Journal of Student Research (2016) Volume 5, Issue 1: pp. 4-7
Review Article

Did Crime Rates Rise After Colorado Legalized Marijuana?

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Using monthly crime reports from Denver's Police Department between January 2010 and December 2014, the authors endeavor to show if there was a break in the trend line of seven different crimes (homicide, rape, aggravated assault, burglary, robbery, larceny, and motor vehicle theft) following Colorado's legalization of marijuana in late 2012. After adjusting for seasonal components (some crimes tend to be higher in summer months), the trend lines reveal no break for crimes against persons. But, three of the four trend lines for crimes against property do reveal a significant decrease after legalization.

Keywords: Marijuana legalization; regression analysis

On November 6, 2012, Amendment 64, the initiative ballot measure to amend Colorado's constitution on marijuana policy, was approved by 55 percent of the state's voters. The amendment allowed the growth, personal consumption, possession, and eventual sale of marijuana for those over 21 years of age. Although retail sale and taxation of recreational marijuana did not begin until January 1, 2014, the law legalizing growth and consumption was added to the state's constitution on December 10, 2012. Groups such as *NoOn64* and *Smart Colorado* opposed the measure, fearing crime would increase.

The purpose of this brief note is to assess the impact of legalizing marijuana on selected crimes against persons (homicide, rape, and aggravated assault) and property (robbery, burglary, larceny, and motor vehicle theft).

Methodology

For each of seven different crimes spanning five years (36 months before legalization and 24 after), we propose to test for a break in the trend line following legalization. This will be done by means of regressions of the form:

$$Crime = b_0 + b_1 Time + b_2 Summer + b_3 Marijuana$$

where *Time* is a time trend; *Summer* is a 0-1 binary variable which is equal to 1 for observations in June, July, or August (and 0 otherwise); and *Marijuana* is another 0-1 binary variable which is equal to 1 for observations in January 2013 (the first full month following legalization) and every month thereafter (and 0 otherwise).

If crimes follow a seasonal pattern, with the number of offenses increasing during the summer months, then the estimated coefficient $\hat{b}_2$ should be positive and statistically discernible from zero. If, after allowing for differences between summer and non-summer months, the estimated coefficient $\hat{b}_3$ is positive (negative) and statistically discernible from zero, we can conclude that the number of offenses in that crime category increased (decreased) following legalization. If the estimated coefficient $\hat{b}_3$ is either positive or negative but not discernible from zero, then we can conclude that the number of offenses in that crime category did not significantly change from what would be expected from the time trend (after allowing for seasonal variations).

Our data (see Table 1) are from the Denver Police Department's monthly crime report for Denver County over the period January 2010 through December 2014 [1, 2, 3, 4]. All but two of the crimes (homicide and rape) reveal an increasing trend over time. Rape, aggravated assault, burglary, and larceny spike during the summer. And, insofar as the marijuana legalization dummy variable is concerned, we observe discernible differences — all *decreases* — for robbery, burglary, and motor vehicle theft, all of which are crimes against property.

But, why should just crimes against *property* decrease after legalization? The average price of marijuana has steadily dropped since legalization.[1] And lower prices, in turn, should lead to fewer crimes against property. The social problem associated with illicit drugs is that users must obtain relatively large sums of money daily and most of the money they spend on illicit drugs is obtained illegally creating much crime. If the demand for marijuana is price inelastic (one estimate is -0.44 for all age groups, but even less elastic for users over 26 years of age, see [6]) and the price of marijuana falls, then users would be obliged to raise much smaller sums of money daily to support their habits.[2] Thus lower prices may well result in less crime, as we observe here for multiple crimes against property in Denver.

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Results

Table 1. Monthly number of crimes in Denver, by type, January 2010 through December 2014

Year	Month	Homicide	Rape	Robbery	Aggravated Assault	Burglary	Larceny	Vehicle Theft
2010	January	5	107	87	165	313	404	271
	February	1	45	69	140	289	337	244
	March	1	56	75	149	339	372	232
	April	1	71	74	145	345	419	239
	May	1	58	88	232	404	496	293
	June	3	86	73	190	386	523	290
	July	2	69	97	225	480	601	267
	August	0	63	74	212	448	554	265
	September	4	76	80	190	454	623	330
	October	6	80	86	210	387	636	314
	November	5	44	75	195	401	461	290
	December	5	61	123	180	397	423	268
2011	January	3	88	105	189	347	441	282
	February	3	60	58	115	281	429	272
	March	3	52	97	206	400	425	323
	April	4	76	79	186	337	441	249
	May	7	69	82	225	391	529	299
	June	3	78	96	202	407	629	290
	July	2	71	117	232	430	662	302
	August	8	85	134	236	465	699	336
	September	4	82	114	211	524	635	279
	October	3	66	115	188	464	513	290
	November	1	59	97	162	416	463	389
	December	2	70	113	175	501	453	307
2012	January	1	84	134	182	413	511	333
	February	3	55	77	132	319	453	237
	March	4	77	122	211	396	573	267
	April	4	73	134	225	368	605	265
	May	4	71	97	270	516	665	313
	June	4	80	123	243	453	655	319
	July	2	94	122	283	485	777	340
	August	3	92	121	246	532	743	355
	September	1	88	109	195	468	674	399
	October	9	64	95	181	488	665	348
	November	3	45	119	191	409	617	294
	December	1	62	108	204	427	559	283
2013	January	4	79	117	207	443	583	331
	February	5	53	78	142	330	496	258
	March	3	66	85	213	357	538	265
	April	5	61	72	177	397	563	267
	May	2	91	85	216	438	727	284
	June	2	79	95	212	444	751	287
	July	4	63	121	238	476	876	303
	August	5	75	110	260	499	809	299
	September	2	53	88	209	456	697	283
	October	4	69	100	201	423	708	357
	November	2	50	102	219	374	613	272
	December	3	51	84	197	457	587	301
2014	January	2	69	121	188	453	627	329
	February	1	49	62	172	348	518	252
	March	5	54	71	186	356	646	251
	April	1	67	81	169	325	620	241
	May	2	72	85	255	397	694	288
	June	2	73	83	224	411	718	313
	July	3	70	104	217	377	779	320
	August	5	57	93	241	422	843	306
	September	1	78	109	198	419	742	293
	October	4	69	104	231	378	721	244
	November	3	55	89	185	315	554	281
	December	2	66	97	209	393	583	328

Sources Table 1:
http://www.denvergov.org/Portals/720/documents/statistics/current/XCitywide_Reported_Offenses_2011.pdf
http://www.denvergov.org/Portals/720/documents/statistics/2012/XCitywide_Reported_Offenses_2012.pdf
http://www.denvergov.org/Portals/720/documents/statistics/2013/XCitywide_Reported_Offenses_2013.pdf
http://www.denvergov.org/Portals/720/documents/statistics/2014/XCitywide_Reported_Offenses_2014.pdf

Table 2. The Regression Results

Crime	Constant term (b_0)	Time Trend (b_1)	Summer (b_2)	Marijuana (b_3)	R^2
Crimes against persons					
Homicide	3.100 (5.29)[1] ***	0.005 (0.21)	0.085 (0.15)	-0.385 (-0.42)	0.005
Rape	67.875 (16.58)***	0.047 (0.26)	9.169 (2.38)*	-7.048 (-1.09)	0.132
Aggravated Assault	168.600 (19.44)***	1.072 (2.77)**	38.197 (4.67)***	-23.201 (-1.70)	0.363
Crimes against property					
Robbery	78.661 (14.97)***	0.982 (4.19)***	9.279 (1.87)	-35.418 (-4.28)***	0.295
Burglary	365.293 (21.62)***	1.926 (2.56)*	49.649 (3.12)**	-67.442 (-2.54)**	0.236
Larceny	410.664 (18.02)***	5.330 (5.25)***	147.958 (6.89)***	-39.762 (-1.11)	0.677
Vehicle Theft	265.149 (25.00)***	1.485 (3.14)**	15.476 (1.55)	-51.356 (-3.08)**	0.191

[1] Numbers in parentheses are t-values.

* $p < .05$, ** $p < .01$, *** $p < .001$.

Concluding Remarks

On December 10, 2012, the state of Colorado allowed adults to possess and use an ounce (or less) of marijuana. Monthly crime statistics in Denver County on seven different types of crimes ─ homicide, rape, aggravated assault, robbery, burglary, larceny, and motor vehicle theft ─ were examined 36 months before and 24 months after legalization. Not one increased. And, three different types of crimes ─ all crimes against property ─ significantly decreased after legalization.

References

1. Reported offenses in the city and county of Denver by month, 2010 http://www.denvergov.org/Portals/720/documents/statistics/current/XCitywide_Reported_offenses_2011.pdf
2. Reported offenses in the city and county of Denver by month, 2011 http://www.denvergov.org/Portals/720/documents/statistics/2012/XCitywide_Reported_offenses_2012.pdf
3. Reported offenses in the city and county of Denver by month, 2012 http://www.denvergov.org/Portals/720/documents/statistics/2013/XCitywide_Reported_offenses_2013.pdf
4. Reported offenses in the city and county of Denver by month, 2013 and 2014 http://www.denvergov.org/Portals/720/documents/statistics/2014/XCitywide_Reported_Offenses_2014.pdf
5. K. Caulderwood, Can marijuana black market compete with legalized industry?, *International Business Times*, December 18, 2014 http://www.ibtimes.com/can-marijuana-black-market-compete-legalized-industry-1762965
6. D. Ruggeri, Marijuana price estimates and the price elasticity of demand, *International Journal of Trends in Economics, Management & Technology*, Vol. II, Issue III, June 2013 http://www.ijtemt.org/vol2issue3/Marijuana_price_estimates.php

Footnotes

1. According to a December 18, 2014 article in the *International Business Times* [5], the average price of an eighth of an ounce of marijuana dropped from $60 to around $30 by the end of the year after sales started in Colorado in January 2014.

2 . The price elasticity of demand is defined to be the percentage change in the quantity demanded of a good in response to a 1 percent change in its price. If the percentage change in the quantity demanded is less than the percentage change in its price, then demand is price inelastic. And, if demand is price inelastic, a price decrease will cause total expenditures to fall.