

Empirical Analysis of the Role of Energy in Economic Growth

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Abstract

***** Add abstract *****

Keywords: economic growth, energy, cobb-douglas, CES, LINEX

Caleb, put your LaTeX code here.

1. Cobb-Douglas Without Energy

```
createCDParamsGraph <- function(){
  # Create a data table with the following columns:
  # country abbrev, parameter (lambda, alpha, or beta), -95% CI, value, +95% CI
  dataTable <- do.call("rbind",
                        lapply(countryAbbrevs,
                              cobbDouglasCountryRowsForParamsGraph))
  print(class(dataTable))
  print(dataTable)
  print(str(dataTable))
  # Make a graph. I want the following:
  ### two-letter country abbreviation on the horizontal axis
  ### dots for the values of each parameter
  ### error bars to the top and bottom of the dots representing the 95% CI
  ### three panels, one for each parameter (lambda, alpha, and beta)
```

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```

#
# Note that "segplot" is in the "latticeExtra" package.
# But, at this point, I obtain the following error:
# "Error: range not meaningful for factors"
graph <- segplot(country ~ upperCI + lowerCI | parameter,
                 data = dataTable,
                 centers = value)
segplot(reorder(factor(county), rate.male) ~ LCL95.male + UCL95.male,
        data = subset(USCancerRates, state == "Washington"),
        draw.bands = FALSE,
        centers = rate.male)
return(graph)
}
createCDParamsGraph()

```

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```

[1] "data.frame"

```

	country	parameter	lowerCI	value
US.1	US	lambda	0.00867713811541703	0.0101554649771947
US.2	US	alpha	0.213128596976903	0.274182451792623
US.3	US	beta	0.664533917792339	0.725817548207377
UK.1	UK	lambda	-0.0104339533284891	0.0097166097229806
UK.2	UK	alpha	-0.245055231216114	0.444076431841734
UK.3	UK	beta	-0.126474527059773	0.555923568158266
JP.1	JP	lambda	0.00214925937049534	0.00517407901182134
JP.2	JP	alpha	0.437044349900555	0.515630717914427
JP.3	JP	beta	0.405869151146723	0.484369282085573
CN.1	CN	lambda	-0.0405221051255718	0.0187921739305594
CN.2	CN	alpha	0.108505956239368	0.712431541207713

CN.3	CN	beta	-0.319614564678439	0.287568458792287
ZA.1	ZA	lambda	-0.000717427211566538	0.000771177746585204
ZA.2	ZA	alpha	0.461441497491662	0.597466553596658
ZA.3	ZA	beta	0.264697791730982	0.402533446403342
SA.1	SA	lambda	-0.0159263027425623	-0.0123103576408377
SA.2	SA	alpha	0.214820434186193	0.448455179197524
SA.3	SA	beta	0.319930296839117	0.551544820802476
IR.1	IR	lambda	0.0031544365568454	0.00385069982960034
IR.2	IR	alpha	0.49113172479408	0.596672406132716
IR.3	IR	beta	0.297079321606455	0.403327593867284
TZ.1	TZ	lambda	-0.00391419988823917	0.00149948729754192
TZ.2	TZ	alpha	0.504166911618199	0.726578989422795
TZ.3	TZ	beta	0.0490171189358977	0.273421010577205
ZM.1	ZM	lambda	0.0217845209774593	0.0249136301557912
ZM.2	ZM	alpha	1.24947924633067	1.41002169368921
ZM.3	ZM	beta	-0.57145350717947	-0.410021693689214
		upperCI		
US.1	0.0116267632506195			
US.2	0.335458612778305			
US.3	0.787101178622416			
UK.1	0.0302750369133842			
UK.2	1.119149013819			
UK.3	1.23832166337631			
JP.1	0.0081926858312227			
JP.2	0.594141371854355			
JP.3	0.562869413024423			
CN.1	0.0779058376028465			
CN.2	1.31814921490484			
CN.3	0.894751482263012			
ZA.1	0.00222325751849382			
ZA.2	0.733549304597543			
ZA.3	0.540369101075701			
SA.1	-0.00873591015395777			
SA.2	0.68279397709528			
SA.3	0.783159344765835			
IR.1	0.00453844391610371			
IR.2	0.702639779772847			

```

IR.3      0.509575866128113
TZ.1      0.00678367569691732
TZ.2      0.951643458591323
TZ.3      0.497824902218513
ZM.1      0.0280398287326144
ZM.2      1.5728851355369
ZM.3      -0.248589880198959
'data.frame': 27 obs. of  5 variables:
 $ country   : Factor w/ 9 levels "US","UK","JP",...: 1 1 1 2 2 2 3 3 3 4 ...
 $ parameter : Factor w/ 3 levels "alpha","beta",...: 3 1 2 3 1 2 3 1 2 3 ...
 $ lowerCI   : Factor w/ 27 levels "0.00867713811541703",...: 1 2 3 4 6 5 7 9 8 10 ...
 $ value     : Factor w/ 27 levels "0.0101554649771947",...: 1 2 3 4 5 6 7 9 8 10 ...
 $ upperCI   : Factor w/ 27 levels "0.0116267632506195",...: 1 2 3 4 5 6 7 9 8 10 ...
NULL
Error: range not meaningful for factors

```

2. Cobb-Douglas With Energy

We can force α , β , and γ to be in $[0, 1]$ by a reparameterization:

$$a \in [0, 1], b \in [0, 1], \alpha = \min(a, b), \beta = |b - a|, \gamma = 1 - \max(a, b)$$

2.1. *Cobb-Douglas with Q*

2.2. *Cobb-Douglas With X*

2.3. *Cobb-Douglas With U*

3. CES

3.1. *CES with Q*