



# The Border Patrol Checkpoint on Interstate 19 in Southern Arizona

**A Case Study of Impacts on  
Residential Real Estate Prices**

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## Executive Summary

This report examines impacts of the Border Patrol checkpoint along Interstate 19 (I-19) in southern Arizona on communities located between the checkpoint and the U.S. border. In particular, the report examines the consequences of the checkpoint for real estate prices in the communities of Tubac and Rio Rico, which are located just to the south of the checkpoint. Interviews with a broad cross-section of community members in the area revealed significant opposition to the checkpoint, including claims that the checkpoint's presence has had a negative impact on residential real estate prices.

### Categories of impact

A number of themes emerged from interviews with community members, which characterize the impacts of the checkpoint as falling into three broad categories related to:

- ***circumvention*** with its attendant public safety and law-enforcement costs;
- ***inconvenience*** deriving from unpredictable wait times and risk of secondary screening for those having to regularly travel through the checkpoint; and
- ***economic harm*** deriving both from changing public perceptions about the dangers of visiting or living in the border region and from the inconvenience, in the case of Tubac and the I-19 checkpoint, to residents and tour groups that have to go through the checkpoint and wait as their busses are boarded and documents inspected.

This report presents the results of a study (a regression analysis) that aimed to answer the question: ***Is there statistical evidence that the I-19 border checkpoint has had a negative impact on residential real estate prices in communities to its south?***

### Measures of impact: Regression analysis of real estate price data

Regression analysis indicated that the I-19 checkpoint *is* having a negative impact on residential real estate prices in communities to its south and that this impact is increasing over time.

The regression calculated a very small (\$92) and not statistically significant initial impact on prices when the checkpoint first opened at its current location, indicating that the checkpoint

did not have an immediate impact on real estate prices. However, the regression analysis also examined whether the checkpoint *changed* the effect associated with the passage of time on Tubac–Rio Rico prices relative to prices in Green Valley (located a few miles north of the checkpoint).

In this case, the magnitude of the checkpoint’s impacts on residential real estate prices is much larger and statistically significant. The analysis estimates that, all other things being equal, real estate prices in Tubac–Rio Rico declined by an average of \$2769 per three-month period relative to those in Green Valley between the time that the checkpoint opened in its current location (April 2010) and when this analysis was conducted (July 2012).

NOTE: It is important to note that the dollar amounts of these estimates calculated by the regression analysis must be interpreted as order-of-magnitude impacts rather than exact dollar estimates.

*Given the above caveat, however, this regression analysis provides statistical evidence that, all other things being equal, the checkpoint is the factor with the largest impact on differences in trends in home prices between Tubac–Rio Rico and Green Valley. These regression results are consistent statistically with the hypotheses that the checkpoint is having negative impacts on housing prices in Tubac–Rio Rico and that these negative impacts have increased over time.*

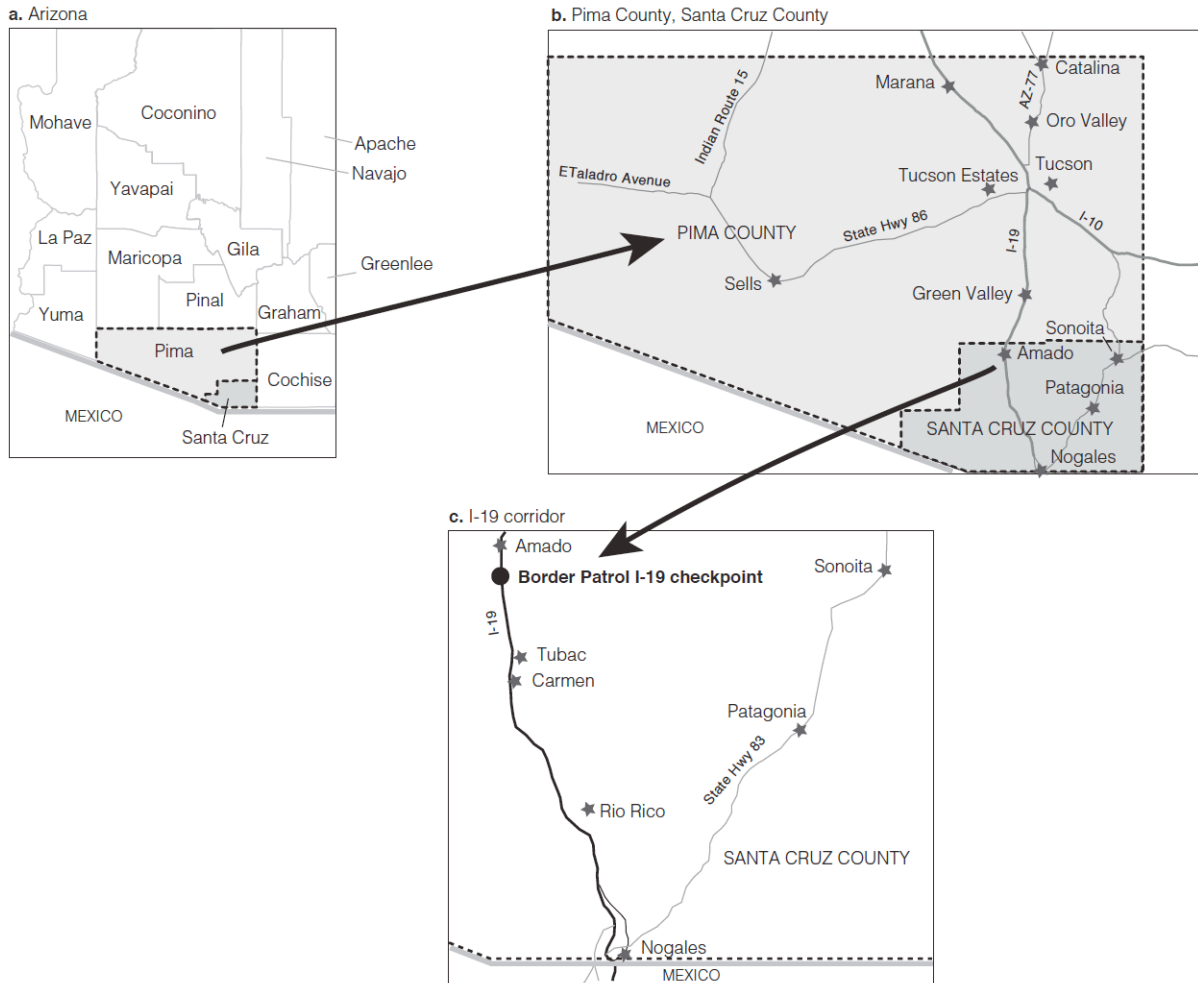
## Introduction and Background

The objective of this study is to use statistical methods to evaluate claims regarding impacts on nearby communities of the Border Patrol checkpoint on Interstate 19 (I-19) located in southern Arizona between the communities of Green Valley and Tubac–Rio Rico (see Figure 1).

Because Border Patrol checkpoints are, by design, some distance inside the United States rather than along its borders they inevitably have impacts on nearby communities. A number of factors shape the extent and magnitude of these impacts including:

- the number, size, and population density of communities between the checkpoint and the U.S. border;
- the nature of the economic activity that sustains these communities; and
- the nature of the terrain around the checkpoint.

The 25-mile corridor along I-19 is home to a number of long-standing communities. The checkpoint along I-19 between Tucson and Nogales, Arizona, is unique in the number and size of communities that exist between it and the U.S.-Mexico border. The village of Tubac, with a year-round population of approximately 1,200 people, is just four miles south of the checkpoint. Rio Rico, with a population of approximately 19,000, is 10 miles to the south, and Nogales, right at the border, has a population of approximately 20,800 people. According to the U.S. Census Bureau, there are approximately 41,400 people living in communities within the 25 miles of I-19 between the checkpoint and the border. To the north of the checkpoint are the communities of Amado, Green Valley, and Sahuarita, with a total population of approximately 55,000 people. The principal economic engines of the region are real estate, tourism, mining, farming, and ranching.



**Figure 1. Location of the U.S. Border Patrol I-19 checkpoint.**

Source: U.S. Government Accountability Office, "Checkpoints Contribute to Border Patrol's Mission, but More Consistent Data Collection and Performance Measurement Could Improve Effectiveness," GAO-09-824, August 2009, p. 70.



## Key Findings and Themes

The location of a checkpoint determines its effectiveness as well as its impacts. While this may seem obvious, it is useful to think in terms of a radius of impacts around a checkpoint that is overlaid on its surrounding communities. As the checkpoint moves, so does the radius. And, not surprisingly, attitudes toward the checkpoint are significantly shaped by location within the radius and relative to the checkpoint.

Background information for this inquiry into the impacts of the checkpoint was obtained through a series of informational meetings with a variety of stakeholders in communities around the I-19 checkpoint. These stakeholders included local residents; representatives of the Southern Arizona Resort and Lodging Association, the Tubac Golf Resort and Spa, the Esplendor Resort in Rio Rico; representatives of the Fresh Produce Association of America; local small business owners in communities south of the checkpoint; representatives of the Santa Cruz County sheriff's office; and representatives of local chambers of commerce. A set of concerns and themes emerged from these meetings and this report examines a claim voiced by a number of people that the I-19 checkpoint is having a negative effect on residential real estate prices in communities to its south.

Interviews with community members indicate that measures of checkpoints' community impacts can be grouped into three broad categories: those related to *circumvention* with attendant public safety and law-enforcement cost consequences; those related to *inconvenience* deriving from unpredictable wait times and risk of secondary screening for those having to travel through the checkpoint; and those related to *economic harm* deriving both from changing public perceptions about dangers in the border region and, in the case of Tubac and the I-19 checkpoint, from the inconvenience to residents and to tour groups that have to go through the checkpoint and wait as their busses are boarded and documents inspected. The impacts of a checkpoint from inconvenience and economic harm are disproportionately born by communities that lie between the checkpoint and the U.S. border. The themes and concerns articulated by a cross-section of those interviewed are summarized below.

- Because the economies of Tubac and Rio Rico are very dependent on tourism, there is a frequently voiced concern by members of the community that the presence of a large, apparently permanent checkpoint contributes to a perception among visitors to the area that the border region is dangerous. Community members indicated that the size of the I-19 checkpoint—with its significant Border Patrol staff, dogs, and physical infrastructure—creates a military atmosphere that is intimidating to people going through it.
- The perception that the border region is dangerous, in turn, hurts real estate values and negatively impacts businesses south of the checkpoint, many of which rely heavily on tourism.
- Because of the dampening effect on tourism, the checkpoint has the effect of shifting the economic base of the region away from tourism and toward border enforcement itself. The presence of Border Patrol agents on the federal payroll does bring money into the region, but a number of people noted that, while the checkpoint is located in Santa Cruz County, many Border Patrol agents live in Green Valley (Pima County) north of the checkpoint. This means that Santa Cruz County bears much of the economic cost of the checkpoint in the form of reduced tourism without necessarily reaping an equivalent share of its economic benefit in the form of Border Patrol paychecks being spent in the community.

## Research Approach

As stated, numerous community members asserted that the checkpoint has had a negative impact on public perceptions, with attendant economic effects, regarding the safety and desirability of living in communities to the south of the checkpoint, and that these impacts include downward pressure on real estate prices above and beyond those associated with general economic conditions. Regression analysis provides insight as to whether there is statistical evidence to support these claims.

The principal challenge in addressing this question is the fact that a number of complex factors combine to determine real estate prices. For the region of southern Arizona, these factors, among others, include a severe economic downturn that has severely impacted the real estate market throughout Arizona and the United States, negative fallout from Arizona's passage of SB1070 (a law intended to curtail illegal immigration), and publicity about violence in Mexico that some fear has made the U.S. border region a more dangerous place to live.

As a result of these complexities, rather than trying to explain real estate prices per se, this analysis was formulated to examine *differences* in prices between Green Valley (north of the checkpoint) and Tubac-Rio Rico (south of the checkpoint.) This approach assumes that the broader, "macro-environment" effects these two areas (north and south of the checkpoint) in essentially the same way and allows the study as to whether there is statistical evidence to support the proposition that differences in real estate prices in the two areas is due to their respective locations relative to the checkpoint. The regression analysis was formulated to ask a very specific question: given the complex factors affecting the region's real estate market, are prices in Green Valley moving differently than those in Tubac-Rio Rico and if so, is there statistical evidence as to why?

## Regression Analysis of Real Estate Prices

Monthly price data for individual homes sold in communities north and south of the checkpoint was collected along with information about home attributes. These data were collected for a time period before and after the I-19 checkpoint opened in its current location. Two monthly residential real estate price indices were constructed: one for Green Valley and a second for Tubac plus Rio Rico. In addition, data on commercial real estate permits was collected from the Santa Cruz County building department.

A regression equation with the following specification was estimated:

$$\begin{aligned} \text{Tubac-Rio Rico price index} = & \\ & \text{a function of a constant} \\ & + \beta_1 * (\text{Green Valley Price Index}) \\ & + \beta_2 * (\text{time trend}) \\ & + \beta_3 * (\text{checkpoint dummy variable}) \\ & + \beta_4 * (\text{time trend-checkpoint interaction}) \\ & + \beta_5 * (\text{Tubac commercial real estate permits}) \end{aligned}$$

The coefficients ( $\beta$ s) in this regression represent the magnitude of change on a unit of the Tubac-Rio Rico price index that results from a unit of change in the associated explanatory variable. By focusing on *differences* between Green Valley and Tubac-Rio Rico, it was not necessary to model the specific effects on home prices of the economic downturn, of SB1070, or concerns about violence in the border region since these similarly affect both subsets of the region's real estate market. By using the price index for Green Valley as a predictor (explanatory variable) for the price index for Tubac-Rio Rico, the broader drivers of regional prices are, by definition, reflected in the Green Valley price index. This focuses the analysis on factors that are correlated with *differences* between the two price indexes.

## Residential real estate price indices

The two monthly residential real estate price indices were constructed using the methodology outlined in a paper by Professor N. Edward Coulson of the Department of Economics at Penn State University<sup>1</sup> and described herein. These indices are the basis of our regression analysis of a possible correlation between the checkpoint and residential real estate prices to its south.

When interpreting regression results, one must distinguish between correlations (associated relationships) and causality. In the face of statistically significant results, we can report that changes in one variable are statistically associated with changes in another. But a regression equation itself cannot *prove* causality. Understanding causality is obtained through *a priori* understanding that shapes the forming of hypotheses and subsequent testing of these hypotheses through statistical techniques such as regression analysis. The results of such testing are either consistent or inconsistent with the hypotheses and *a priori* understanding and can then inform further inquiry.

## Price index methodology

For each time period in each region, a linear regression was done on prices as a function of a property's real estate characteristics (such as the number of bedrooms, bathrooms, etc.). The coefficients of these regressions provide an idea of how each characteristic was valued in each region at each time period. The characteristics of a benchmark property in each region were then calculated by averaging the characteristics of all houses sold across markets and periods. Once this was completed, the estimated price of this benchmark property was calculated for each region in each period by multiplying the coefficient values for that period and region by its benchmark characteristics. Once the predicted price for every region and time period of the benchmark property was calculated, it was used to create a price index from a base year—in this case February–April 2009—for each region. When the price index changes by a unit of 1, prices have increased by 1% of the price of the benchmark property in the benchmark period. In this case, the price of the benchmark house in Tubac–Rio Rico in February–April of 2009 was \$157400. A 1% change in the index translates to a price change of \$1574.

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1. Coulson, N. Edward, "Housing Price Index Methodologies," Department of Economics, Penn State University, Prepared for the International Encyclopedia of Housing and Home to be published by Elsevier, Limited. Available at: <http://www.econ.psu.edu/~ecoulson/iehh3.pdf>.

### *Regression model specification*

Table 1 describes the explanatory variables used in the regression, the reasoning that informed their inclusion. Please refer to the Appendix (page 15) for the statistical results of the regressions.

**Table 1. Regression variables**

<b>Explanatory Variable</b>	<b>Reason for Inclusion</b>
Green Valley Price Index	Inclusion of this variable presumes that Tubac and Rio Rico are subject to the same general economic trends as Green Valley. This specification has the effect of taking conditions in the broader economy as given.
Time trend	Inclusion of this variable estimates any systemic changes in the relationship between Green Valley and Tubac/Rio Rico prices that may be occurring over time for any of a variety of reasons.
Checkpoint “dummy”	Having a value of 0 prior to the locating of the checkpoint in its current location and a value of 1 thereafter, “dummy” variables are included to estimate the impact of events that begin at and continue from a specific point in time. The checkpoint indicator measures the average difference, all other things equal, between the Tubac/Rio Rico price index before the checkpoint and after the checkpoint.
Time trend - Checkpoint “dummy” interaction	Inclusion of this variable provides a statistical test of whether the checkpoint <i>alters</i> the nature of any systematic changes over time in the relationship between Green Valley and Tubac–Rio Rico residential real estate prices.
Square footage of Tubac commercial real estate building permits	Inclusion of this variable presumes that expansion of commercial real estate in Tubac—most of which is devoted to tourism amenities—has the effect of “sprucing up the town” and making Tubac and Rio Rico more desirable places to live.

### *Regression results*

Overall, this regression specification resulted in an R-squared of 98 percent, which means that 98 percent of the variation in the Tubac–Rio Rico price index is statistically accounted for by the variation in the regression’s explanatory variables. The signs on the coefficients are intuitively plausible:

- The regression estimates a statistically significant (measured by a t-statistic of 4.48) positive relationship between Tubac–Rio Rico and Green Valley prices. This means that, all other things being equal, as Green Valley prices increase or decrease, prices in Tubac–Rio Rico can also be expected to increase or decrease. This statistical result is consistent with the hypotheses that the “macro” environment affects both communities similarly.
- The regression estimates a positive, but not statistically significant (t-statistic of .33) relationship between Tubac–Rio Rico prices and the time trend. This means that, all other things being equal, there is not significant evidence of any divergence between Green Valley and Tubac–Rio Rico prices over time.
- The regression estimates a negative, but not statistically significant (t-statistic of -0.01) relationship between Tubac–Rio Rico prices and the checkpoint. This means that, all other things being equal, there is no statistical evidence that the checkpoint in its current location had an immediate negative effect on Tubac–Rio Rico prices.
- The regression estimates a statistically significant (t-statistic of -2.32) negative relationship between Tubac–Rio Rico prices and the interaction term between time and the checkpoint. The coefficient for the time-checkpoint interaction term provides an estimate, all other things equal, of how the checkpoint *changes* time’s effects on Tubac–Rio Rico prices. In this case, the statistically significant negative coefficient is consistent with the hypothesis that the checkpoint has negatively altered time’s impacts on Tubac–Rio Rico prices relative to Green Valley prices. This time-checkpoint interaction variable is important. We have noted that there is no statistical evidence of a divergence over time in and of itself between Tubac–Rio Rico and Green Valley prices. We have also noted that there is not strong statistical evidence that the checkpoint had an *immediate* impact on Tubac–Rio Rico prices. But the time-checkpoint interaction term provides statistical evidence that a divergence over time between Green Valley and Tubac–Rio Rico prices emerged after the checkpoint began operation in its current location. While there could be another causal factor to explain this change, we have not been able to

identify what that is, and the results of this regression are consistent with the hypothesis that the checkpoint is the causal factor.

- The regression estimates a positive relationship between Tubac–Rio Rico prices and expansion of commercial square footage in Tubac. This provides statistical evidence that expansion of Tubac’s commercial square footage—this included an expansion of the Tubac Center for the Arts, which is an important tourist amenity—has the effect of “sprucing up” the community and making it a more desirable place to live.

### **Regression implications for home prices**

Because this regression uses price indices calculated for benchmark properties, it is necessary to translate what the regression means for actual average residential real estate prices in Tubac–Rio Rico. While it is very important not to assign too much precision to the estimates of the individual coefficients, they do provide a gauge of the order of magnitude of the statistical estimate of each variable’s effect relative to the others. With this caveat in mind, the following describes what the various regression variables’ coefficients imply as to their effects on Tubac–Rio Rico prices.

- The regression estimates the effect on Tubac–Rio Rico prices that is associated with changes in Green Valley prices. The magnitude of that effect is provided by the coefficient, which is estimated by the regression to be 0.475. This is interpreted as meaning that, all other things equal, a 1% change in the Green Valley price index is associated with a .475% change in the Tubac–Rio Rico price index. However, the benchmark price, described above, must be used to translate percent changes in the price indices to dollar amounts. This is accomplished as follows. The value of the benchmark house in Tubac–Rio Rico is \$157,400 and 1 percent of this value is \$1574. Thus, all other things being equal, a 1% change in the Green Valley price index is associated with an approximate \$747 ( $\$1574 \times .475$ ) change in the Tubac price index.
- The regression estimates the effect on Tubac–Rio Rico prices that is associated with the passage of time. The magnitude of that effect is provided by the coefficient, estimated by



the regression to be 0.2992708. This means that, all other things equal—including the absence of the checkpoint—during each three-month period, Tubac–Rio Rico prices increased on average by \$471 ( $= \$1574 \times 0.2992708$ ). The fact that this coefficient is not statistically significant indicates that the \$471 impact is not statistically different from \$0.

- The regression estimates the effect on Tubac–Rio Rico prices that is associated with the opening of the checkpoint at its current location. The magnitude of that effect is provided by the coefficient, estimated by the regression to be -0.0586727. This means that an average house declined in value by \$92 ( $= \$1574 \times -0.0586727$ ) after the checkpoint opened in its current location. The fact that this coefficient is not statistically significant indicates that the \$92 impact is not statistically different from \$0.
- The checkpoint-time interaction term causes the regression to estimate whether the checkpoint *changes* the effect on Tubac–Rio Rico prices associated with the passage of time. In other words, it estimates the *difference* between the time trend effect after the checkpoint and before the checkpoint. In this case, the magnitude of the coefficient estimated by the regression is -2.058916 and is statistically significant. This means that, all other things equal, compared to before the checkpoint, the time trend after the checkpoint decreased Tubac–Rio Rico prices by \$3240 ( $= \$1572 \times -2.058916$ ) per three-month period. On net, if one takes into account both the positive impact of time on its own and the negative time-checkpoint interaction, Tubac–Rio Rico prices fell by an average of \$2769 ( $= \$3240 - \$471$ ) per three-month period since the checkpoint opened in its current location.
- The regression estimates the effect on Tubac–Rio Rico prices that is associated with the expansion of commercial square footage in Tubac. The magnitude of that effect is provided by the coefficient, estimated by the regression to be 0.0019266. This means that an average house increased in value by \$3 ( $= \$1574 \times 0.0019266$ ) for every square foot of commercial real estate building permit that was granted.

It is important to reiterate that the dollar amounts of the estimates calculated by this regression must be interpreted as order-of-magnitude impacts rather than reliable dollar estimates. Having said this, however, this regression analysis does clearly suggest that the checkpoint is associated with fairly large negative impacts on the difference in housing prices in the Tubac-Rio Rico area compared to those in Green Valley and that those negative impacts are increasing over time.

## Summary and Conclusions

The concerns voiced by members of communities to the south of the I-19 checkpoint with regard to its impacts are, in many instances, difficult to quantify, and perspectives are shaped by a number of factors including distance from the checkpoint. There was, however, quite a bit of consistency in the perspectives of a wide range of individuals—retirees, business and community leaders, law enforcement representatives, individual members of the community, and school officials—with regard to the checkpoint. Specifically, there is significant concern about economic harm to communities south of the checkpoint as a result of the checkpoint increasing negative perceptions of safety in the region. Analysis of real estate price data provides strong statistical evidence of one type of economic harm associated with the checkpoint. While the perceived decline in tourism in the region as a result of the checkpoint is difficult to quantify, business representatives to the south of the checkpoint were unequivocal in their views that there has been, in fact, a decline in tourism in the region as a result of the checkpoint. Thus, while the full extent of community impacts are difficult to quantify, the nature of these impacts seems fairly clear and the quantitative analysis we were able to perform provides support for many of the concerns expressed by members of communities to the south of the I-19 checkpoint.

## Appendix

### Regression Analysis of Technical Information

**Table A1. Regression Summary Statistics**

Source	Sum of Squares	Degrees of Freedom	Mean Squared	Number of observations:	13
Model	1898.62827	5	379.725654	F( 5, 7)	110.5
Residual	24.0545625	7	3.43636607	Prob. > F	0
Total	1922.68283	12	160.223569	R-squared:	0.9875
				Adj. R-squared:	0.9786
				Root MSE:	1.8537

**Table A2. Regression Technical Results**

**Dependent Variable: Tubac–Rio Rico Price Index**

Explanatory Variable	Coefficient	Standard Error	T statistic	p>[t]	[95 Confidence Interval]	
Green Valley Price Index	0.4750008	0.1060376	4.48	0.003	0.2242618	0.7257398
Time Trend	0.2992708	0.9109363	0.33	0.752	-1.854751	2.453293
Checkpoint Variable	-0.0586727	3.997048	-0.01	0.989	-9.510189	9.392844
Checkpoint-Time Interact	-2.058916	0.8856974	-2.32	0.053	-4.153257	0.0354259
Tubac Comm. Bldg Permits (sq. ft.)	0.0019266	0.000349	5.52	0.001	0.0011014	0.0027518
Constant	51.93082	11.24902	4.62	0.002	25.33112	78.53052