Economies of Scale within State Prisons

Nicholas W. Irving & David A. King
Students of Economics
Department of Economics
Linfield College

Presentation prepared for the 20th Annual Science Symposium on May, 11th 2012

©2012 Nicholas W. Irving & David A. King – Do not cite or quote without the author's permission

Abstract

Our paper analyzes the cost of state prisons as a function of state prison populations across U.S. states. Historically and intuitively, a given state's prison expenditures have risen as more inmates enter the prison system. Through panel regression analysis, a detailed understanding is obtained of how state prisons experience economies of scale as inmate populations rise over time. Our model consists of a single function. The equation is quadratic in nature and uses a cost function to see if there are economies of scale within the state prison systems. Our results indicate that as prison populations increase over time, the cost per-prisoner decreases at a decreasing rate. We find that state prison systems are experiencing economies of scale.

Equation Explained

$$COST_{it}/P_{it} = \alpha_0 + \alpha_1 P_{it} + \alpha_2 P_{it}^2 + \alpha_3 CPI_{it} + \alpha_4 GUARD_{it} + \alpha_5 THREE_{it} + e_{it}$$

$COST_{it}$= Total State Prison Expenditures in Each State

P_{it}= State Prison Population

CPI_{it}= Consumer Price Index Across States

$GUARD_{it}$= Annual Prison Guard Wage

$THREE_{it}$= Tests the Presence of a Three Strikes Law in Each State

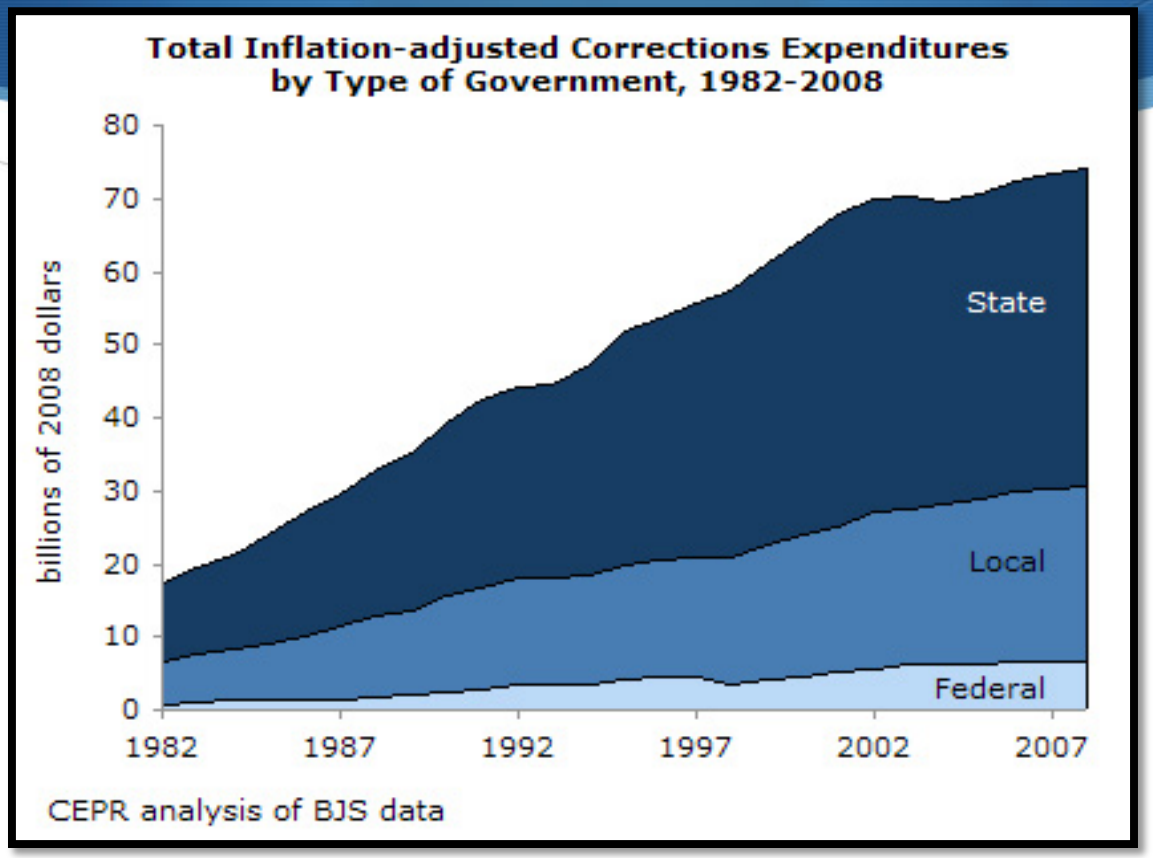
e_{it}= Error Term which Captures Unaccounted Variables

- *$_{it}$ denotes a panel data set. Panel data sets consist of cross-sectional and time-series data*
- *Data was drawn from across the 50 US States for the years: 1994, 1998, 2004, 2006*

Why This Project?

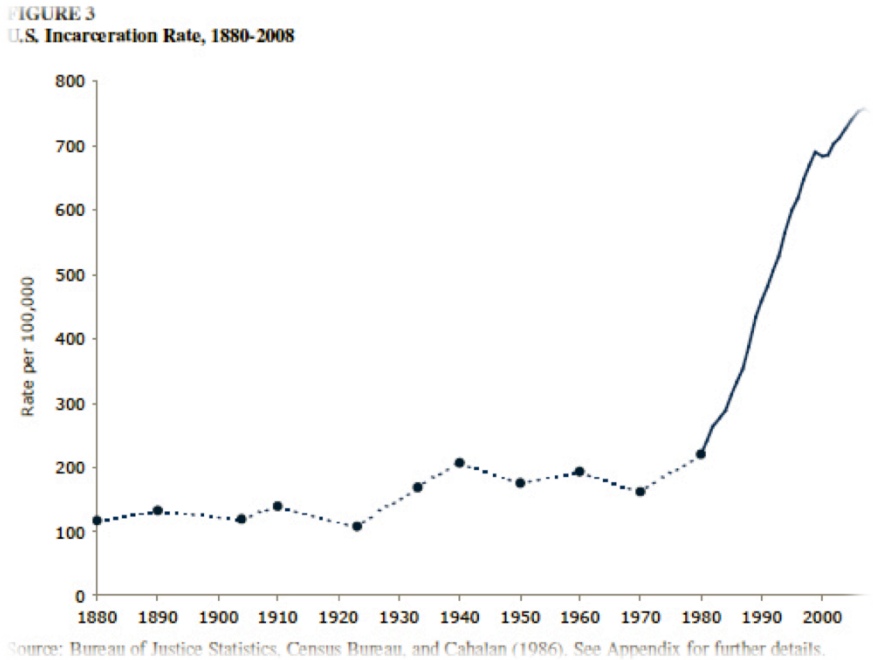
- The United States imprisons 753 inmates for every 100,000 people
  - *240% more than in 1980*
  - *Poland is the 2nd closest country with 224 inmates per 100,000 people*
- State Prisons account for 60% of inmates and roughly 60% of total correction expenditures
- Recent news has highlighted record-high prison populations, creating a socially relevant topic to research
  - *Media generally targets California overcrowding within state prisons*
- Similar studies have been done on the postsecondary educational system

Historical Evidence



•Source: Schmitt, John, Kris Warner, Sarika Gupta. 2010 "The High Budgetary Cost of Incarceration." CEPR. Center for Economic and Policy Research.

Historical Evidence (Cont.)

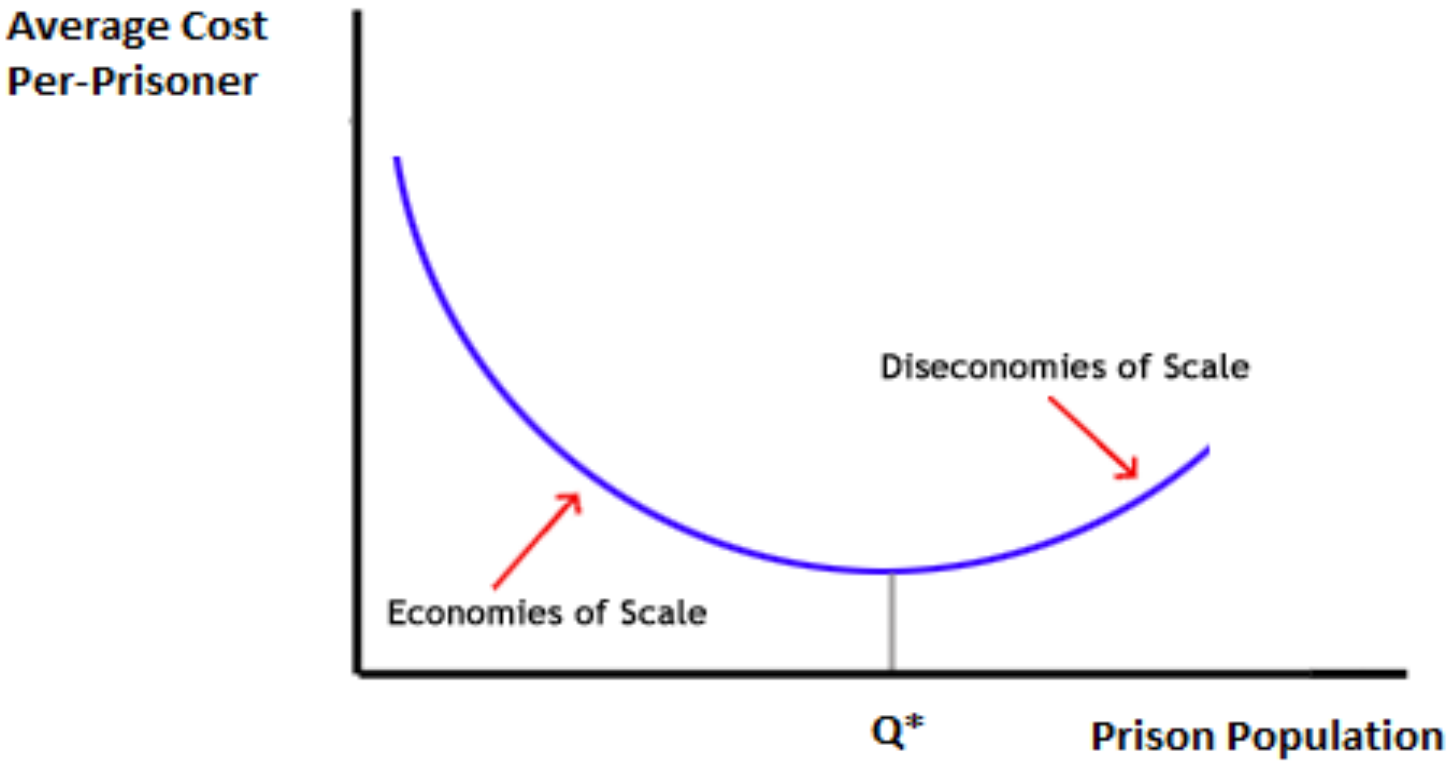


Source: Schmitt, John, Kris Warner, Sarika Gupta. 2010 "The High Budgetary Cost of Incarceration." CEPR. Center for Economic and Policy Research.

Theory

- The model we adopted is based on a previous study that focuses on how the application of cost functions can be used in policy making, and how institutional factors influence costs
  - *"The Value of Cost Functions for Policymaking and Institutional Research." Robert Toutkoushian (1999)*
- We believe the relationship between prison population and the cost per-prisoner will show that short-run reductions in expenditures per-prisoner can be achieved through increasing the prison population
  - *Economies of Scale*
- Economies of scale will exist, but at a decreasing rate. A point will come where adding another prisoner in fact makes the cost per-prisoner rise.
  - *i.e. Overcrowding*

Results Displayed Graphically



Summary

- Our theory aligned with our results, confirming that economies of scale exist within US state prison systems
- Data limitations existed
  - *Data prior to 1994 must be requested in paper form*
  - *In 1980 political initiatives that began the war on drugs caused a massive spike in prison inmates*
- Inclusion of data from 1980 onward would increase the overall accuracy of our equation
- Three Strikes Variable, although statistically insignificant, is still a viable variable if prisoners are to be housed indefinitely, surely this will have a positive effect on prison expenditures.
  - *Extending our data to 1980 will possibly make three strikes a viable variable and increase our equations accuracy*
  - *Prior to 1993 no states had a three strikes law*