee and Park (2018)           -0.8510 [-3.5851;  1.8831]      2.1
## Lee (2016)                    0.0164 [-2.5570;  2.5898]      2.4
## Kessler (2014)                0.1740 [ 0.0074;  0.3406]     13.1
## Bjedov et al. (2014)         -0.0030 [-0.0226;  0.0166]     13.4
## Baskaran (2013)              0.9740 [-0.1212;  2.0692]      7.3
## Erler (2007)                 3.9300 [ 1.6172;  6.2428]      2.8
## Chen and Malhotra (2007)     -2.0400 [-4.6468;  0.5668]      2.3
## Fiorino and Ricciuti (2007)  0.2130 [ 0.1777;  0.2483]     13.4
## Primo (2006)                 -0.8200 [-1.1924; -0.4476]     12.2
## Matsusaka (2005)            -0.9600 [-1.3128; -0.6072]     12.3
## Schaltegger and Feld (2009)  0.0010 [-0.0010;  0.0030]     13.4
##
## Number of studies combined: k = 12
##
##                               SMD          95%-CI      t p-value
## Random effects model -0.0699 [-0.6712; 0.5314] -0.26 0.8028
## Prediction interval      [-1.5540; 1.4142]
##
## Quantifying heterogeneity:
## tau^2 = 0.3690 [0.1794; 4.7570]; tau = 0.6075 [0.4236; 2.1810];
## I^2 = 94.7% [92.3%; 96.3%]; H = 4.34 [3.61; 5.21]
##
## Test of heterogeneity:
##      Q d.f.  p-value
## 206.92  11 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

Highlights:

1. The results are highly heterogeneous:  $I^2 = 94.68$ .
2. The Random effects model SMD estimated is  $g = -0.07$  ( $SE = 0.273$ ).
3. The prediction interval ranges from -1.55 to 1.41. Therefore, it encompasses zero.

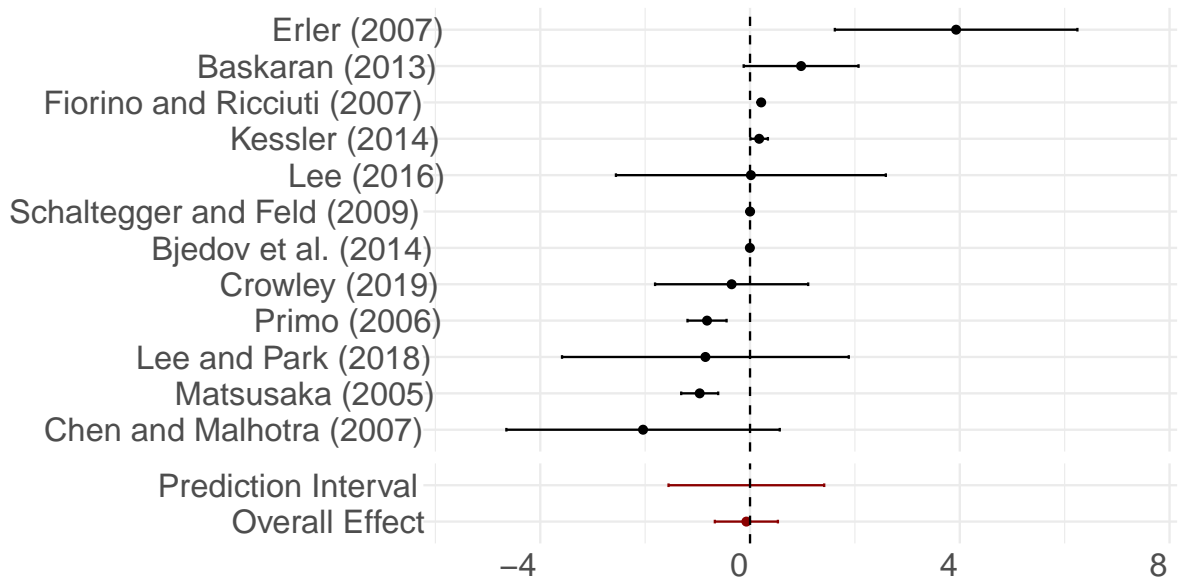


Figure 9: Effect of lower houses size (N) on Per Capita Expenditure (ExpPC)

**Electoral system subgroup analysis** The law of  $1/n$  was created for majoritarian systems. In the theoretical section below, we explain why the argument have potential issues when applied to non-majoritarian electoral systems. We estimated a subgroup analysis using a binary electoral system.

Therefore, we can see that the hypothesis that majoritarian systems produce systematic positive effects was disproved. The majoritarian systems in the sample had a random effects model estimate of -0.25, while the random effects model in the non-majoritarian subgroup fitted a value of 0.08. Both are non-significant, but they reassure us that the absense of effect is not caused by pooling multiple types of electoral systems.

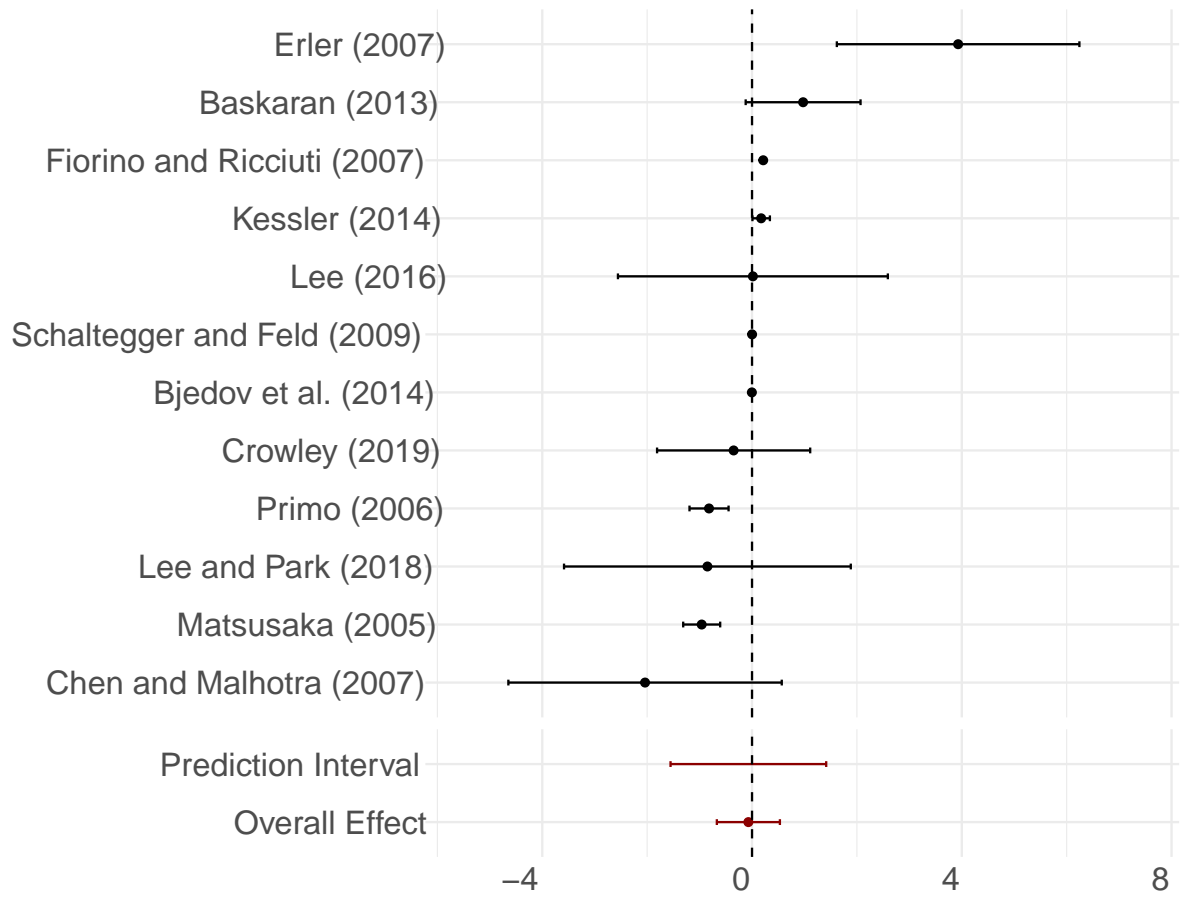


Figure 10: Subgroup Analysis of (N) x (ExpPC), controlling by electoral system

**ExpPC x logN**

There were no studies that had per capita expenditure in the dependent variable and log of lower house size in the treatment variable.

## ExpPC x K

Now we are investigating the upper house size (K). In this model, we investigate the effect of upper house size on expenditure per capita (ExpPC).

```
# Pooling effects analysis -- ExpPC x K
aux <- dat %>%
  filter(indepvar2 == 'K',
         depvar2 == 'ExpPC')

mod <- metagen(coef, SE, data=aux,
               studlab=paste(authoryear),
               comb.fixed = FALSE,
               comb.random = TRUE,
               method.tau = "REML",
               hakn = TRUE,
               prediction=TRUE,
               sm="SMD")

mod

##                               SMD          95%-CI %W(random)
## Crowley (2019)                8.2100 [ 0.2702; 16.1498]      20.0
## Lee and Park (2018)           19.7400 [ 3.2645; 36.2155]      13.8
## Lee (2016)                    38.4400 [ 0.7499; 76.1301]       5.1
## Bradbury and Stephenson (2009) 0.6240 [ 0.2295; 1.0185]      23.1
## Chen and Malhotra (2007)       26.0900 [11.4883; 40.6917]      15.1
## Primo (2006)                  0.9700 [-0.4804; 2.4204]      23.0
##
## Number of studies combined: k = 6
##
##                               SMD          95%-CI    t p-value
## Random effects model 10.6134 [ -2.6210; 23.8479] 2.06 0.0943
## Prediction interval          [-21.1303; 42.3571]
##
## Quantifying heterogeneity:
## tau^2 = 104.2124 [20.3551; >1042.1236]; tau = 10.2084 [4.5117; >32.2819];
## I^2 = 79.4% [55.1%; 90.6%]; H = 2.20 [1.49; 3.26]
##
## Test of heterogeneity:
##      Q d.f. p-value
## 24.31   5 0.0002
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

Highlights:

1. The results are highly heterogeneous:  $I^2 = 79.43$ .
2. The Random effects model SMD estimated is  $g = 10.61$  ( $SE = 5.148$ ).
3. The prediction interval ranges from -21.13 to 42.36. Therefore, it encompasses zero.

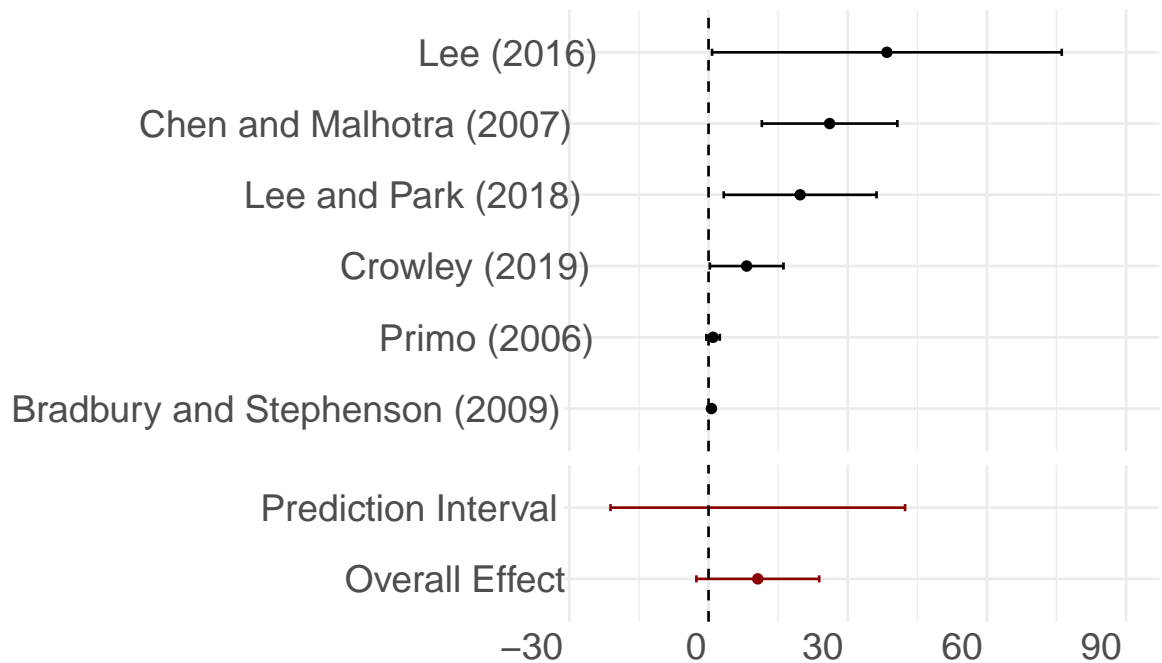


Figure 11: Effect of upper house size (K) on the per capita government expenditure (ExpPC)

### logExpPC x N

This model estimates the Log of Per Capita Expenditure as the dependent variable, and the number of lower house legislators as the treatment variable.

```
# Pooling effects analysis -- logExpPC x N
aux <- dat %>%
  filter(indepvar2 == 'N',
         depvar2 == 'logExpPC')
```

```
mod <- metagen(
  coef, SE, data=aux,
  studlab=paste(authoryear),
  comb.fixed = FALSE,
  comb.random = TRUE,
  method.tau = "REML",
  hakn = TRUE,
  prediction = TRUE,
  sm="SMD"
)
```

```
mod
```

	SMD	95%-CI	%W(random)
## Lewis (2019)	-0.1740	[-0.2450; -0.1030]	24.3
## Höhmann (2017)	-0.0300	[-0.0496; -0.0104]	26.6
## Drew and Dollery (2017)	0.0770	[ 0.0221; 0.1319]	25.3
## Pettersson-Lidbom (2012)	-0.1590	[-0.2394; -0.0786]	23.7

```
##
## Number of studies combined: k = 4
##
##           SMD           95%-CI      t p-value
## Random effects model -0.0686 [-0.2560; 0.1188] -1.17 0.3282
## Prediction interval      [-0.6179; 0.4807]
##
## Quantifying heterogeneity:
## tau^2 = 0.0128 [0.0034; 0.1933]; tau = 0.1133 [0.0584; 0.4396];
## I^2 = 92.5% [84.1%; 96.5%]; H = 3.66 [2.51; 5.34]
##
## Test of heterogeneity:
##      Q d.f.  p-value
## 40.11    3 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

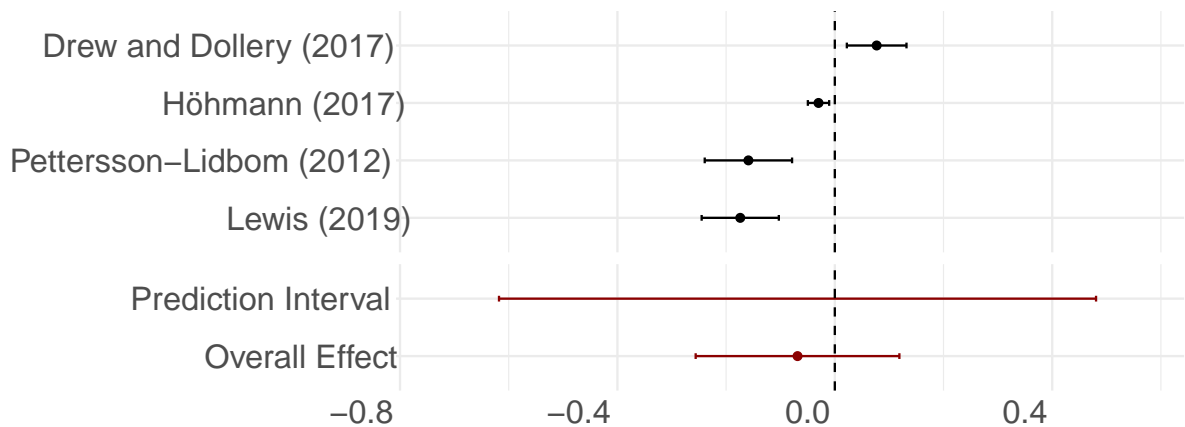


Figure 12: Effect of lower houses size (N) on log of per capita expenditure (logExpPC)

Highlights:

1. The results are highly heterogeneous:  $I^2 = 92.52$ .
2. The Random effects model SMD estimated is  $\hat{\theta} = -0.07$  ( $SE = 0.059$ ).
3. The prediction interval ranges from -0.62 to 0.48. Therefore, it encompasses zero.

## logExpPC x logN

In this specification, we study the log of per capita expenditure (logExpPC) as a function of the log of lower house size (logN).

```
# Pooling effects analysis -- logExpPC x logN
aux <- dat %>%
  filter(indepvar2 == 'logN',
         depvar2 == 'logExpPC')

mod <- metagen(coef, SE, data=aux,
               studlab=paste(authoryear),
               comb.fixed = FALSE,
               comb.random = TRUE,
               method.tau = "REML",
               hakn = TRUE,
               prediction=TRUE,
               sm="SMD")

mod

##              SMD          95%-CI %W(random)
## MacDonald (2008) 0.1360 [0.0447; 0.2273]      31.9
## Baqir (2002)     0.1127 [0.0396; 0.1858]      34.2
## Baqir (1999)     0.3020 [0.2269; 0.3771]      33.9
##
## Number of studies combined: k = 3
##
##              SMD          95%-CI    t p-value
## Random effects model 0.1844 [-0.0738; 0.4425] 3.07 0.0916
## Prediction interval      [-1.2580; 1.6267]
##
## Quantifying heterogeneity:
## tau^2 = 0.0093 [0.0014; 0.4193]; tau = 0.0964 [0.0372; 0.6476];
## I^2 = 85.9% [59.0%; 95.2%]; H = 2.66 [1.56; 4.54]
##
## Test of heterogeneity:
##      Q d.f. p-value
## 14.18   2 0.0008
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

Highlights:

1. The results are highly heterogeneous:  $I^2 = 85.9$ .
2. The Random effects model SMD estimated is  $g = 0.18$  ( $SE = 0.06$ ). **This model is significant at the 10% confidence level.**
3. The prediction interval ranges from -1.26 to 1.63. Therefore, it encompasses zero.



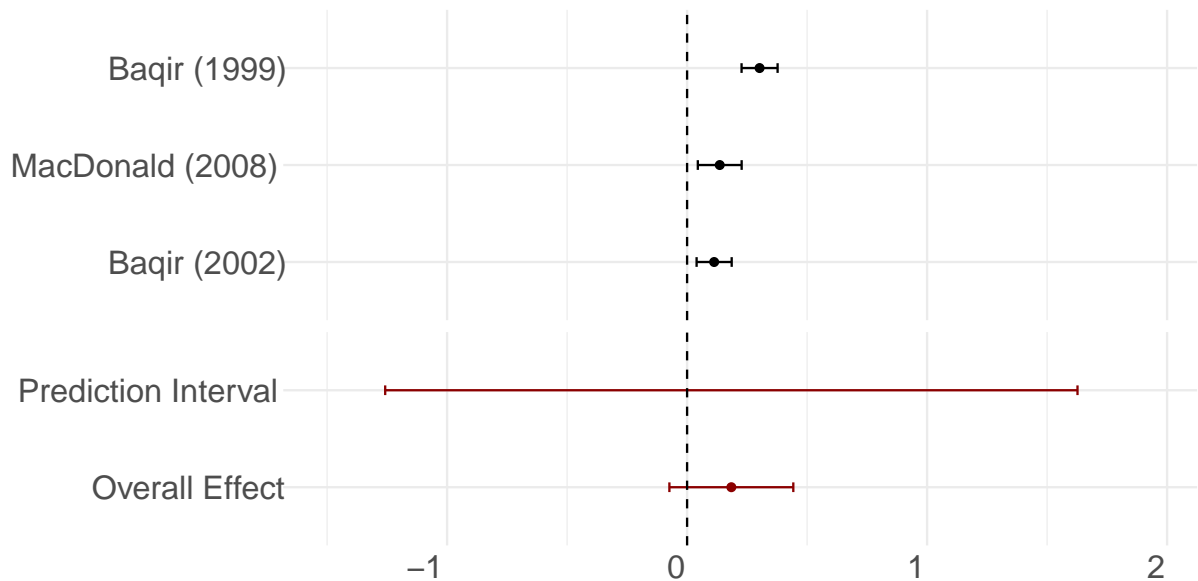


Figure 13: Effect of log lower houses size (logN) on the log of per capita government expenditure (logExpPC)

### logExpPC x K

No studies related the log of per capita expenditure with the size of upper house (K).

### PCTGDP x N

This model fits the random effects for the percentage of GDP as public expenditure as the main outcome, and the size of lower house as the main treatment variable.

```
# Pooling effects analysis -- PCTGDP x N
aux <- dat %>%
  filter(indepvar2 == 'N',
         depvar2 == 'PCTGDP')

mod <- metagen(coef, SE, data=aux,
               studlab=paste(authoryear),
               comb.fixed = FALSE,
               comb.random = TRUE,
               method.tau = "REML",
               hakn = TRUE,
               prediction=TRUE,
               sm="SMD")

mod
```

	SMD	95%-CI	%W(random)
## Bjedov et al. (2014)	-0.0040	[-0.0432; 0.0352]	15.1
## Maldonado (2013)	-0.0609	[-0.0838; -0.0380]	19.5
## Mukherjee (2003)	0.0030	[ 0.0010; 0.0050]	23.0
## Bradbury and Crain (2001)	0.0036	[ 0.0008; 0.0065]	23.0
## Ricciuti (2004)	0.0140	[-0.0095; 0.0375]	19.4
##			

```
## Number of studies combined: k = 5
##
##              SMD              95%-CI      t p-value
## Random effects model -0.0083 [-0.0450; 0.0285] -0.62 0.5667
## Prediction interval      [-0.1054; 0.0889]
##
## Quantifying heterogeneity:
## tau^2 = 0.0008 [0.0002; 0.0072]; tau = 0.0275 [0.0129; 0.0849];
## I^2 = 87.1% [72.2%; 94.0%]; H = 2.78 [1.90; 4.08]
##
## Test of heterogeneity:
##      Q d.f.  p-value
## 30.97    4 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

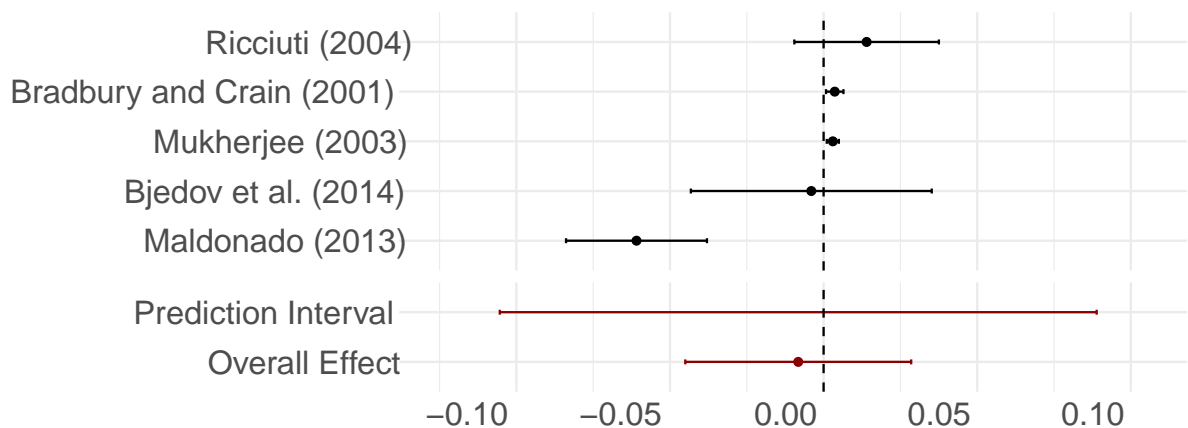


Figure 14: Effect of lower houses size (N) on percentage of public expenditure GDP (PCTGDP)

Highlights:

1. The results are highly heterogeneous:  $I^2 = 87.08$ .
2. The Random effects model SMD estimated is  $\hat{\theta} = -0.01$  ( $SE = 0.013$ ).
3. The prediction interval ranges from -0.11 to 0.09. Therefore, it encompasses zero.

## PCTGDP x logN

This meta-regression investigates the percentage of GDP as public expenditure as the dependent variable and the log lower house size (logN) as the treatment variable.

```
# Pooling effects analysis -- PCTGDP x logN
aux <- dat %>%
  filter(indepvar2 == 'logN',
         depvar2 == 'PCTGDP')

mod <- metagen(
  coef, SE, data=aux,
  studlab=paste(authoryear),
  comb.fixed = FALSE,
  comb.random = TRUE,
  method.tau = "REML",
  hakn = TRUE,
  prediction=TRUE,
  sm="SMD"
)

mod

##              SMD              95%-CI %W(random)
## Baqir (1999)      2.0660 [ 1.4887; 2.6433]      40.8
## Lledo (2003)     -4.6900 [-9.9427; 0.5627]      17.7
## Stein et al. (1998) 0.0109 [-0.0171; 0.0389]      41.5
##
## Number of studies combined: k = 3
##
##              SMD              95%-CI    t p-value
## Random effects model 0.0203 [ -7.1961;  7.2367] 0.01 0.9914
## Prediction interval      [-36.2058; 36.2465]
##
## Quantifying heterogeneity:
## tau^2 = 5.3156 [0.5756; >100.0000]; tau = 2.3056 [0.7587; >10.0000];
## I^2 = 96.1% [91.8%; 98.2%]; H = 5.08 [3.48; 7.42]
##
## Test of heterogeneity:
##      Q d.f.  p-value
## 51.65    2 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

Highlights:

1. The results are highly heterogeneous:  $I^2 = 96.13$ .
2. The Random effects model SMD estimated is  $g = 0.02$  ( $SE = 1.677$ ).
3. The prediction interval ranges from -36.21 to 36.25. Therefore, it encompasses zero.

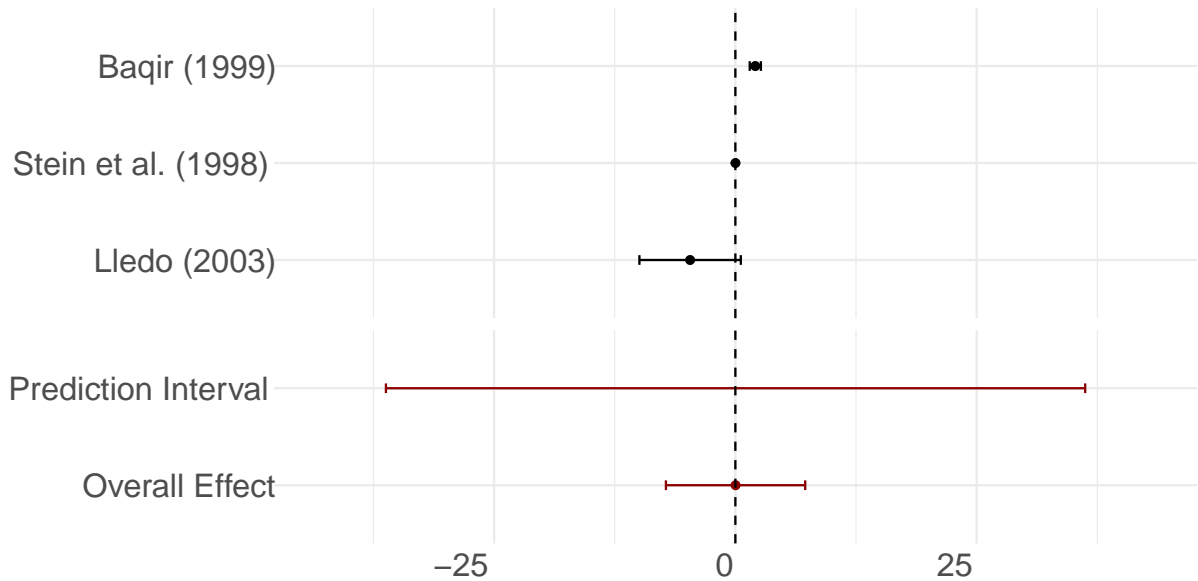


Figure 15: Effect of log lower houses size (logN) on the GDP share of public expenditure (PCTGDP)

## PCTGDP x K

This model looks into the effect of upper house size (K) on the public expenditure share of the GDP (PCTGDP).

```
# Pooling effects analysis -- PCTGDP x K
aux <- dat %>%
  filter(indepvar2 == 'K',
         depvar2 == 'PCTGDP')

mod <- metagen(coef, SE, data=aux,
               studlab=paste(authoryear),
               comb.fixed = FALSE,
               comb.random = TRUE,
               method.tau = "REML",
               hakn = TRUE,
               prediction=TRUE,
               sm="SMD")

mod

##               SMD               95%-CI %W(random)
## Maldonado (2012)    -0.0400 [-0.0659; -0.0141]    31.3
## Bradbury and Crain (2001) 0.0126 [ 0.0010; 0.0243]    36.4
## Ricciuti (2004)      0.0160 [-0.0075; 0.0395]    32.3
##
## Number of studies combined: k = 3
##
##               SMD               95%-CI      t p-value
## Random effects model -0.0027 [-0.0793; 0.0738] -0.15 0.8915
## Prediction interval      [-0.4284; 0.4229]
##
```

```
## Quantifying heterogeneity:
## tau^2 = 0.0008 [0.0001; 0.0388]; tau = 0.0284 [0.0101; 0.1970];
## I^2 = 85.8% [58.6%; 95.1%]; H = 2.65 [1.55; 4.53]
##
## Test of heterogeneity:
##      Q d.f. p-value
## 14.07   2  0.0009
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

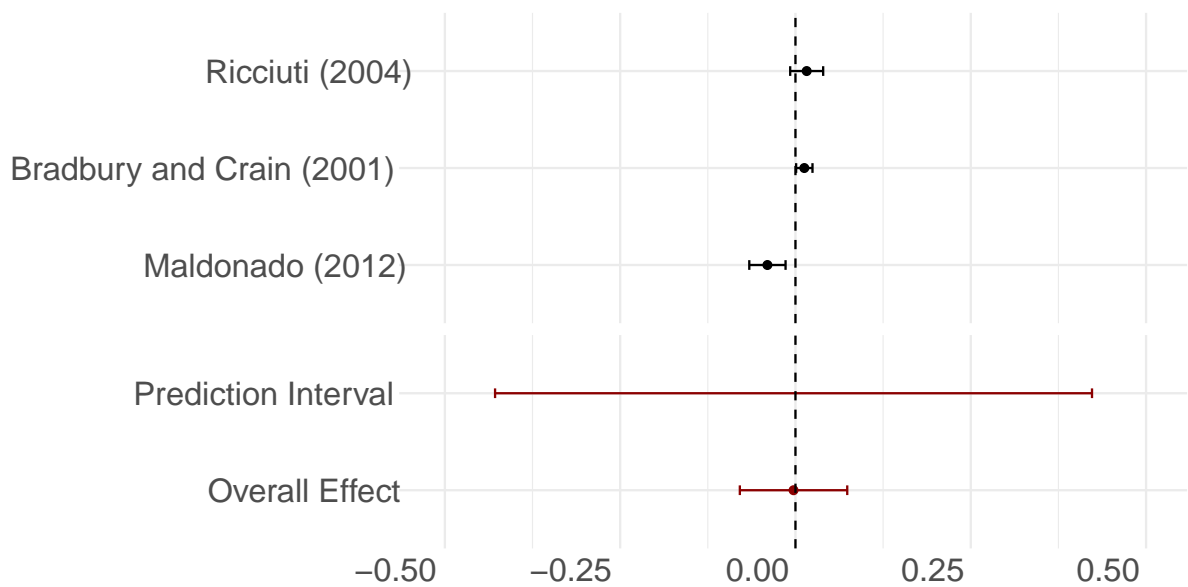
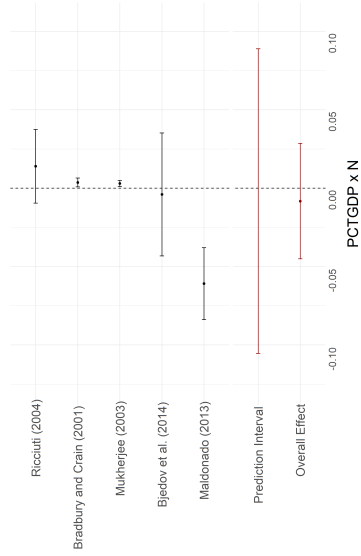
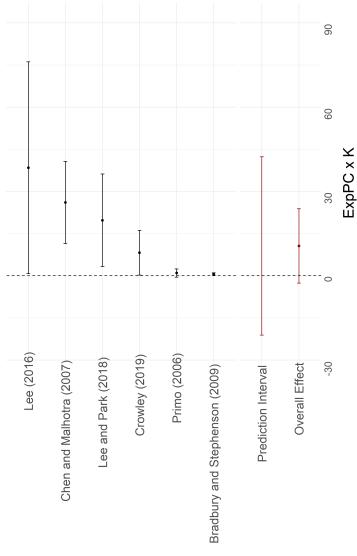
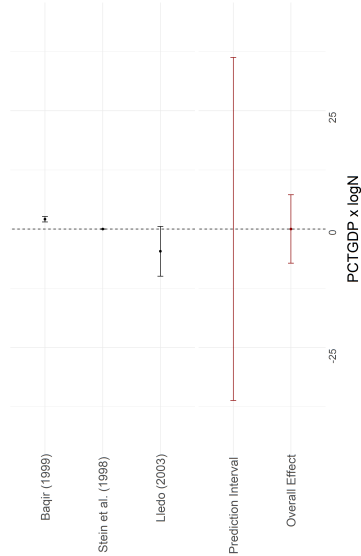
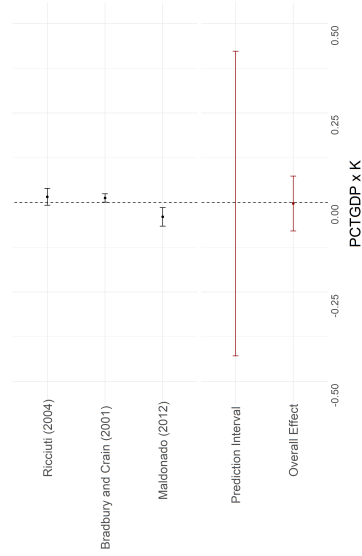
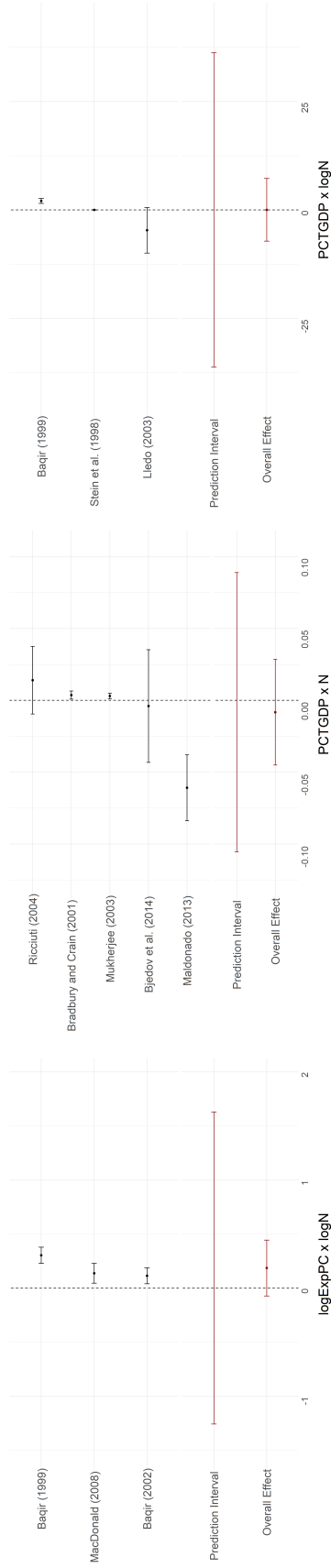
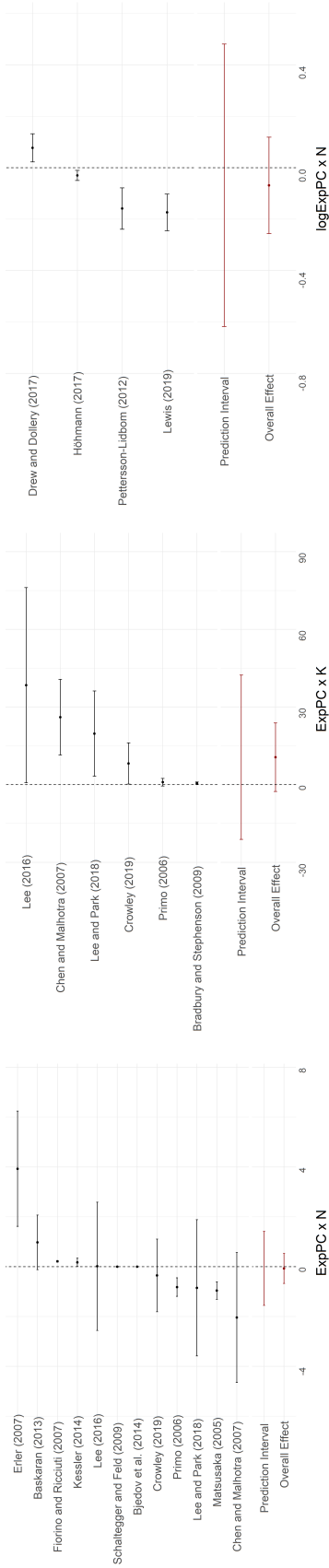


Figure 16: Effect of upper house size (K) on the public expenditure share of the GDP (PCTGDP)

Highlights:

1. The results are highly heterogeneous:  $I^2 = 85.79$ .
2. The Random effects model SMD estimated is  $g = 0$  ( $SE = 0.018$ ).
3. The prediction interval ranges from -0.43 to 0.42. Therefore, it encompasses zero.



## Meta-Analysis (all coefficients)

### ExpPC x N

```
## Warning in rma.uni(yi = TE[sel], sei = seTE[sel], method = method.tau, control
## = control): Ratio of largest to smallest sampling variance extremely large. May
## not be able to obtain stable results.
```

	SMD	95%-CI	%W(random)
## Crowley (2019)	-0.3510	[-1.8112; 1.1092]	2.0
## Crowley (2019)	5.9750	[ 0.7889; 11.1611]	0.3
## Crowley (2019)	7.6580	[-0.0290; 15.3450]	0.2
## Lee and Park (2018)	-0.8510	[-3.5851; 1.8831]	0.9
## Lee and Park (2018)	-1.6890	[-3.0551; -0.3229]	2.1
## Lee and Park (2018)	7.6320	[ 3.1064; 12.1576]	0.4
## Lee (2016)	0.0164	[-2.5570; 2.5898]	1.0
## Kessler (2014)	0.1740	[ 0.0074; 0.3406]	3.6
## Kessler (2014)	0.2230	[ 0.1211; 0.3249]	3.6
## Kessler (2014)	0.2150	[ 0.0954; 0.3346]	3.6
## Kessler (2014)	0.1580	[ 0.0522; 0.2638]	3.6
## Bjedov et al. (2014)	-0.0030	[-0.0226; 0.0166]	3.6
## Bjedov et al. (2014)	-0.0060	[-0.0256; 0.0136]	3.6
## Baskaran (2013)	0.9740	[-0.1212; 2.0692]	2.5
## Erler (2007)	3.9300	[ 1.6172; 6.2428]	1.2
## Chen and Malhotra (2007)	-2.0400	[-4.6468; 0.5668]	1.0
## Chen and Malhotra (2007)	-1.4000	[-2.6544; -0.1456]	2.3
## Fiorino and Ricciuti (2007)	0.2130	[ 0.1777; 0.2483]	3.6
## Fiorino and Ricciuti (2007)	0.2290	[ 0.1565; 0.3015]	3.6
## Fiorino and Ricciuti (2007)	0.4550	[ 0.3805; 0.5295]	3.6
## Fiorino and Ricciuti (2007)	0.4110	[ 0.3150; 0.5070]	3.6
## Fiorino and Ricciuti (2007)	0.2260	[ 0.1221; 0.3299]	3.6
## Fiorino and Ricciuti (2007)	0.2130	[-0.4083; 0.8343]	3.1
## Fiorino and Ricciuti (2007)	0.1850	[-0.4128; 0.7828]	3.2
## Fiorino and Ricciuti (2007)	0.2350	[-0.4235; 0.8935]	3.1
## Fiorino and Ricciuti (2007)	0.3740	[ 0.2486; 0.4994]	3.6
## Fiorino and Ricciuti (2007)	0.8110	[ 0.4562; 1.1658]	3.4
## Fiorino and Ricciuti (2007)	0.7950	[ 0.4500; 1.1400]	3.5
## Fiorino and Ricciuti (2007)	0.8490	[ 0.3825; 1.3155]	3.3
## Primo (2006)	-0.8200	[-1.1924; -0.4476]	3.4
## Primo (2006)	-1.7000	[-2.3076; -1.0924]	3.2
## Primo (2006)	-2.3700	[-3.0952; -1.6448]	3.0
## Primo (2006)	-2.0300	[-2.7552; -1.3048]	3.0
## Matsusaka (2005)	-0.9600	[-1.3128; -0.6072]	3.4
## Schaltegger and Feld (2009)	0.0010	[-0.0010; 0.0030]	3.6
## Schaltegger and Feld (2009)	-0.0010	[-0.0030; 0.0010]	3.6

```
##
## Number of studies combined: k = 36
```

	SMD	95%-CI	t	p-value
## Random effects model	-0.0169	[-0.4166; 0.3829]	-0.09	0.9322
## Prediction interval		[-1.7588; 1.7250]		

```
##
## Quantifying heterogeneity:
## tau^2 = 0.6959 [0.7202; 4.3553]; tau = 0.8342 [0.8486; 2.0869];
## I^2 = 95.3% [94.2%; 96.1%]; H = 4.60 [4.16; 5.08]
```

```
##
## Test of heterogeneity:
##      Q d.f.  p-value
## 739.53   35 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

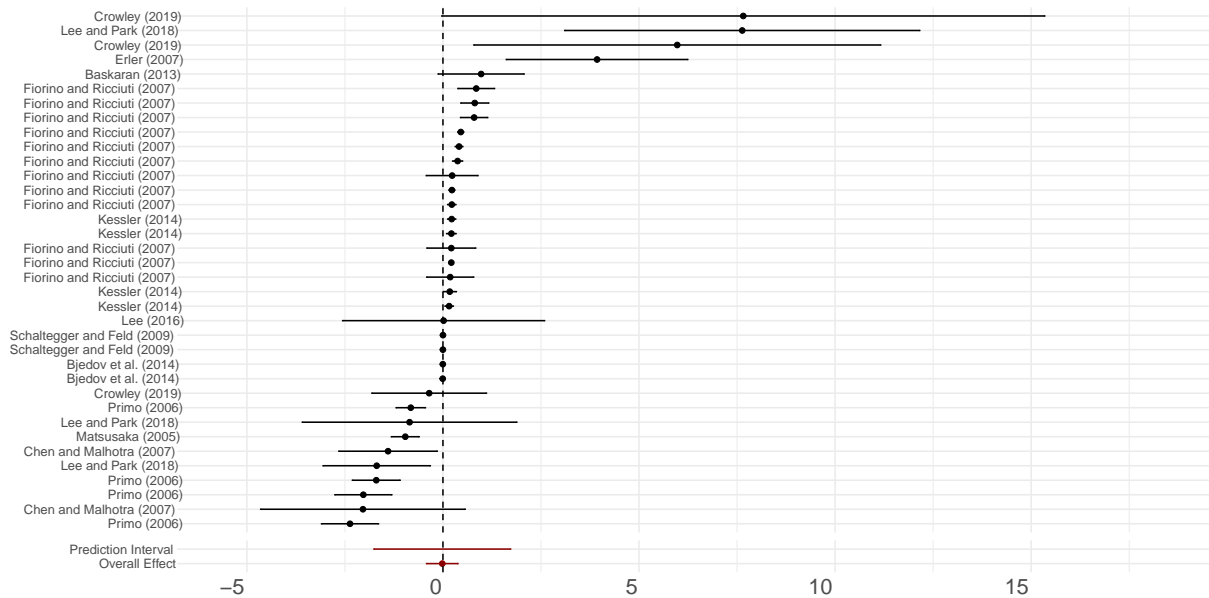


Figure 17: Effect of lower houses size (N) on Per Capita Expenditure (ExpPC)

Highlights:

1. The results are highly heterogeneous:  $I^2 = 95.27$ .
2. The Random effects model SMD estimated is  $g = -0.02$  ( $SE = 0.197$ ).
3. The prediction interval ranges from -1.76 to 1.73. Therefore, it encompasses zero.



**Electoral system subgroup analysis** The law of  $1/n$  was created for majoritarian systems. In the theoretical section below, we explain why the argument have potential issues when applied to non-majoritarian electoral systems. We estimated a subgroup analysis using a binary electoral system.

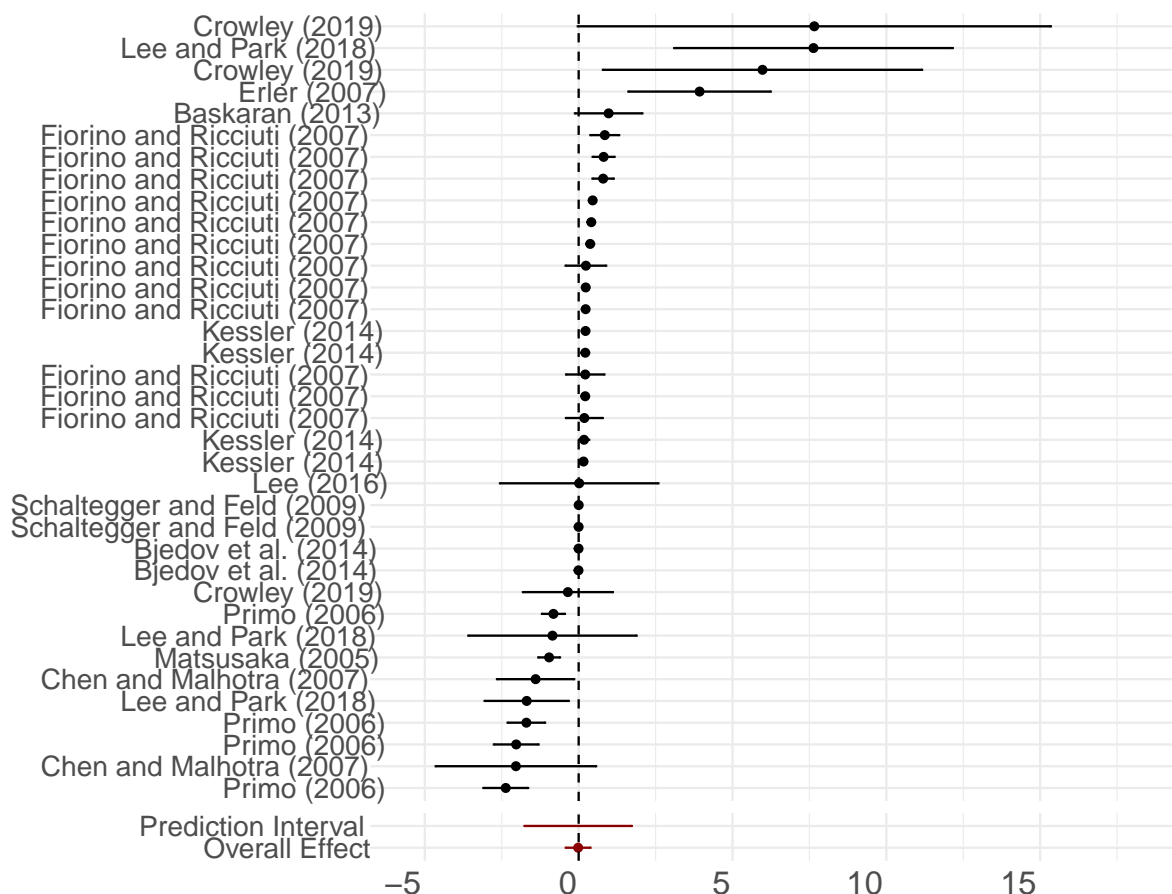


Figure 18: Subgroup Analysis of  $(N) \times (ExpPC)$ , controlling by electoral system

Therefore, we can see that the hypothesis that majoritarian systems produce systematic positive effects was disproved. The majoritarian systems in the sample had a random effects model estimate of -0.25, while the random effects model in the non-majoritarian subgroup fitted a value of 0.08. Both are non-significant, but they reassure us that the absense of effect is not caused by pooling multiple types of electoral systems.

**ExpPC x logN**

There were no studies that had per capita expenditure in the dependent variable and log of lower house size in the treatment variable.

## ExpPC x K

Now we are investigating the upper house size (K). In this model, we investigate the effect of upper house size on expenditure per capita (ExpPC).

```
# Pooling effects analysis -- ExpPC x K
```

```
aux <- fulldat %>%
```

```
  filter(indepvar2 == 'K',
         depvar2 == 'ExpPC')
```

```
mod <- metagen(coef, SE, data=aux,
               studlab=paste(authoryear),
               comb.fixed = FALSE,
               comb.random = TRUE,
               method.tau = "REML",
               hakn = TRUE,
               prediction=TRUE,
               sm="SMD")
```

```
mod
```

##	SMD	95%-CI	%W(random)
## Crowley (2019)	8.2100 [ 0.2702; 16.1498]		4.8
## Crowley (2019)	8.4230 [-27.1895; 44.0355]		0.4
## Crowley (2019)	9.5940 [ 2.1383; 17.0497]		5.1
## Lee and Park (2018)	19.7400 [ 3.2645; 36.2155]		1.7
## Lee and Park (2018)	10.0600 [ 2.2887; 17.8313]		4.9
## Lee and Park (2018)	9.0620 [-30.8821; 49.0061]		0.3
## Lee (2016)	38.4400 [ 0.7499; 76.1301]		0.4
## Lee (2016)	37.8500 [ 3.0214; 72.6786]		0.4
## Lee (2016)	25.6100 [ -0.8103; 52.0303]		0.8
## Lee (2016)	5.9960 [-19.6011; 31.5931]		0.8
## Lee (2016)	25.5600 [ -0.8799; 51.9999]		0.8
## Lee (2016)	4.6930 [-19.5126; 28.8986]		0.9
## Bradbury and Stephenson (2009)	0.6240 [ 0.2295; 1.0185]		10.0
## Chen and Malhotra (2007)	26.0900 [ 11.4883; 40.6917]		2.1
## Chen and Malhotra (2007)	8.3000 [ 3.6941; 12.9059]		7.3
## Chen and Malhotra (2007)	5.1400 [ 0.1813; 10.0987]		7.0
## Chen and Malhotra (2007)	4.7800 [ -0.9039; 10.4639]		6.4
## Chen and Malhotra (2007)	20.3800 [ 7.6990; 33.0610]		2.6
## Chen and Malhotra (2007)	4.8700 [ 1.2833; 8.4567]		8.2
## Chen and Malhotra (2007)	26.7500 [ 0.8589; 52.6411]		0.8
## Primo (2006)	0.9700 [ -0.4804; 2.4204]		9.7
## Primo (2006)	5.9000 [ 2.6857; 9.1143]		8.5
## Primo (2006)	5.7500 [ 2.3593; 9.1407]		8.4
## Primo (2006)	6.9600 [ 2.6089; 11.3111]		7.6

```
##
```

```
## Number of studies combined: k = 24
```

```
##
```

##	SMD	95%-CI	t	p-value
## Random effects model	7.2162 [ 4.4400; 9.9925]		5.38	< 0.0001
## Prediction interval		[-1.2217; 15.6542]		

```
##
```

```
## Quantifying heterogeneity:
```

```
## tau^2 = 14.7532 [5.4141; 111.2304]; tau = 3.8410 [2.3268; 10.5466];
```

```
## I^2 = 77.7% [67.3%; 84.8%]; H = 2.12 [1.75; 2.57]
```

```
##
## Test of heterogeneity:
##      Q d.f.  p-value
## 103.34   23 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

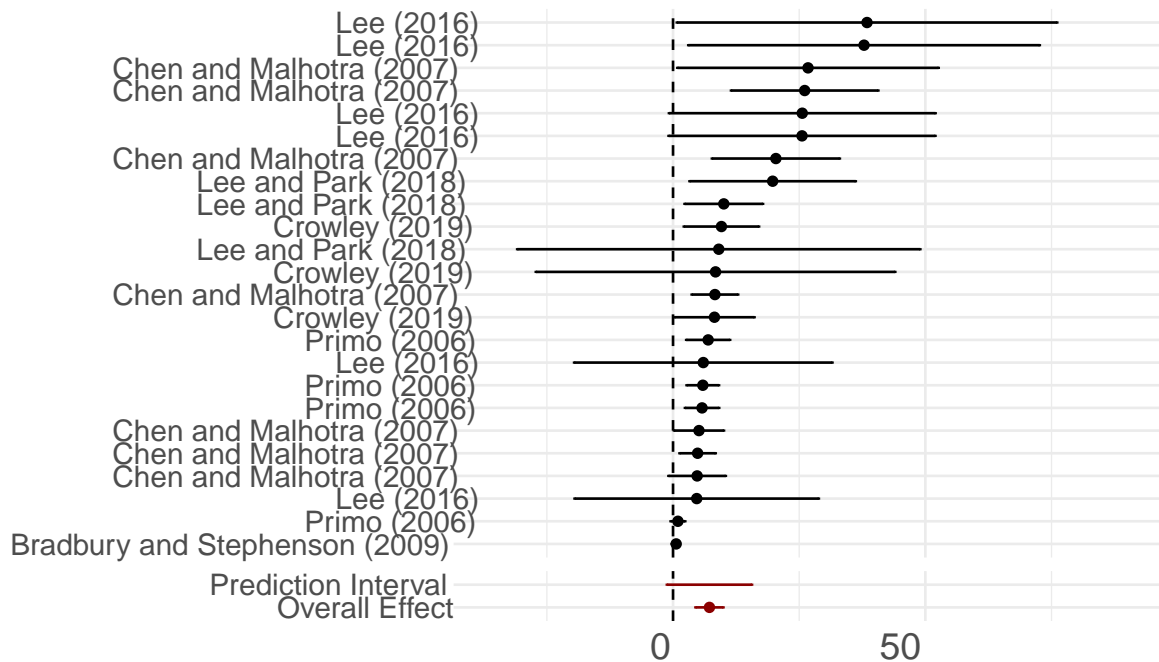


Figure 19: Effect of upper house size (K) on the per capita government expenditure (ExpPC)

Highlights:

1. The results are highly heterogeneous:  $I^2 = 77.74$ .
2. The Random effects model SMD estimated is  $g = 7.22$  ( $SE = 1.342$ ).
3. The prediction interval ranges from -1.22 to 15.65. Therefore, it encompasses zero.

## logExpPC x N

This model estimates the Log of Per Capita Expenditure as the dependent variable, and the number of lower house legislators as the treatment variable.

```
# Pooling effects analysis -- logExpPC x N
aux <- fulldat %>%
  filter(indepvar2 == 'N',
         depvar2 == 'logExpPC')

mod <- metagen(coef, SE, data=aux,
               studlab=paste(authoryear),
               comb.fixed = FALSE,
               comb.random = TRUE,
               method.tau = "REML",
               hakn = TRUE,
               prediction=TRUE,
               sm="SMD")

mod

##              SMD              95%-CI %W(random)
## Lewis (2019)      -0.1740 [-0.2450; -0.1030]      6.6
## Höhmann (2017)    -0.0300 [-0.0496; -0.0104]      7.1
## Höhmann (2017)    -0.0300 [-0.0496; -0.0104]      7.1
## Höhmann (2017)    -0.0400 [-0.0792; -0.0008]      7.0
## Drew and Dollery (2017) 0.0770 [ 0.0221;  0.1319]      6.8
## Drew and Dollery (2017) 0.0310 [-0.0121;  0.0741]      6.9
## Pettersson-Lidbom (2012) -0.1590 [-0.2394; -0.0786]      6.4
## Pettersson-Lidbom (2012) -0.1470 [-0.2274; -0.0666]      6.4
## Pettersson-Lidbom (2012) -0.0900 [-0.1645; -0.0155]      6.5
## Pettersson-Lidbom (2012) -0.0810 [-0.1574; -0.0046]      6.5
## Pettersson-Lidbom (2012) -0.0880 [-0.1625; -0.0135]      6.5
## Pettersson-Lidbom (2012) 0.2100 [ 0.1649;  0.2551]      6.9
## Pettersson-Lidbom (2012) 0.1570 [ 0.0845;  0.2295]      6.5
## Pettersson-Lidbom (2012) -0.1990 [-0.2774; -0.1206]      6.4
## Pettersson-Lidbom (2012) -0.1690 [-0.2494; -0.0886]      6.4
##
## Number of studies combined: k = 15
##
##              SMD              95%-CI      t p-value
## Random effects model -0.0463 [-0.1142; 0.0216] -1.46 0.1655
## Prediction interval      [-0.3105; 0.2178]
##
## Quantifying heterogeneity:
## tau^2 = 0.0139 [0.0070; 0.0364]; tau = 0.1181 [0.0836; 0.1908];
## I^2 = 93.8% [91.2%; 95.6%]; H = 4.00 [3.38; 4.75]
##
## Test of heterogeneity:
##      Q d.f.  p-value
## 224.56  14 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
```

## - Hartung-Knapp adjustment for random effects model

And the forest plot:

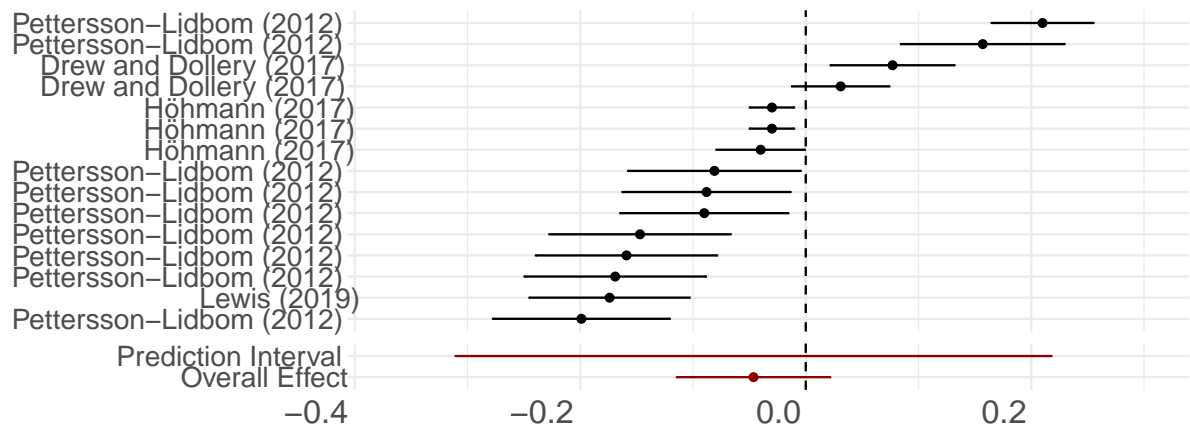


Figure 20: Effect of lower houses size (N) on log of per capita expenditure (logExpPC)

Highlights:

1. The results are highly heterogeneous:  $I^2 = 93.77$ .
2. The Random effects model SMD estimated is  $g = -0.05$  ( $SE = 0.032$ ).
3. The prediction interval ranges from -0.31 to 0.22. Therefore, it encompasses zero.

## logExpPC x logN

In this specification, we study the log of per capita expenditure (logExpPC) as a function of the log of lower house size (logN).

```
# Pooling effects analysis -- logExpPC x logN
aux <- fulldat %>%
  filter(indepvar2 == 'logN',
         depvar2 == 'logExpPC')

mod <- metagen(coef, SE, data=aux,
               studlab=paste(authoryear),
               comb.fixed = FALSE,
               comb.random = TRUE,
               method.tau = "REML",
               hakn = TRUE,
               prediction=TRUE,
               sm="SMD")

mod

##              SMD          95%-CI %W(random)
## MacDonald (2008) 0.1360 [0.0447; 0.2273]      7.9
## MacDonald (2008) 0.2319 [0.1322; 0.3316]      7.4
## MacDonald (2008) 0.1443 [0.0471; 0.2415]      7.6
## MacDonald (2008) 0.1594 [0.0667; 0.2521]      7.8
## MacDonald (2008) 0.2259 [0.1163; 0.3355]      6.9
## Baqir (2002)      0.1127 [0.0396; 0.1858]      9.1
## Baqir (2002)      0.2760 [0.2007; 0.3513]      8.9
## Baqir (2002)      0.3021 [0.2270; 0.3772]      8.9
## Baqir (2002)      0.3203 [0.2450; 0.3956]      8.9
## Baqir (1999)      0.3020 [0.2269; 0.3771]      8.9
## Baqir (1999)      0.2760 [0.2007; 0.3513]      8.9
## Baqir (1999)      0.2950 [0.2165; 0.3735]      8.7
##
## Number of studies combined: k = 12
##
##              SMD          95%-CI      t  p-value
## Random effects model 0.2346 [0.1864; 0.2828] 10.71 < 0.0001
## Prediction interval      [0.0848; 0.3844]
##
## Quantifying heterogeneity:
## tau^2 = 0.0040 [0.0011; 0.0145]; tau = 0.0636 [0.0335; 0.1203];
## I^2 = 70.0% [45.6%; 83.4%]; H = 1.82 [1.36; 2.45]
##
## Test of heterogeneity:
##      Q d.f. p-value
## 36.62  11  0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

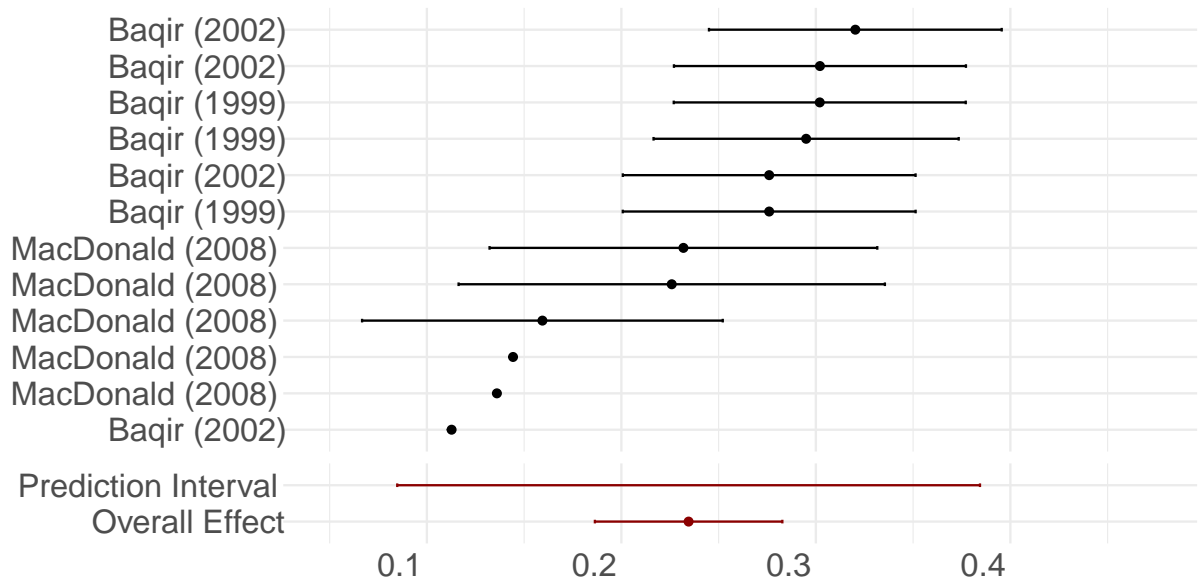


Figure 21: Effect of log lower houses size (logN) on the log of per capita government expenditure (logExpPC)

#### Highlights:

1. The results are highly heterogeneous:  $I^2 = 69.96$ .
2. The Random effects model SMD estimated is  $g = 0.23$  ( $SE = 0.022$ ). **This model is significant at the 10% confidence level.**
3. The prediction interval ranges from 0.08 to 0.38. Therefore, it does not encompass zero.

#### logExpPC x K

No studies related the log of per capita expenditure with the size of upper house (K).



## PCTGDP x N

This model fits the random effects for the percentage of GDP as public expenditure as the main outcome, and the size of lower house as the main treatment variable.

```
# Pooling effects analysis -- PCTGDP x N
aux <- fulldat %>%
  filter(indepvar2 == 'N',
         depvar2 == 'PCTGDP')

mod <- metagen(coef, SE, data=aux,
               studlab=paste(authoryear),
               comb.fixed = FALSE,
               comb.random = TRUE,
               method.tau = "REML",
               hakn = TRUE,
               prediction=TRUE,
               sm="SMD")

mod
```

##	SMD	95%-CI	%W(random)
## Bjedov et al. (2014)	-0.0040 [-0.0432; 0.0352]	2.1	
## Bjedov et al. (2014)	-0.0080 [-0.0472; 0.0312]	2.1	
## Maldonado (2013)	-0.0609 [-0.0838; -0.0380]	3.6	
## Mukherjee (2003)	0.0030 [ 0.0010; 0.0050]	5.6	
## Mukherjee (2003)	0.0090 [ 0.0051; 0.0129]	5.5	
## Mukherjee (2003)	0.0110 [ 0.0051; 0.0169]	5.4	
## Mukherjee (2003)	0.0050 [-0.0009; 0.0109]	5.4	
## Mukherjee (2003)	0.0400 [ 0.0380; 0.0420]	5.6	
## Mukherjee (2003)	0.0300 [ 0.0280; 0.0320]	5.6	
## Mukherjee (2003)	0.0100 [ 0.0061; 0.0139]	5.5	
## Mukherjee (2003)	0.0200 [ 0.0122; 0.0278]	5.3	
## Bradbury and Crain (2001)	0.0036 [ 0.0008; 0.0065]	5.6	
## Bradbury and Crain (2001)	0.0005 [-0.0016; 0.0027]	5.6	
## Bradbury and Crain (2001)	0.0169 [ 0.0131; 0.0208]	5.6	
## Bradbury and Crain (2001)	0.0123 [ 0.0087; 0.0160]	5.6	
## Ricciuti (2004)	0.0140 [-0.0095; 0.0375]	3.5	
## Ricciuti (2004)	-0.0110 [-0.0286; 0.0066]	4.2	
## Ricciuti (2004)	0.0070 [-0.0067; 0.0207]	4.7	
## Ricciuti (2004)	0.0050 [-0.0126; 0.0226]	4.2	
## Ricciuti (2004)	0.0050 [-0.0126; 0.0226]	4.2	
## Ricciuti (2004)	0.0120 [-0.0017; 0.0257]	4.7	
##			
## Number of studies combined: k = 21			
##			
##	SMD	95%-CI	t p-value
## Random effects model	0.0078 [-0.0003; 0.0160]	2.01	0.0579
## Prediction interval	[-0.0259; 0.0416]		
##			
## Quantifying heterogeneity:			
## tau^2 = 0.0002 [0.0002; 0.0007]; tau = 0.0156 [0.0136; 0.0261];			
## I^2 = 98.5% [98.2%; 98.7%]; H = 8.11 [7.40; 8.88]			
##			
## Test of heterogeneity:			
## Q d.f. p-value			

```
## 1314.54 20 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

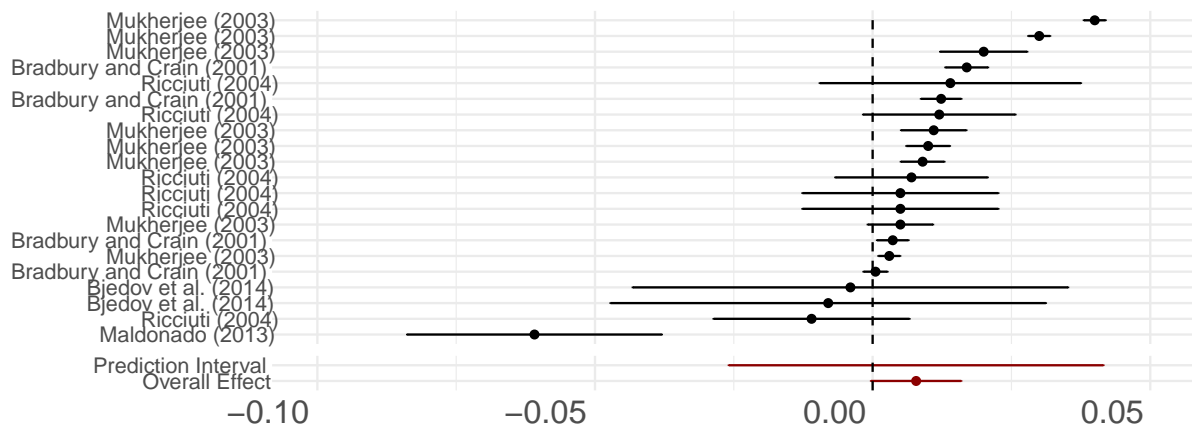


Figure 22: Effect of lower houses size (N) on percentage of public expenditure GDP (PCTGDP)

Highlights:

1. The results are highly heterogeneous:  $I^2 = 98.48$ .
2. The Random effects model SMD estimated is  $g = 0.01$  ( $SE = 0.004$ ).
3. The prediction interval ranges from -0.03 to 0.04. Therefore, it encompasses zero.

### PCTGDP x logN

This meta-regression investigates the percentage of GDP as public expenditure as the dependent variable and the log lower house size (logN) as the treatment variable.

```
# Pooling effects analysis -- PCTGDP x logN
```

```
aux <- fulldat %>%
  filter(indepvar2 == 'logN',
         depvar2 == 'PCTGDP')

mod <- metagen(coef, SE, data=aux,
               studlab=paste(authoryear),
               comb.fixed = FALSE,
               comb.random = TRUE,
               method.tau = "REML",
               hakn = TRUE,
               prediction=TRUE,
               sm="SMD")

mod
```

```
##                               SMD          95%-CI %W(random)
## Baqir (1999)                 2.0660 [ 1.4887; 2.6433]    18.9
```

```

## Baqir (1999)          2.0120 [ 1.4235; 2.6005]          18.8
## Baqir (1999)          2.4680 [ 1.8817; 3.0543]          18.8
## Lledo (2003)          -4.6900 [-9.9427; 0.5627]           3.8
## Stein et al. (1998)   0.0109 [-0.0171; 0.0389]          19.8
## Stein et al. (1998)   0.0135 [-0.0102; 0.0372]          19.8
##
## Number of studies combined: k = 6
##
##              SMD              95%-CI      t p-value
## Random effects model 1.0619 [-0.7256; 2.8493] 1.53 0.1873
## Prediction interval      [-3.0267; 5.1504]
##
## Quantifying heterogeneity:
## tau^2 = 1.6850 [0.6497; 38.1618]; tau = 1.2981 [0.8060; 6.1775];
## I^2 = 96.9% [95.2%; 98.1%]; H = 5.71 [4.55; 7.16]
##
## Test of heterogeneity:
##      Q d.f.  p-value
## 163.00    5 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model

```

And the forest plot:

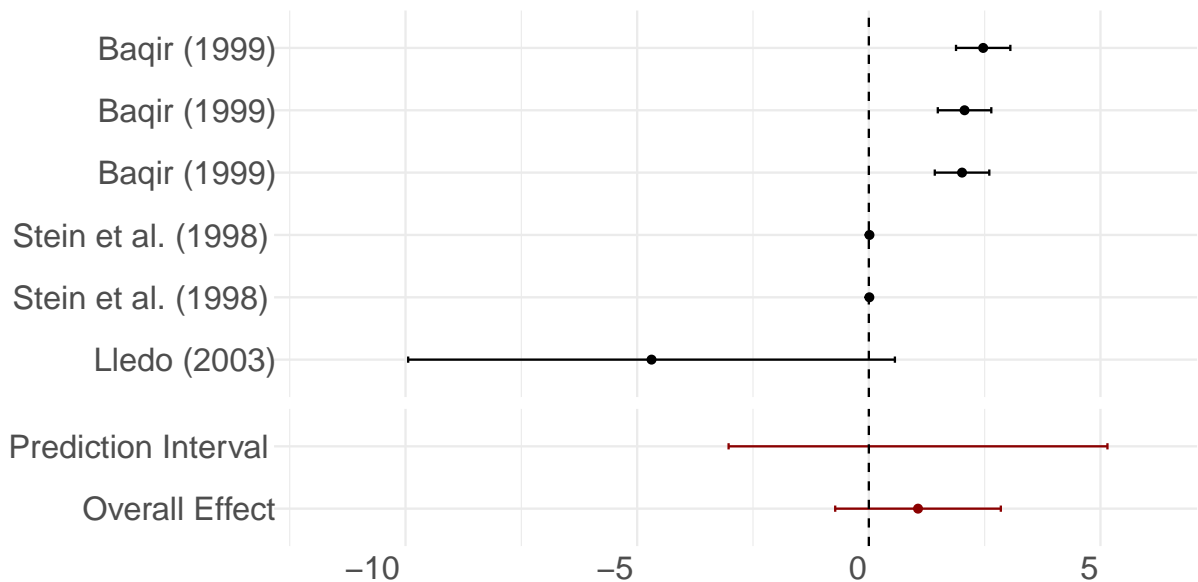


Figure 23: Effect of log lower houses size (logN) on the GDP share of public expenditure (PCTGDP)

Highlights:

1. The results are highly heterogeneous:  $I^2 = 96.93$ .
2. The Random effects model SMD estimated is  $g = 1.06$  ( $SE = 0.695$ ).

3. The prediction interval ranges from -3.03 to 5.15. Therefore, it encompasses zero.

## PCTGDP x K

This model looks into the effect of upper house size (K) on the public expenditure share of the GDP (PCTGDP).

```
# Pooling effects analysis -- PCTGDP x K
aux <- fulldat %>%
  filter(indepvar2 == 'K',
         depvar2 == 'PCTGDP')

mod <- metagen(coef, SE, data=aux,
               studlab=paste(authoryear),
               comb.fixed = FALSE,
               comb.random = TRUE,
               method.tau = "REML",
               hakn = TRUE,
               prediction=TRUE,
               sm="SMD")

mod
```

##	SMD	95%-CI	%W(random)
## Maldonado (2012)	-0.0400	[-0.0659; -0.0141]	5.7
## Bradbury and Crain (2001)	0.0126	[ 0.0010; 0.0243]	9.8
## Bradbury and Crain (2001)	0.0050	[ 0.0016; 0.0083]	11.8
## Bradbury and Crain (2001)	-0.0113	[-0.0163; -0.0064]	11.5
## Bradbury and Crain (2001)	-0.0056	[-0.0102; -0.0010]	11.6
## Ricciuti (2004)	0.0160	[-0.0075; 0.0395]	6.2
## Ricciuti (2004)	0.0210	[-0.0006; 0.0426]	6.7
## Ricciuti (2004)	0.0140	[-0.0036; 0.0316]	7.9
## Ricciuti (2004)	0.0030	[-0.0088; 0.0148]	9.7
## Ricciuti (2004)	0.0300	[-0.0210; 0.0810]	2.2
## Ricciuti (2004)	0.0300	[-0.0210; 0.0810]	2.2
## Ricciuti (2004)	0.0390	[-0.0022; 0.0802]	3.1
## Ricciuti (2004)	0.0127	[-0.0147; 0.0401]	5.3
## Ricciuti (2004)	0.0160	[-0.0075; 0.0395]	6.2

```
##
## Number of studies combined: k = 14
##
##               SMD           95%-CI    t p-value
## Random effects model 0.0056 [-0.0042; 0.0155] 1.24 0.2376
## Prediction interval      [-0.0233; 0.0346]
##
## Quantifying heterogeneity:
## tau^2 = 0.0002 [0.0001; 0.0008]; tau = 0.0125 [0.0109; 0.0279];
## I^2 = 80.0% [67.3%; 87.8%]; H = 2.24 [1.75; 2.86]
##
## Test of heterogeneity:
##      Q d.f.  p-value
## 65.02  13 < 0.0001
##
## Details on meta-analytical method:
## - Inverse variance method
## - Restricted maximum-likelihood estimator for tau^2
```

```
## - Q-profile method for confidence interval of tau^2 and tau
## - Hartung-Knapp adjustment for random effects model
```

And the forest plot:

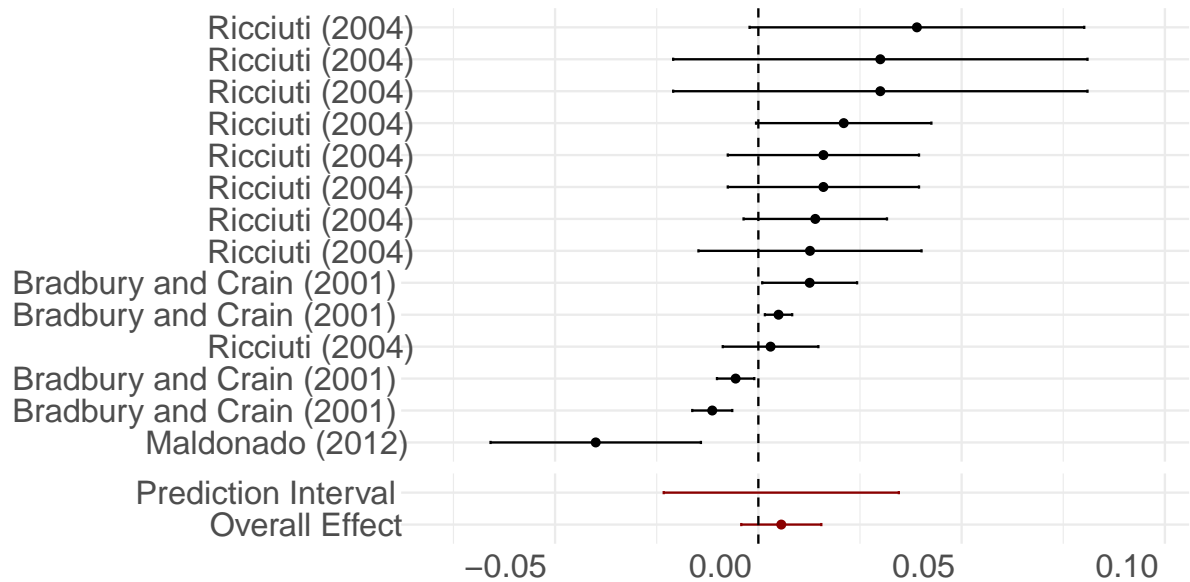
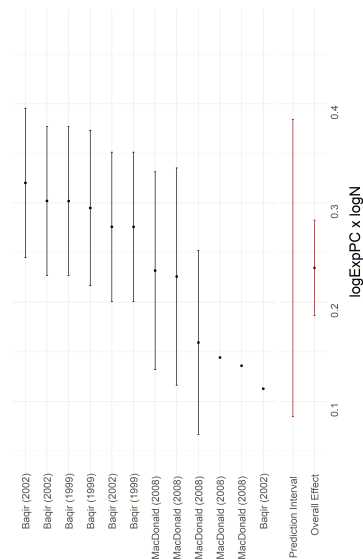
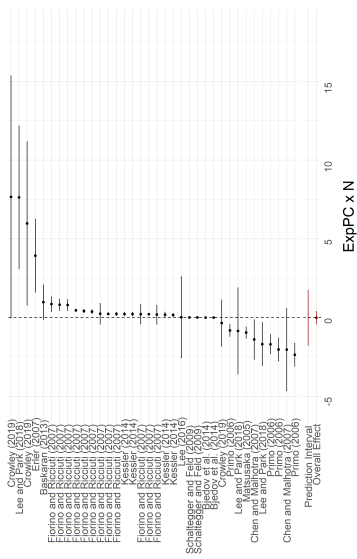


Figure 24: Effect of upper house size (K) on the public expenditure share of the GDP (PCTGDP)

Highlights:

1. The results are highly heterogeneous:  $I^2 = 80.01$ .
2. The Random effects model SMD estimated is  $g = 0.01$  ( $SE = 0.005$ ).
3. The prediction interval ranges from -0.02 to 0.03. Therefore, it encompasses zero.



## Meta-regressions

Meta-regressions for Expenditure measured as

Meta-regressions for Expenditure as a Percentage of the GDP

```
summary(mod)
```

```
##
## Mixed-Effects Model (k = 11; tau^2 estimator: REML)
##
##   logLik deviance      AIC      BIC     AICc
##   7.0993 -14.1987   5.8013  -7.2672  225.8013
##
## tau^2 (estimated amount of residual heterogeneity):      0 (SE = 0.0001)
## tau (square root of estimated tau^2 value):              0
## I^2 (residual heterogeneity / unaccounted variability):  0.00%
## H^2 (unaccounted variability / sampling variability):    1.00
## R^2 (amount of heterogeneity accounted for):              100.00%
##
## Test for Residual Heterogeneity:
## QE(df = 2) = 0.5965, p-val = 0.7421
##
## Test of Moderators (coefficients 2:9):
## F(df1 = 8, df2 = 2) = 40.7363, p-val = 0.0242
##
## Model Results:
##
##              estimate      se      tval      pval      ci.lb      ci.ub
## intrcpt           7.4330  1.7594    4.2248  0.0517   -0.1370  15.0030 .
## indepvar2logN     -4.7067  1.4637   -3.2156  0.0846  -11.0045   1.5912 .
## indepvar2N        -0.0094  0.0030   -3.1174  0.0893   -0.0223   0.0036 .
## year              -0.0003  0.0005   -0.6899  0.5615   -0.0024   0.0017 .
## publishedYes      -0.0633  0.0078   -8.1139  0.0149   -0.0969  -0.0297 *
## elecsys2Non-Maj   -2.0554  0.1611  -12.7621  0.0061   -2.7484  -1.3625 **
## methodPANEL        0.0556  0.0071    7.7913  0.0161    0.0249   0.0864 *
## agglevelStates    -4.6992  1.4637   -3.2106  0.0848  -10.9969   1.5984 .
## location2World    -4.6959  1.4637   -3.2082  0.0850  -10.9937   1.6019 .
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

As we have considerable heterogeneity in our sample, we run a permutation test to ensure the validity of our estimates. The results follow below.

```
## Error in rma.uni(x$yi, x$vi, weights = x$weights, mods = cbind(X[sample(x$k), :
## Fisher scoring algorithm did not converge. See 'help(rma)' for possible remedies.
## Error in rma.uni(x$yi, x$vi, weights = x$weights, mods = cbind(X[sample(x$k), :
## Fisher scoring algorithm did not converge. See 'help(rma)' for possible remedies.
## Error in rma.uni(x$yi, x$vi, weights = x$weights, mods = cbind(X[sample(x$k), :
## Fisher scoring algorithm did not converge. See 'help(rma)' for possible remedies.
## Error in rma.uni(x$yi, x$vi, weights = x$weights, mods = cbind(X[sample(x$k), :
## Fisher scoring algorithm did not converge. See 'help(rma)' for possible remedies.
##
## Test of Moderators (coefficients 2:9):
```

```
## F(df1 = 8, df2 = 2) = 40.7363, p-val* = 0.0060
##
## Model Results:
##
##           estimate      se      tval    pval*    ci.lb    ci.ub
## intrcpt          7.4330  1.7594    4.2248  0.0290   -0.1370  15.0030  *
## indepvar2logN    -4.7067  1.4637   -3.2156  0.1770  -11.0045   1.5912
## indepvar2N       -0.0094  0.0030   -3.1174  0.0160   -0.0223   0.0036  *
## year             -0.0003  0.0005   -0.6899  0.4110   -0.0024   0.0017
## publishedYes     -0.0633  0.0078   -8.1139  0.0110   -0.0969  -0.0297  *
## elecsys2Non-Maj  -2.0554  0.1611  -12.7621  0.0050   -2.7484  -1.3625  **
## methodPANEL       0.0556  0.0071    7.7913  0.0110    0.0249   0.0864  *
## agglevelStates   -4.6992  1.4637   -3.2106  0.1740  -10.9969   1.5984
## location2World   -4.6959  1.4637   -3.2082  0.2240  -10.9937   1.6019
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

We have the following results for the meta-regressions of Expenditure Per Capita:

1. Compared with K, models with N and logN find significantly negative coefficients.
2. Year has null effect.
3. Unpublished papers tend to have higher coefficients than published papers.
4. Passing from Majoritarian to Non-Majoritarian, decreases significantly the effects found in our models.
5. In terms of the modeling, passing from OLS to PANEL increases the detected effects.
6. When passing from Local to State or World levels, it decreases the detected effect size.

Below we also run the meta-regressions adding all coefficients in the papers. The results follow below:

```
summary(mod)
```

```
##
## Mixed-Effects Model (k = 41; tau^2 estimator: REML)
##
##      logLik  deviance      AIC      BIC      AICc
##    89.1145 -178.2290 -158.2290 -143.5716 -147.7528
##
## tau^2 (estimated amount of residual heterogeneity):      0.0001 (SE = 0.0000)
## tau (square root of estimated tau^2 value):             0.0102
## I^2 (residual heterogeneity / unaccounted variability): 94.05%
## H^2 (unaccounted variability / sampling variability):    16.81
## R^2 (amount of heterogeneity accounted for):             99.92%
##
## Test for Residual Heterogeneity:
## QE(df = 32) = 1001.8067, p-val < .0001
##
## Test of Moderators (coefficients 2:9):
## F(df1 = 8, df2 = 32) = 29.7201, p-val < .0001
##
## Model Results:
##
##           estimate      se      tval    pval    ci.lb    ci.ub
## intrcpt          -5.2700  5.8694   -0.8979  0.3760  -17.2256   6.6857
## indepvar2logN    -4.6069  2.4363   -1.8909  0.0677   -9.5696   0.3558  .
## indepvar2N       -0.0014  0.0048   -0.2945  0.7703   -0.0112   0.0084
```



```
## year          0.0060  0.0027   2.2730  0.0299   0.0006  0.0114   *
## publishedYes  -0.1130  0.0251  -4.5060 <.0001  -0.1641 -0.0619 ***
## elecsys2Non-Maj -2.1629  0.1568 -13.7904 <.0001  -2.4823 -1.8434 ***
## methodPANEL    0.1252  0.0304   4.1232  0.0002   0.0633  0.1870 ***
## agglevelStates -4.7325  2.4361  -1.9426  0.0609  -9.6947  0.2298 .
## location2World -4.6443  2.4362  -1.9064  0.0656  -9.6067  0.3181 .
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##
## Test of Moderators (coefficients 2:9):
## F(df1 = 8, df2 = 32) = 29.7201, p-val* = 0.0010
##
## Model Results:
##
##              estimate      se      tval    pval*    ci.lb    ci.ub
## intrcpt         -5.2700  5.8694   -0.8979  0.2670  -17.2256   6.6857
## indepvar2logN    -4.6069  2.4363   -1.8909  0.1010   -9.5696   0.3558
## indepvar2N       -0.0014  0.0048   -0.2945  0.7280   -0.0112   0.0084
## year             0.0060  0.0027   2.2730  0.0030   0.0006   0.0114   **
## publishedYes     -0.1130  0.0251   -4.5060  0.0060   -0.1641  -0.0619   **
## elecsys2Non-Maj -2.1629  0.1568  -13.7904  0.0010   -2.4823  -1.8434   ***
## methodPANEL      0.1252  0.0304   4.1232  0.0060   0.0633   0.1870   **
## agglevelStates   -4.7325  2.4361   -1.9426  0.0870   -9.6947   0.2298 .
## location2World   -4.6443  2.4362   -1.9064  0.1050   -9.6067   0.3181
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

For all the coefficients, we have the following results:

1. Compared with K, models with N and logN tend to have significantly negative coefficients.
2. Year has a positive effect: the younger the publication, the higher the detected coefficient.
3. Unpublished papers tend to have higher coefficients than published papers.
4. Passing from Majoritarian to Non-Majoritarian, decreases significantly the effects found in our models.
5. In terms of the modeling, passing from OLS to PANEL increases the detected effects.
6. When passing from Local to State or World levels, it decreases the detected effect size.

## Meta-regressions for Expenditure Per Capita

```
summary(mod)
```

```
##
## Mixed-Effects Model (k = 18; tau^2 estimator: REML)
##
##      logLik  deviance      AIC      BIC      AICc
## -34.6251   69.2502   85.2502   88.4333  157.2502
##
## tau^2 (estimated amount of residual heterogeneity):      1.8429 (SE = 1.2361)
## tau (square root of estimated tau^2 value):             1.3575
## I^2 (residual heterogeneity / unaccounted variability): 95.05%
## H^2 (unaccounted variability / sampling variability):    20.21
## R^2 (amount of heterogeneity accounted for):             0.00%
```

```
##
## Test for Residual Heterogeneity:
## QE(df = 11) = 45.4940, p-val < .0001
##
## Test of Moderators (coefficients 2:7):
## F(df1 = 6, df2 = 11) = 0.3429, p-val = 0.8998
##
## Model Results:
##
##               estimate         se      tval      pval      ci.lb      ci.ub
## intrcpt        -104.0701    318.9300   -0.3263   0.7503   -806.0302   597.8900
## indepvar2N       -2.9238      2.0932   -1.3968   0.1900    -7.5309     1.6834
## year             0.0525      0.1586    0.3308   0.7470    -0.2967     0.4017
## elecsys2Non-Maj  0.3458      1.5533    0.2226   0.8279    -3.0730     3.7645
## methodPANEL      1.4571      2.2376    0.6512   0.5283    -3.4679     6.3821
## methodIV         1.4936      2.6675    0.5599   0.5868    -4.3776     7.3648
## agglevelStates   -0.0915      2.4255   -0.0377   0.9706    -5.4299     5.2470
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

As we have considerable heterogeneity in our sample, we run a permutation test to ensure the validity of our estimates. The results follow below.

```
## Error in rma.uni(x$yi, x$vi, weights = x$weights, mods = cbind(X[sample(x$k), :
## Fisher scoring algorithm did not converge. See 'help(rma)' for possible remedies.
## Error in rma.uni(x$yi, x$vi, weights = x$weights, mods = cbind(X[sample(x$k), :
## Fisher scoring algorithm did not converge. See 'help(rma)' for possible remedies.
## Error in rma.uni(x$yi, x$vi, weights = x$weights, mods = cbind(X[sample(x$k), :
## Fisher scoring algorithm did not converge. See 'help(rma)' for possible remedies.
## Error in rma.uni(x$yi, x$vi, weights = x$weights, mods = cbind(X[sample(x$k), :
## Fisher scoring algorithm did not converge. See 'help(rma)' for possible remedies.
##
## Test of Moderators (coefficients 2:7):
## F(df1 = 6, df2 = 11) = 0.3429, p-val* = 0.5750
##
## Model Results:
##
##               estimate         se      tval      pval*      ci.lb      ci.ub
## intrcpt        -104.0701    318.9300   -0.3263   0.6080   -806.0302   597.8900
## indepvar2N       -2.9238      2.0932   -1.3968   0.0840    -7.5309     1.6834
## year             0.0525      0.1586    0.3308   0.5990    -0.2967     0.4017
## elecsys2Non-Maj  0.3458      1.5533    0.2226   0.7430    -3.0730     3.7645
## methodPANEL      1.4571      2.2376    0.6512   0.3410    -3.4679     6.3821
## methodIV         1.4936      2.6675    0.5599   0.4430    -4.3776     7.3648
## agglevelStates   -0.0915      2.4255   -0.0377   0.9500    -5.4299     5.2470
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

We have the following results for the meta-regressions of Expenditure Per Capita:

1. Compared with K, models with N tend to detect significantly smaller effects.
2. Year has null effect.
3. Passing the electoral rules from Majoritarian to Non-Majoritarian, increases significantly the per

capita expenditure found in our models.

4. In terms of the modeling, passing from OLS to PANEL or IV increases the detected effects.
5. When passing from Local to State level, decreases the detected effects.

Below we also run the meta-regressions adding all coefficients in the papers. The results follow below:

```
summary(mod)
```

```
##
## Mixed-Effects Model (k = 60; tau^2 estimator: REML)
##
##      logLik    deviance      AIC      BIC      AICc
## -141.1228    282.2456    298.2456    314.0079    301.5183
##
## tau^2 (estimated amount of residual heterogeneity):      1.7264 (SE = 0.4944)
## tau (square root of estimated tau^2 value):              1.3139
## I^2 (residual heterogeneity / unaccounted variability): 99.80%
## H^2 (unaccounted variability / sampling variability):    500.07
## R^2 (amount of heterogeneity accounted for):              39.21%
##
## Test for Residual Heterogeneity:
## QE(df = 53) = 325.8548, p-val < .0001
##
## Test of Moderators (coefficients 2:7):
## F(df1 = 6, df2 = 53) = 5.9441, p-val < .0001
##
## Model Results:
##
##              estimate      se      tval      pval      ci.lb      ci.ub
## intrcpt          -296.9072  166.6870  -1.7812  0.0806  -631.2389  37.4245  .
## indepvar2N         -5.4468   0.9692  -5.6201  <.0001   -7.3907  -3.5029  ***
## year               0.1503   0.0830   1.8117  0.0757   -0.0161   0.3167  .
## elecsys2Non-Maj    1.0236   0.7701   1.3293  0.1894   -0.5209   2.5682
## methodPANEL        -0.1422   0.8136  -0.1747  0.8620   -1.7739   1.4896
## methodIV           0.1907   0.8223   0.2319  0.8175   -1.4587   1.8401
## agglevelStates     -0.2008   1.0049  -0.1998  0.8424   -2.2164   1.8149
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Test of Moderators (coefficients 2:7):
## F(df1 = 6, df2 = 53) = 5.9441, p-val* = 0.0010
##
## Model Results:
##
##              estimate      se      tval      pval*      ci.lb      ci.ub
## intrcpt          -296.9072  166.6870  -1.7812  0.0240  -631.2389  37.4245  *
## indepvar2N         -5.4468   0.9692  -5.6201  0.0010   -7.3907  -3.5029  ***
## year               0.1503   0.0830   1.8117  0.0230   -0.0161   0.3167  *
## elecsys2Non-Maj    1.0236   0.7701   1.3293  0.0810   -0.5209   2.5682  .
## methodPANEL        -0.1422   0.8136  -0.1747  0.8180   -1.7739   1.4896
## methodIV           0.1907   0.8223   0.2319  0.7530   -1.4587   1.8401
## agglevelStates     -0.2008   1.0049  -0.1998  0.7610   -2.2164   1.8149
##
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

With all coefficients, the results of the effect sizes on the Expenditure Per Capita Regressions are the following:

1. Compared with K, models with N tend to detect significantly smaller effects.
2. Year has now a positive effect on coefficient sizes.
3. Passing the electoral rules from Majoritarian to Non-Majoritarian, increases significantly the effects on per capita expenditure found in our models.
4. In terms of the modeling, passing from OLS to PANEL decreases the detected effects.
5. All other coefficients were not significant.

## Meta-regressions for the Log of Expenditure Per Capita

```
summary(mod)
```

```
##
## Mixed-Effects Model (k = 7; tau^2 estimator: REML)
##
##      logLik  deviance      AIC      BIC      AICc
##      0.8657   -1.7315   12.2685   -1.7315   124.2685
##
## tau^2 (estimated amount of residual heterogeneity):      0.0096 (SE = 0.0147)
## tau (square root of estimated tau^2 value):             0.0977
## I^2 (residual heterogeneity / unaccounted variability): 92.15%
## H^2 (unaccounted variability / sampling variability):    12.74
## R^2 (amount of heterogeneity accounted for):             65.22%
##
## Test for Residual Heterogeneity:
## QE(df = 1) = 12.7408, p-val = 0.0004
##
## Test of Moderators (coefficients 2:6):
## F(df1 = 5, df2 = 1) = 2.9742, p-val = 0.4128
##
## Model Results:
##
##              estimate      se      tval      pval      ci.lb      ci.ub
## intrcpt           8.9590  47.6441   0.1880  0.8817  -596.4166  614.3346
## indepvar2logN     0.1641   0.3258   0.5037  0.7029   -3.9760   4.3043
## year            -0.0044   0.0237  -0.1864  0.8827   -0.3053   0.2965
## publishedYes     -0.1520   0.1902  -0.7993  0.5707   -2.5687   2.2647
## methodPANEL       0.2581   0.1886   1.3680  0.4018   -2.1389   2.6550
## agglevelStates   -0.0875   0.1901  -0.4602  0.7254   -2.5028   2.3278
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

As we have considerable heterogeneity in our sample, we run a permutation test to ensure the validity of our estimates. The results follow below.

```
##
## Test of Moderators (coefficients 2:6):
## F(df1 = 5, df2 = 1) = 2.9742, p-val* = 0.4130
##
## Model Results:
##
##              estimate      se      tval      pval*      ci.lb      ci.ub
```

```
## intrcpt          8.9590  47.6441   0.1880  0.9190 -596.4166  614.3346
## indepvar2logN    0.1641   0.3258   0.5037  0.7200  -3.9760   4.3043
## year            -0.0044   0.0237  -0.1864  0.9200  -0.3053   0.2965
## publishedYes     -0.1520   0.1902  -0.7993  0.6180  -2.5687   2.2647
## methodPANEL      0.2581   0.1886   1.3680  0.4040  -2.1389   2.6550
## agglevelStates   -0.0875   0.1901  -0.4602  0.7150  -2.5028   2.3278
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

	Estimate	SE	T	P-Value	CI
Intercept	8.959	47.644	0.188	0.919	(-596.4166 ; 614.3346)
Indepvar: N	0.164	0.326	0.504	0.720	(-3.976 ; 4.3043)
Year	-0.004	0.024	-0.186	0.920	(-0.3053 ; 0.2965)
Published: No	-0.152	0.190	-0.799	0.618	(-2.5687 ; 2.2647)
Method: Panel	0.258	0.189	1.368	0.404	(-2.1389 ; 2.655)
AggLevel: States	-0.087	0.190	-0.460	0.715	(-2.5028 ; 2.3278)

We have the following results for the meta-regressions of Log of Expenditure Per Capita:

1. Unpublished papers report a significantly higher coefficient.
2. In terms of the modeling, passing from OLS to PANEL increases the detected effects.
3. All other coefficients remained insignificant.

Below we also run the meta-regressions adding all coefficients in the papers. The results follow below:

```
summary(mod)
```

```
##
## Mixed-Effects Model (k = 27; tau^2 estimator: REML)
##
##   logLik deviance      AIC      BIC      AICc
##  21.9924 -43.9848 -27.9848 -20.0190 -14.8939
##
## tau^2 (estimated amount of residual heterogeneity):    0.0051 (SE = 0.0021)
## tau (square root of estimated tau^2 value):           0.0716
## I^2 (residual heterogeneity / unaccounted variability): 86.93%
## H^2 (unaccounted variability / sampling variability):   7.65
## R^2 (amount of heterogeneity accounted for):           82.37%
##
## Test for Residual Heterogeneity:
## QE(df = 20) = 98.5701, p-val < .0001
##
## Test of Moderators (coefficients 2:7):
## F(df1 = 6, df2 = 20) = 16.9707, p-val < .0001
##
## Model Results:
##
##              estimate      se      tval      pval      ci.lb      ci.ub
## intrcpt          -1.5738  15.8830  -0.0991  0.9221  -34.7051  31.5574
## indepvar2logN    -0.0088   0.1262  -0.0701  0.9448   -0.2721   0.2544
## year              0.0009   0.0079   0.1187  0.9067   -0.0155   0.0174
## publishedYes     -0.0829   0.0728  -1.1387  0.2683   -0.2347   0.0689
## methodPANEL      -0.2436   0.0705  -3.4537  0.0025   -0.3908  -0.0965  **
```

```

## methodRDD          -0.2978    0.0656  -4.5398  0.0002   -0.4347  -0.1610  ***
## agglevelStates     -0.0438    0.0673  -0.6505  0.5228   -0.1842   0.0966
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##
## Test of Moderators (coefficients 2:7):
## F(df1 = 6, df2 = 20) = 16.9707, p-val* = 0.0010
##
## Model Results:
##
##              estimate      se      tval   pval*      ci.lb      ci.ub
## intrcpt         -1.5738  15.8830  -0.0991  0.9240  -34.7051  31.5574
## indepvar2logN    -0.0088   0.1262  -0.0701  0.9400   -0.2721   0.2544
## year              0.0009   0.0079   0.1187  0.9090   -0.0155   0.0174
## publishedYes     -0.0829   0.0728  -1.1387  0.2610   -0.2347   0.0689
## methodPANEL      -0.2436   0.0705  -3.4537  0.0030   -0.3908  -0.0965   **
## methodRDD        -0.2978   0.0656  -4.5398  0.0010   -0.4347  -0.1610   ***
## agglevelStates   -0.0438   0.0673  -0.6505  0.5260   -0.1842   0.0966
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

With all coefficients, the results of the effect sizes on the Log of Expenditure Per Capita Regressions are the following:

1. In terms of the modeling, passing from OLS to PANEL or RDD decreases the detected effects.
2. All other coefficients remained insignificant.

## Summary of Results

	ExpPC			logExpPC			PCTGDP		
	Estimate	SE	P-Value	Estimate	SE	P-Value	Estimate	SE	P-Value
<b>Base</b>									
Intercept	-104.070	318.930		8.959	47.644	0.882	7.4330	1.7594	0.0517
Indepvar: N	-2.924	2.093		0.164	0.326	0.703	-4.7067	1.4637	0.0846
Indepvar: logN	NA	NA	NA	NA	NA	NA	-0.0094	0.0030	0.0893
Year	0.052	0.159		-0.004	0.024	0.883	-0.0003	0.0005	0.5615
Published: No	NA	NA	NA	-0.152	0.190	0.571	-0.0633	0.0078	0.0149
Elecsys: Non-Majoritarian	0.346	1.553		NA	NA	NA	-2.0554	0.1611	0.0061
Method: Panel	1.457	2.238		0.258	0.189	0.402	0.0556	0.0071	0.0161
Method: IV	1.494	2.668		NA	NA	NA	NA	NA	NA
AggLevel: States	-0.091	2.425		-0.087	0.190	0.725	-4.6992	1.4637	0.0848
Location: World	NA	NA	NA	NA	NA	NA	-4.6959	1.4637	0.0850
<b>All Coefs</b>									
Intercept	-296.907	166.687		-1.574	15.883	0.922	-5.2700	5.8690	0.3760
Indepvar: N	-5.447	0.969	***	-0.009	0.126	0.945	-4.6070	2.4360	0.0680
Indepvar: logN	NA	NA	NA	NA	NA	NA	-0.0010	0.0050	0.7700
Year	0.150	0.083		0.001	0.008	0.907	0.0060	0.0030	0.0300
Published: No	NA	NA	NA	-0.083	0.073	0.268	-0.1130	0.0250	0.0000
Elecsys: Non-Majoritarian	1.024	0.770		NA	NA	NA	-2.1630	0.1570	0.0000
Method: Panel	-0.142	0.814		-0.244	0.071	0.003	0.1250	0.0300	0.0000
Method: IV	0.191	0.822		NA	NA	NA	NA	NA	NA
AggLevel: States	-0.201	1.005		-0.044	0.067	0.523	-4.7320	2.4360	0.0610
Location: World	NA	NA	NA	NA	NA	NA	-4.6440	2.4360	0.0660

*Note:*

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

## Summary of Results (Permutation)

		ExpPC			logExpPC			PCTGDP		
		Estimate	SE	P-Value	Estimate	SE	P-Value	Estimate	SE	P-Value
<b>Base</b>										
	Intercept	-104.070	318.930		8.959	47.644	0.919	7.433	1.759	0.029
	Indepvar: N	-2.924	2.093		0.164	0.326	0.720	-4.707	1.464	0.177
	Indepvar: logN	NA	NA	NA	NA	NA	NA	-0.009	0.003	0.016
	Year	0.052	0.159		-0.004	0.024	0.920	0.000	0.000	0.411
	Published: No	NA	NA	NA	-0.152	0.190	0.618	-0.063	0.008	0.011
	Elecsys: Non-Majoritarian	0.346	1.553		NA	NA	NA	-2.055	0.161	0.005
	Method: Panel	1.457	2.238		0.258	0.189	0.404	0.056	0.007	0.011
	Method: IV	1.494	2.668		NA	NA	NA	NA	NA	NA
	AggLevel: States	-0.091	2.425		-0.087	0.190	0.715	-4.699	1.464	0.174
	Location: World	NA	NA	NA	NA	NA	NA	-4.696	1.464	0.224
<b>All Coefs</b>										
	Intercept	-296.907	166.687	*	-1.574	15.883	0.924	-5.270	5.869	0.267
	Indepvar: N	-5.447	0.969	***	-0.009	0.126	0.940	-4.607	2.436	0.101
	Indepvar: logN	NA	NA	NA	NA	NA	NA	-0.001	0.005	0.728
	Year	0.150	0.083	*	0.001	0.008	0.909	0.006	0.003	0.003
	Published: No	NA	NA	NA	-0.083	0.073	0.261	-0.113	0.025	0.006
	Elecsys: Non-Majoritarian	1.024	0.770		NA	NA	NA	-2.163	0.157	0.001
	Method: Panel	-0.142	0.814		-0.244	0.071	0.003	0.125	0.030	0.006
	Method: IV	0.191	0.822		NA	NA	NA	NA	NA	NA
	AggLevel: States	-0.201	1.005		-0.044	0.067	0.526	-4.732	2.436	0.087
	Location: World	NA	NA	NA	NA	NA	NA	-4.644	2.436	0.105

*Note:*

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1



## Theory of Meta Analysis

There are two main estimators for conducting meta analysis: fixed effects and random effects models. The fixed effects model assumes that there is one true effect in reality, and that all estimates are an attempt to uncover this true effect. The random effects model, on the other hand, assumes that there are a distribution of true effects, that vary based on sample and tests characteristics.

In this paper, we use the random effects model. The empirical papers testing the law of  $1/n$  are very diverse. We tried to capture some of this diversity by considering the main dependent and independent variables separately, but they have at least three other important sources of dispersion:

1. **Subjects:** Counties, Municipalities, States, Provinces, Countries.
2. **Electoral systems:** Majoritarian, PR, Mixed.
3. **Modeling strategies:** Panel data, Standard OLS, IV, RDD.

These sources of heterogeneity have two implications. First, it makes our estimates very disperse. The heterogeneity tests are all but one significant. When the sample sizes are large enough, we removed more heterogeneous studies, but we still had considerable dispersion in our estimates. Second, the amount of heterogeneity makes fixed effects estimates unrealistic and biased. Thus, we opt for random effects model.

Let each study having an effect of  $T_i$ . In a random effects model, we can decompose this effect in two components, the true effect that the study with the same specifications as  $i$  come from,  $\theta_i$ , and a within-study error  $\varepsilon_i$ :

$$T_i = \theta_i + \varepsilon_i$$

And the random effects model assumes that the  $\theta_i$  varies from study to study, having a true parameter  $\mu$ , plus a between-study error,  $\xi_i$ :

$$T_i = \mu + \xi_i + \varepsilon_i$$

And the random effects model estimates the parameter  $\mu$ , under the challenge of estimating both the within-and-between-study sampling errors.

In all empirical estimates, we use the package `meta`, and the package `dmetar`, described in (Doing Meta-Analysis with R)[[https://bookdown.org/MathiasHarrer/Doing\\_Meta\\_Analysis\\_in\\_R/random.html](https://bookdown.org/MathiasHarrer/Doing_Meta_Analysis_in_R/random.html)]. To empirically implement the random effects model, we need to choose a method to estimate the true effect size variance,  $\tau^2$ , which in our formulation, represents the variance of  $\xi_i$ . We selected the **Restricted Maximum Likelihood Estimator**, as the literature regards it as more precise when we have continuous measures, such as we have on our data (link)[<https://www.ncbi.nlm.nih.gov/pubmed/26332144>].

## Robustness: Full model meta-regressions combined

In this section, we aggregate all the coefficients and run a multivariate meta-regression, controlling by:

1. The type of the dependent variable in the study (expenditure per capita, log of the expenditure per capita, and share of government expenditure in the GDP)
2. The type of the independent variable in the study (N, K, log of N);
3. The electoral system (Majoritarian, Proportional Representation, and Mixed).

The results follow below, and show null effect for all variables, including the intercept.

```
summary(mod)
```

```
##
## Mixed-Effects Model (k = 36; tau^2 estimator: REML)
##
##    logLik  deviance      AIC      BIC     AICc
```

```
## -47.9845    95.9689   125.9689   142.3345   205.9689
##
## tau^2 (estimated amount of residual heterogeneity):      0.2315 (SE = 0.1007)
## tau (square root of estimated tau^2 value):             0.4812
## I^2 (residual heterogeneity / unaccounted variability): 99.94%
## H^2 (unaccounted variability / sampling variability):    1599.58
## R^2 (amount of heterogeneity accounted for):             0.00%
##
## Test for Residual Heterogeneity:
## QE(df = 22) = 175.9758, p-val < .0001
##
## Test of Moderators (coefficients 2:14):
## F(df1 = 13, df2 = 22) = 0.3352, p-val = 0.9772
##
## Model Results:
##
##               estimate          se      tval      pval      ci.lb      ci.ub
## intrcpt        -22.1882   122.5298   -0.1811   0.8580   -276.2994   231.9230
## depvar2logExpPC  -0.5979    0.8526   -0.7012   0.4905    -2.3661    1.1704
## depvar2PCTGDP     0.1796    0.8381    0.2143   0.8323    -1.5585    1.9176
## indepvar2logN     0.4376    1.6148    0.2710   0.7889    -2.9113    3.7865
## indepvar2N       -0.4922    0.5236   -0.9400   0.3574    -1.5780    0.5937
## year             0.0114    0.0609    0.1875   0.8530    -0.1148    0.1376
## publishedYes     -0.2843    0.6541   -0.4346   0.6681    -1.6408    1.0723
## elecsys2Non-Maj   0.2724    0.6284    0.4335   0.6689    -1.0308    1.5755
## methodPANEL       0.1754    0.7126    0.2461   0.8079    -1.3025    1.6532
## methodIV          0.0336    1.0078    0.0334   0.9737    -2.0565    2.1237
## methodRDD         0.2411    1.2612    0.1912   0.8501    -2.3745    2.8567
## agglevelStates    -0.2400    0.7393   -0.3247   0.7485    -1.7733    1.2932
## agglevelCountries -1.4929    1.2027   -1.2414   0.2275    -3.9871    1.0013
## location2World     0.7437    1.5559    0.4780   0.6374    -2.4830    3.9704
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

As we have considerable heterogeneity in our sample, we run a permutation test to ensure the validity of our estimates. The results follow below.

```
##
## Test of Moderators (coefficients 2:14):
## F(df1 = 13, df2 = 22) = 0.3352, p-val* = 0.6810
##
## Model Results:
##
##               estimate          se      tval      pval*      ci.lb      ci.ub
## intrcpt        -22.1882   122.5298   -0.1811   0.8070   -276.2994   231.9230
## depvar2logExpPC  -0.5979    0.8526   -0.7012   0.3270    -2.3661    1.1704
## depvar2PCTGDP     0.1796    0.8381    0.2143   0.7120    -1.5585    1.9176
## indepvar2logN     0.4376    1.6148    0.2710   0.7250    -2.9113    3.7865
## indepvar2N       -0.4922    0.5236   -0.9400   0.1670    -1.5780    0.5937
## year             0.0114    0.0609    0.1875   0.8070    -0.1148    0.1376
## publishedYes     -0.2843    0.6541   -0.4346   0.5280    -1.6408    1.0723
## elecsys2Non-Maj   0.2724    0.6284    0.4335   0.5160    -1.0308    1.5755
## methodPANEL       0.1754    0.7126    0.2461   0.6910    -1.3025    1.6532
## methodIV          0.0336    1.0078    0.0334   0.9640    -2.0565    2.1237
```

```
## methodRDD          0.2411    1.2612    0.1912    0.7710    -2.3745    2.8567
## agglevelStates     -0.2400    0.7393   -0.3247    0.6070    -1.7733    1.2932
## agglevelCountries  -1.4929    1.2027   -1.2414    0.2370    -3.9871    1.0013
## location2World      0.7437    1.5559    0.4780    0.5810    -2.4830    3.9704
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

In the main text, we selected the coefficients based on the regressions that had most observations and that presented a full model (with fixed effects or intermediate bandwidth in RDD). Below we also run the meta-regressions adding all coefficients in the papers. The results follow below:

```
summary(mod)
```

```
##
## Mixed-Effects Model (k = 128; tau^2 estimator: REML)
##
##      logLik   deviance      AIC      BIC      AICc
## -192.2430   384.4860   414.4860   455.5290   419.3840
##
## tau^2 (estimated amount of residual heterogeneity):      0.0624 (SE = 0.0108)
## tau (square root of estimated tau^2 value):             0.2498
## I^2 (residual heterogeneity / unaccounted variability): 99.96%
## H^2 (unaccounted variability / sampling variability):    2838.73
## R^2 (amount of heterogeneity accounted for):             66.57%
##
## Test for Residual Heterogeneity:
## QE(df = 114) = 2083.6861, p-val < .0001
##
## Test of Moderators (coefficients 2:14):
## F(df1 = 13, df2 = 114) = 2.7571, p-val = 0.0019
##
## Model Results:
##
##              estimate      se      tval      pval      ci.lb      ci.ub
## intrcpt          38.5165  36.3251   1.0603  0.2912  -33.4434  110.4763
## depvar2logExpPC   -0.3311   0.2342  -1.4139  0.1601   -0.7949   0.1328
## depvar2PCTGDP      0.4967   0.3068   1.6189  0.1082   -0.1111   1.1044
## indepvar2logN      0.1689   0.4677   0.3611  0.7187   -0.7576   1.0954
## indepvar2N        -0.1467   0.1451  -1.0113  0.3140   -0.4342   0.1407
## year             -0.0190   0.0180  -1.0533  0.2944   -0.0547   0.0167
## publishedYes       0.0690   0.1689   0.4088  0.6834   -0.2655   0.4036
## elecsys2Non-Maj    0.6244   0.2274   2.7464  0.0070   0.1740   1.0748   **
## methodPANEL       -0.1833   0.1588  -1.1546  0.2507   -0.4978   0.1312
## methodIV          -0.1452   0.2364  -0.6139  0.5405   -0.6135   0.3232
## methodRDD         -0.2569   0.2618  -0.9812  0.3286   -0.7756   0.2618
## agglevelStates     -0.5263   0.2324  -2.2648  0.0254   -0.9867  -0.0659   *
## agglevelCountries  -1.8292   0.4527  -4.0406 <.0001  -2.7261  -0.9324  ***
## location2World     0.4062   0.4891   0.8305  0.4080   -0.5627   1.3751
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Test of Moderators (coefficients 2:14):
## F(df1 = 13, df2 = 114) = 2.7571, p-val* = 0.0010
```

```

##
## Model Results:
##
##               estimate      se      tval      pval*      ci.lb      ci.ub
## intrcpt          38.5165  36.3251   1.0603   0.1320  -33.4434  110.4763
## depvar2logExpPC   -0.3311   0.2342  -1.4139   0.0390   -0.7949   0.1328   *
## depvar2PCTGDP     0.4967   0.3068   1.6189   0.0230   -0.1111   1.1044   *
## indepvar2logN     0.1689   0.4677   0.3611   0.5700   -0.7576   1.0954
## indepvar2N        -0.1467   0.1451  -1.0113   0.1340   -0.4342   0.1407
## year             -0.0190   0.0180  -1.0533   0.1330   -0.0547   0.0167
## publishedYes       0.0690   0.1689   0.4088   0.5460   -0.2655   0.4036
## elecsys2Non-Maj   0.6244   0.2274   2.7464   0.0010   0.1740   1.0748   ***
## methodPANEL       -0.1833   0.1588  -1.1546   0.0980   -0.4978   0.1312   .
## methodIV          -0.1452   0.2364  -0.6139   0.3560   -0.6135   0.3232
## methodRDD         -0.2569   0.2618  -0.9812   0.1370   -0.7756   0.2618
## agglevelStates    -0.5263   0.2324  -2.2648   0.0020   -0.9867  -0.0659   **
## agglevelCountries -1.8292   0.4527  -4.0406   0.0010   -2.7261  -0.9324   ***
## location2World     0.4062   0.4891   0.8305   0.2210   -0.5627   1.3751
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```