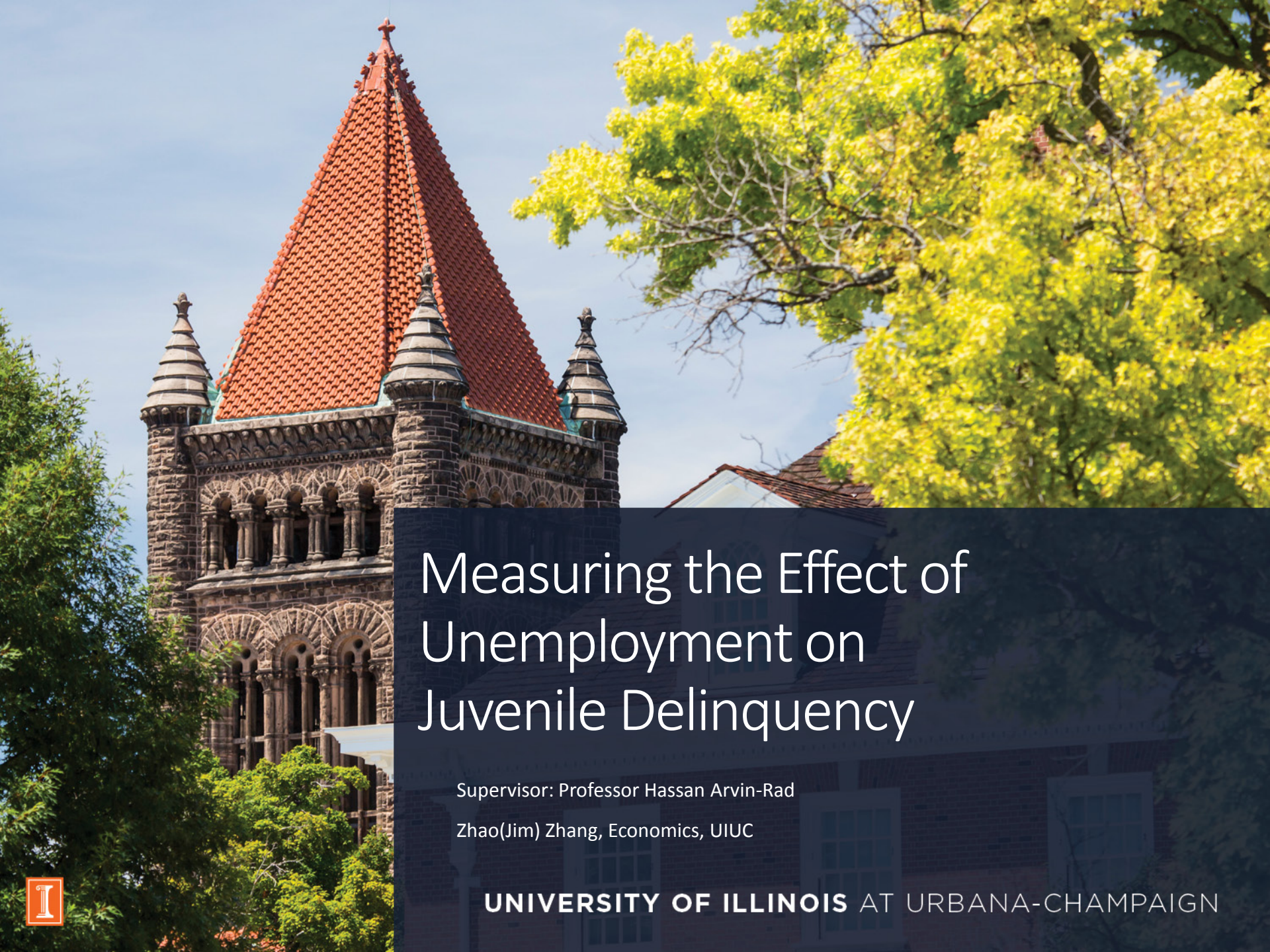

Measuring the Effect of Unemployment on Juvenile Delinquency

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Contents

Introduction

“Youth crime has been increasing in some countries. Violent crimes are committed at younger ages. Youth are disproportionate in statistics, both as victims and perpetrators.”

(United Nations Office on Drugs and Crime & World Bank, 2007).

Literature Review

There have been many studies trying to explain and suggest preventions from the aspects of *psychology, social strain, culture, family, school & peer pressure*. ***(McCord et al., 2001) (Jacob & Lefgren, 2003) (Bartollas & Schmalleger, 2014) (Shoemaker, 2017)

Meanwhile, Researches from the ***Unemployment*** aspect are less carried out. Hence, I conducted this study to measure effects of unemployment on juvenile delinquency with *China's province level data.*

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McCord, J., Widom, C. S., & Crowell, N. A. (2001). *Juvenile Crime, Juvenile Justice. Panel on Juvenile Crime: Prevention, Treatment, and Control*. National Academy Press, 2101 Constitution Avenue, NW, Washington, DC, 20418.

Jacob, B. A., & Lefgren, L. (2003). Are idle hands the devil's workshop? Incapacitation, concentration, and juvenile crime. *American Economic Review*, *93*(5), 1560-1577.

Bartollas, C. L., & Schmalleger, F. J. (2014). *Juvenile delinquency*. Prentice Hall.

Shoemaker, D. J. (2017). *Juvenile delinquency*. Rowman & Littlefield.

Crime: Economics approaches

The study of *Economics of Crime* began with a thesis*** (1968) of Nobel laureate Gary S. Becker.

The original study is on aggregate level.
A logic of criminal decision-making at the individual level could be derived:

$$\textbf{\textit{Expected Utility(Crime Activity)}} = E(\text{Return of Crime}) - E(\text{Punishment Of Crime})$$

$$\textbf{\textit{Expected Utility(Non Crime Activity)}} = E(\text{Wage}) * P(\text{Work Opportunity})$$
$$= E(\text{Wage}) * (1 - \text{Unemployment rate} - u)$$

(u:other disturbance influencing work opportunity)

Individuals rationally choose the option that gives the higher Utility

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Becker, G. S. (1968). Crime and punishment: An economic approach. In The economic dimensions of crime (pp. 13-68). Palgrave Macmillan, London.

In the following decades, empirical researches (statistical research) have repeatedly proved the correctness of Becker's theory.

Macro-level research confirms that unemployment leads to crime in the aggregate. (Hagan, 1993)

Raphael and Winter-Ebmer (2001), Edmark (2005), Speziale (2014), and many other researchers have found that unemployment and crime are positively related.

Raphael, S., & Winter-Ebmer, R. (2001). Identifying the effect of unemployment on crime. *The Journal of Law and Economics*, *44*(1), 259-283.

Hagan, J. (1993). The social embeddedness of crime and unemployment. Criminology, 31(4), 465-491.

Edmark, K. (2005). Unemployment and crime: Is there a connection?. *The Scandinavian journal of economics*, *107*(2), 353-373.

Speziale, N. (2014). Does unemployment increase crime? Evidence from Italian provinces. *Applied Economics Letters*, *21*(15), 1083-1089.

What about for juveniles?

$$\textbf{\textit{Expected Utility(Crime)}} = E(\text{Return of Crime}) - E(\text{Punishment Of Crime})$$

$$\textbf{\textit{Expected Utility(Non Crime Activity)}} = E(\text{Wage}) * P(\text{Work Opportunity})$$
$$= E(\text{Wage}) * (1 - \text{Unemployment rate} - u)$$

However, when apply this analysis to juveniles, problems come: they are not expected to work. **Unemployment should *not* increase their crime rate.**

In the U.S.: Children under 14 may not be employed, children between 14 and 16 may be employed in allowed occupations during limited hours, and children between 16 and 18 may be employed in non-hazardous occupations. Child Labor Provisions for Nonagricultural Occupations under the Fair Labor Standards Act, *U.S. Department of Labor*, 2010

In China: for any entity, employing Child Labor (age<16) is illegal; employing Juvenile Worker(16<age<18) is legal yet with a lot of restrictive conditions.
Order No.364 from the State Council of the People's Republic of China*, Prime Minister Zhu,Rongji*, 2002

However, many previous researches*** have stated that unemployment and juvenile delinquency ***are*** related, positively.

Therefore, the purpose of this study is to determine the relationship between unemployment and juvenile crimes in China's social and economics conditions.

***

Fougère, D., Kramarz, F., & Pouget, J. (2009). Youth unemployment and crime in France. Journal of the European Economic Association, 7(5), 909-938.

Narayan, P. K., & Smyth*, R. (2004). Crime rates, male youth unemployment and real income in Australia: evidence from Granger causality tests. Applied Economics, 36(18), 2079-2095.

Duster, T. (1987). Crime, youth unemployment, and the black urban underclass. Crime & Delinquency, 33(2), 300-316.

Hagan, J. (1993). The social embeddedness of crime and unemployment. Criminology, 31(4), 465-491.

Fleisher, B. M. (1963). The effect of unemployment on juvenile delinquency. Journal of Political Economy, 71(6), 543-555.

Model & Variables

The model is a cross sectional multiple regression model based on province level data.

$$\boldsymbol{Juvenile\ Crime_i = \beta_0 + \beta_1 * Unemployment_i + \sum_{j=2}^{n} \beta_j X_{ji} + \varepsilon}$$

Control variables $\boldsymbol{\beta_j}$ are included for the *family situation, education, regional urbanization and the income gap*.

$$Juvenile\ Crime_i = \beta_0 + \beta_1 * Unemployment_i + \beta_2 * Juvenile\ Dependency\ Ratio_i + \beta_3 * Divorce\ Rate_i + \beta_4 * GDP\ per\ capita_i + \beta_5 * Urbanization\ rate_i + \beta_6 * Income\ Inequality_i + \varepsilon$$

Data

$$Juvenile\ Crime_i = \beta_0 + \beta_1 * Unemployment_i + \beta_2 * Juvenile\ Dependency\ Ratio_i + \beta_3 * Divorce\ Rate_i + \beta_4 * GDP\ per\ capita_i + \beta_5 * Urbanization\ rate_i + \beta_6 * Income\ Inequality_i$$

Most of the variables can be directly obtained in the *China Statistical Yearbook*. There are two variables that are more difficult to obtain.

Unemployment

Income Inequality

Methodology

Macroeconomic variables could have problems with ***multicollinearity.***
Multivariate regression with multicollinear data may still be valid overall, but it might not give valid results about individual coefficients.

$$VIF=\frac{1}{1-R_k^2}$$

where R_k^2 is the R-squared-value obtained by regressing the k-th predictor on the remaining predictors.

VIF measure the extent to which variance are inflated due to predictor correlations

$$\widehat{\mathrm{var}}(\hat{\beta}_j) = \frac{s^2}{(n-1)\widehat{\mathrm{var}}(X_j)} \cdot \frac{1}{1-R_j^2},$$

In this study, the Data are confirmed with issues of multicollinearity.
(checking VIF and correlation matrix)
3 methods are introduced to address the issue.

Ridge Regression

Consider the simplest linear regression

$$\hat{\beta}_{ols} = (X'X)^{-1}X'Y$$

When multicollinearity exists, |X'X|~0, $(X'X)^{-1}$ unstable.
We can solve such problem "by adding a small constant value λ to the diagonal entries of the matrix X′X before taking its inverse"***

$$\hat{\beta}_{ridge} = (X'X + \lambda I)^{-1}X'Y$$

***

Hoerl, A. E., & Kennard, R. W. (1970). Ridge regression: Biased estimation for nonorthogonal problems. *Technometrics*, *12*(1), 55-67.

Penn State STAT897D notes (2018)

Ridge Regression Continued

$$\hat{\beta}_{ridge} = \text{argmin}\left\{\sum_{i=1}^{N}\left(y_i - \sum_{j=0}^{P} x_{ij}\beta_j\right)^2 + \lambda\sum_{j=0}^{p}\beta_j^2\right\}$$

Take the derivative, set it to zero:

$$2X'(Y - X\beta) - 2\lambda\beta = 0$$

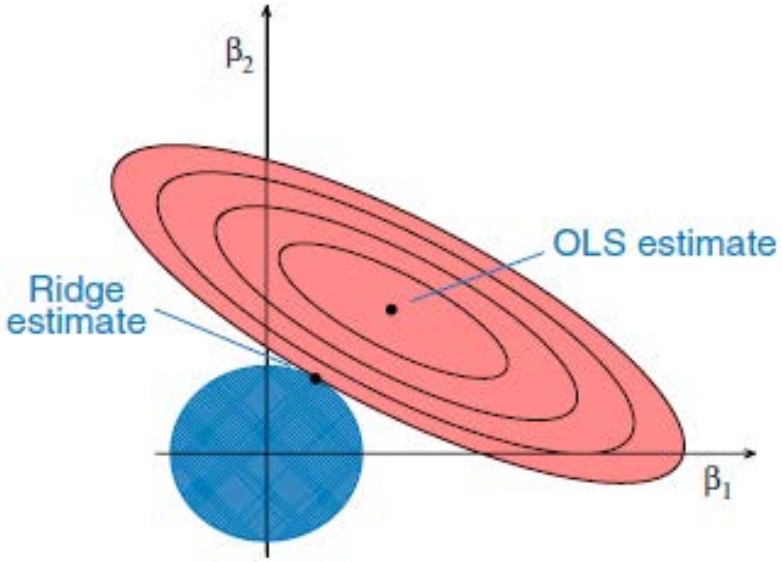
$$\hat{\beta} = (X'X + \lambda I)^{-1}X'Y$$

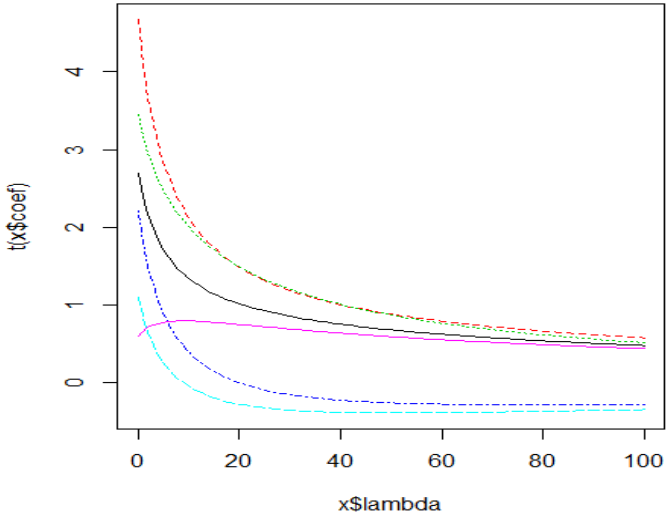
"Tolerate biasness, get more stable (smaller variance) predicts."

Ridge Regression Continued

To choose λ:

- Ridge trace plot
- Cross validation
- VIF selection

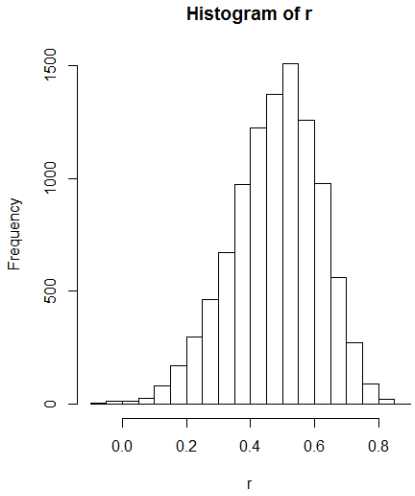


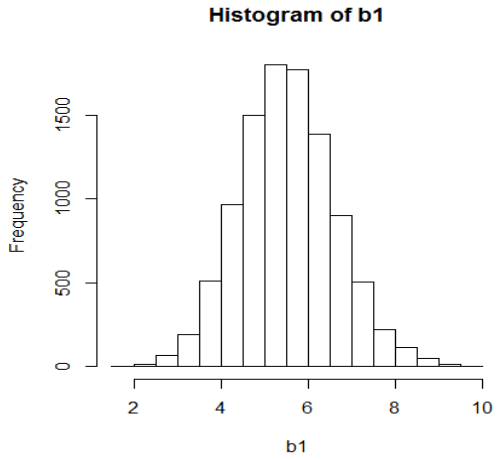


Bootstrap

McCarthy, P. J., & Snowden, C. B. (1985). The bootstrap and finite population sampling.

Booth, J. G., Butler, R. W., & Hall, P. (1994). Bootstrap methods for finite populations. Journal of the American Statistical Association, 89(428), 1282-1289.





Dropping problematic regressors

Dropping regressors that cause multicollinearity is always a reserved option.

Outcomes

Table 2: Ridge Regression

	Scaled Coefficients:
	y
Unemployment	0.9152***
	(0.3363)
Juvenile Dependency Ratio	1.0279***
	(0.3350)
Divorce Rate	0.7105*
	(0.3678)
GDP per capita	-0.7096**
	(0.3272)
Urbanization Rate	-0.7993**
	(0.3244)
Income Inequality	0.8529**
	(0.3465)
Constant	8.8779
Observations	31
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 3: With Bootstrap

	Dependent variable:
	y
Unemployment	0.4805*
Juvenile Dependency Ratio	0.7316***
Divorce Rate	471.7102***
GDP per capita	0.00012
Urbanization Rate	0.0201
Income Inequality	1.6998
Constant	−53.9811**
Observations	31
Replications	10000
Mean R^2	0.6902
Mean Adjusted R^2	0.6127
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 4: With variable 5 and 6 dropped

	Dependent variable:
	y
Unemployment	0.531**
	(0.214)
Juvenile Dependency Ratio	0.699***
	(0.189)
Divorce Rate	468.134***
	(113.291)
GDP per capita	0.0001271**
	(0.000061)
Constant	−25.704***
	(8.393)
Observations	31
R^2	0.597
Adjusted R^2	0.535
Residual Std. Error	4.316 (df = 26)
F Statistic	9.633*** (df = 4; 26)
Note:	*p<0.1; **p<0.05; ***p<0.01

Conclusions & Explanations

Estimates for Unemployment are persistent and robust:
Unemployment, always significantly and positively related to juvenile's committing crime.

Mental Account? Expected future income? And more…

Critiques

Longitudinal(panel) data

Causality tests

Aggregate or individual level?

And more ……

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