

Public Works Programs and Crime

Evidence for El Salvador

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Abstract

Most evaluations of public works programs in developing countries study their effects on poverty reduction and other labor market outcomes (job creation, earnings, and participation). However, very few look at other collateral effects, such as the incidence of violence. Between 2009 and 2014, El Salvador implemented the Temporary Income Support Program, which aimed to guarantee a temporary minimum level of income to extremely poor urban families for six months, as well as provide beneficiaries with experience in social and productive activities at the municipal level. Making use of a panel data set at the municipal level for 2007 to 2014, with monthly data on different types of crime rates and social program benefits by municipalities, this paper assesses the effects of the program on crime rates in municipalities in El Salvador. There are several

possible channels through which the Temporary Income Support Program can affect crime. Since the program is associated with cash transfers to beneficiaries, a reduction in economically motivated crimes is expected (income effect). But since the program enforces work requirements and community participation, this could generate a negative impact on crime, because the beneficiaries will have less time to commit crime and because of community deterrence effects. Overall, the paper finds a robust and significant negative impact of the Temporary Income Support Program on most types of crimes in the municipalities with the intervention. Moreover, the negative effects of the program on some types of crime rates hold several years after participation. Positive spillover effects for municipalities hold within a radius of 50 kilometers.

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Public Works Programs and Crime: Evidence for El Salvador

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1. Introduction

Public works programs are safety net programs that have two main objectives: first, to provide a source of income to poor and/or unemployed individuals, and second, to construct or rehabilitate public infrastructure (Grosh et al. 2008). These programs typically provide short-term employment on labor-intensive projects in exchange of either cash wages or food transfers in exchange for work effort. They have been an important safety net intervention in both developed and developing countries and are among the most common types of assistance in the world (after school feeding, food, in-kind, and near-cash transfers). Nowadays, 94 countries are implementing these programs—many of them are in conflict-affected and fragile states such as Sierra Leone, Ghana, Morocco, South Sudan, Malawi, Somalia, India, Ethiopia, Morocco, the Russian Federation, and Bangladesh (World Bank, 2015). In Latin America, Argentina, Brazil, Colombia, Mexico, Peru, and Uruguay have also implemented these programs.

Under a similar context, El Salvador implemented between 2010 and 2015 the Temporary Income Support Program (PATI), which aimed to guarantee a temporary minimum level of income to extremely poor urban families, as well as provide beneficiaries with experience in social and productive activities at the municipal level. During this period, the program served 43,000 beneficiaries in targeted extreme poor urban settlements in 43 municipalities, most of them women (75 percent) and youngsters (44 percent).

Most evaluations of public works programs in developing countries have studied the impact in terms of poverty reduction and other positive impacts on poor families (job creation, women's labor force participation). In Ghana, a national public works program was found to have a positive impact on paid employment, food consumption expenditure, and food security for children. School attendance, particularly at the upper secondary school level, also increased among beneficiary households (Handa et al. 2013). In Sierra Leone, monthly incomes of participating households increased by 26 percent, as well as the likelihood of creating enterprises and investing in homes and, in some cases, existing businesses (Rosas 2016).

However, very few have looked at other collateral effects. The objective of this paper is to study the collateral effects of PATI on crime and violence in El Salvador. There are several possible channels through which PATI could have affected crime incidence and behavior. If crime is mainly

a substitute for lack of income, then PATI should have had a negative effect on crime, since the increase in disposable income would have allowed beneficiaries to increase consumption of certain goods, which may have reduced the incentive or need to engage in economically motivated crimes. In addition, since PATI enforced work requirements, this could have generated a negative impact on crime because beneficiaries will have less time to commit crime. Participation in community activities and training could also have had crime deterrence effects. On the other hand, there could have been a positive community effect on crime arising from the fact that there is more money in the community due to the income transfers from the program. The paper uses panel data at the municipal level for the period 2007 to 2014. Such information contains monthly data on different types of crime rates and social program benefits by municipalities. Fixed effect estimations are used to control for unobservable variables.

The remainder of the paper is structured as follows. We first review the theory and evidence on the impact of development programs on conflict. Section 3 describes PATI's objectives and operation. Section 4 describes the data and empirical strategy, and section 5 reports the results. The final section concludes.

2. Literature Review

Many safety net programs provide income to needy individuals. Given that the poor are the main recipients of such programs and are more likely to commit crime (Ehrlich 1973; Murray 1984; Lott 1987; Grogger 1991), welfare programs may be expected to have an effect on criminal behavior. Economic models postulate that incentives matter for people's decisions on whether to participate in crime (Becker 1968; Ehrlich 1973, 1996). However, very few studies have focused on the effect of welfare programs on crime. Most have concentrated on their direct stated objectives of impact on consumption, poverty, education and health outcomes, and others.¹

There is ample evidence in the literature that welfare programs, such as unemployment benefits or vouchers can have an effect on crime rates. Overall, studies from both developing and developed

¹ However, there is a long list of studies looking for links between crime and unemployment incidence (Freeman 1999) or lower wages (Grogger 1991; Gould et al. 2002; Machin and Marie 2004).

countries have found that additional income targeted to low-income segments of the population can lead to sizable reductions in criminal activity, the benefits being heavily concentrated among male youth (Chioda 2017). Zhang (1997) uses a set of cross-sectional U.S. state data for 1987 and shows that cash or in-kind welfare programs reduce the time allocated to illegal activities and have a negative and often significant effect on property crime. Jacob et al. (2015) analyze a housing voucher program in Chicago that transferred the equivalent of 50 percent of household income to beneficiaries, reporting a decline of roughly 20 percent in both violent and overall arrests. Kling et al. (2005) studied the assignment of housing vouchers via random lottery to public housing residents in five cities in the United States and concluded that it reduces arrests among female youth for violent and property crimes.

The literature on cash transfers, conditional or not, is even more conclusive. Camacho and Mejia (2013) have found that Colombia's *Familias en Accion* conditional cash transfer (CCT) program reduces urban crime in Bogota, while Pena, Urrego, and Villa (2015) conclude that the program also has positive effects on the demobilization of combatants. Crost et al. (2016) suggest that the Philippines national CCT program is responsible for a decrease in conflict-related incidents in the country. Chioda, Mello, and Soares (2015) find a robust and significant negative impact of Brazil's *Bolsa Família* CCT on crime. Finally, Blattman et al. (2017) found that cash transfers along with behavioral therapy in Liberia can dramatically reduce crime and violence, even over the medium term after intervention.

However, some studies have found that welfare payments can also be associated, in certain circumstances, with higher levels of crime. An analysis of daily reported incidents of major crimes in 12 U.S. cities reveals an increase in crime over the course of monthly welfare payment cycles (Fritz Foley 2008). Ellen et al. (2011) also find that additional voucher holders lead to elevated rates of crime, controlling for census tract fixed effects. And a study by Kling et al. (2005) on housing vouchers also finds that they can increase problem behavior and property crime arrests among recipient males. In such cases, it seems that additional criminal activity is associated with episodes that have a direct financial motivation, like burglary, larceny, motor vehicle theft, and robbery, as opposed to other kinds of crime like arson, assault, homicide, and rape (Burek 2005). The main hypothesis is that welfare beneficiaries tend to consume grant income quickly and then attempt to supplement it with criminal income.

There are very few specific studies that focus on the crime effects of public works programs. Alzua (2011) investigates the effect of introducing a massive workfare program on property crimes in Argentina, finding that such intervention can reduce property crime, but has no effect on other kinds of crime. Dasgupta, Gawande, and Kapur (2017) also show that the roll-out of India's National Rural Employment Guarantee Scheme can cause a large long-run reduction in Maoist conflict violence. And for programs with very similar features in Papua New Guinea (two months of public works employment for out-of-school youth, combined with six months of classroom and on-the-job training), Ivaschenko et al. (2017) have found that project participants became less likely to hang out with friends at night, and less likely to have friends involved in crime, and involved in fights or robberies. However, it presents little robust evidence that the program reduces participants' engagement in or exposure to crime.

This paper contributes to the scant evidence for public works programs, focusing on the case of El Salvador.

3. Crime in El Salvador and the Temporary Income Support Program (PATI)

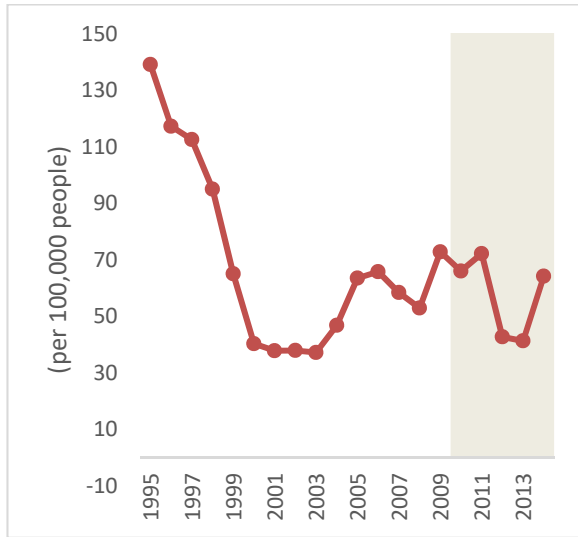
El Salvador has been among the countries with the highest homicide rates in the world for many years. Over the past 15 few years, the average homicide rate has been around 53 homicides per 100,000 (Figure 1). The trend started to decline at the beginning of the 1990s and slightly decreased in the first half of the 2000s, yet in 2006, the country still had the highest homicide rate in Latin America, 58 per 100,000 inhabitants, compared to around 20 per 100,000 for all Latin America. In 2014, El Salvador had the second highest homicide rate in the world, 64 per 100,000 habitants (only below Honduras with 75 per 100,000 habitants) and far above the Latin America and Caribbean average of 23 per 100,000 habitants, and the world, 5 per 100,000 habitants (Figure 2).

² Most homicide victims are young men between the ages of 15 and 34. The level of violence in the country exceeds the level of violence defined by the World Health Organization (WHO) as

² These levels are far above other regions' averages: 9.7, 4.4, 2.7, and 2.9 for Africa, North America, Asia, and Europe, respectively (Chioda 2017).

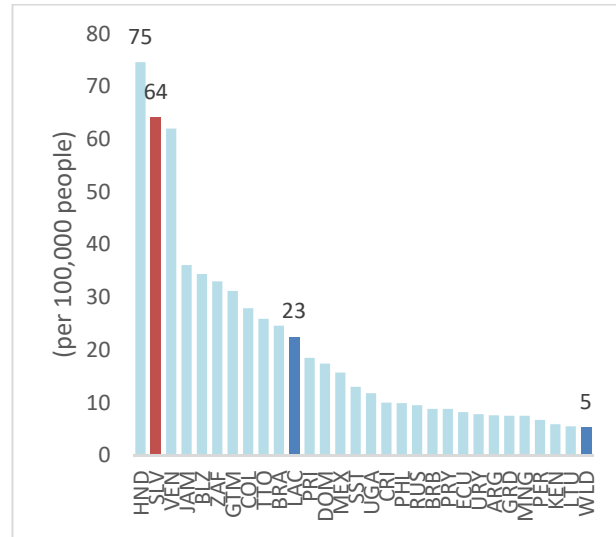
‘conflict’ (30 homicides per 100,000) and is well above the rate of any country in Africa, some of which were engaged in civil wars.³

Figure 1: El Salvador, Intentional homicides (per 100,000 people 1995–2014)



Source: World Bank, World Development Indicators

Figure 2: Intentional homicides (per 100,000 people) by countries, 2014



Source: World Bank, World Development Indicators

In this context, PATI was introduced in 2009 by combining income support with training opportunities, as a response to the international global financial and fuel crisis, which resulted in a significant contraction of the economy (gross domestic product [GDP] declined 3.1 percent in 2009) and seriously affected employment (between 2008 and 2009, more than 100,000 Salvadorans, or 3 percent of the labor force, became unemployed or under-employed).

The objective of the program was dual: (a) to provide short-term income support to poor and vulnerable individuals in urban areas, and (b) to increase beneficiaries' medium-term employability by offering training opportunities in addition to them gaining experience working in productive social activities. PATI provided each participant a cash benefit of US\$100 per month for a maximum of six months, conditional on participation in community projects, occupational training, and labor market orientation courses. Eligible beneficiaries had to be at least 16 years old, with neither formal work (self-employed, under-employed, or unemployed) nor studying. In each eligible settlement, there was a preregistration process, and eligible individuals were prioritized

³ Chioda (2017).

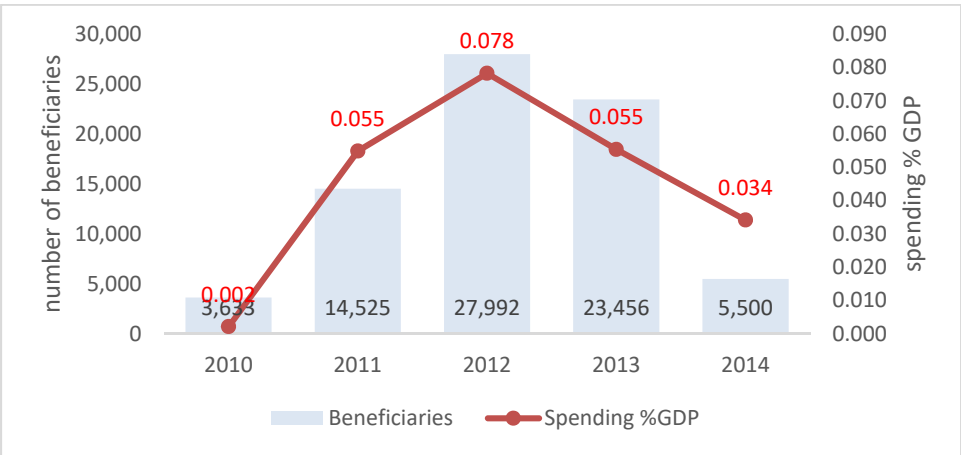
using an index that assigned higher priority to individuals between the ages of 16 and 24, and women heads of household. The prioritization index also had a component that included variables relating to household income, to give higher priority to the poorest applicants.

Finally, the local committees of each municipality verified and confirmed the prioritized list of participants.

The program reached its peak in 2012, covering 27,992 beneficiaries, representing an allocation of 0.08 percent of GDP (Figure 3). Around 40 percent of the beneficiaries were youngsters in the 16–24-year-old range, and more than 70 percent were females. The most active years were 2011 and 2013, and in 2015 the program was discontinued.

An impact evaluation of the program showed that it was effective in attracting individuals who were most in need, as well as in increasing labor force participation (in particular among the youth, women, and those relatively well educated), and readiness to start a new job (Beneke de Sanfelio and Acosta 2014) in the short run. The evaluation also highlighted that program participants seem to be more satisfied in their communities with the public areas, many of which were improved by the assets built through the program, especially among the persons who will probably make most use of them, the youth and adults. Finally, the participants demonstrated increased civic participation in their community, whether in community organizations or in positions of responsibility. However, the evaluation did not find any improving effects on social interactions in the neighborhood.

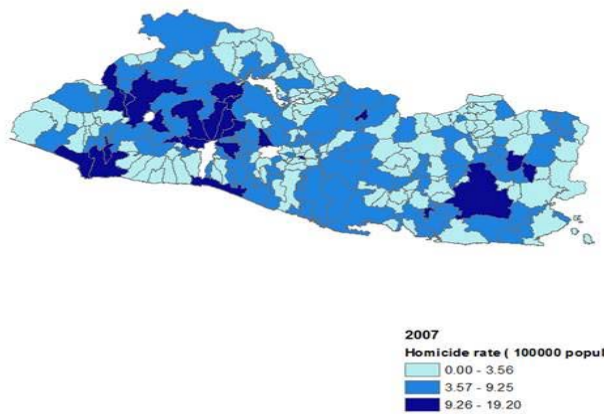
Figure 3: PATI: Number of beneficiaries and spending as a share of GDP 2010–2014



Source: World Bank, ASPIRE database.

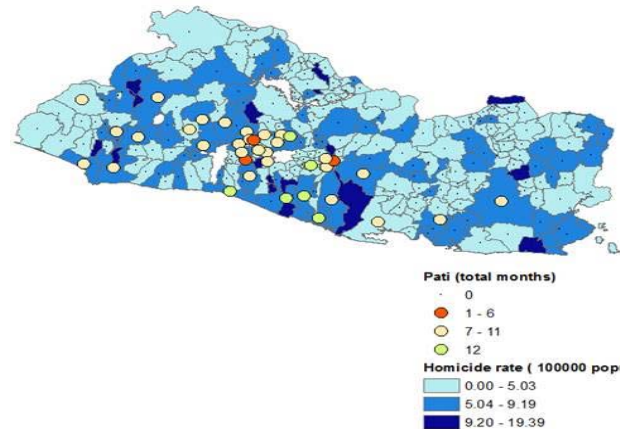
PATI was implemented mostly in urban settlements with high incidence of poverty/unemployment, but not necessarily with high levels of violence and crime, as these characteristics were not part of the targeting strategy (Figure 4 and Figure 5). Though previous studies have shown that whereas adult unemployment is unrelated to crime, youth unemployment is consistently positively related to the homicide rate (Chioda 2017). So, despite not targeting the most violent municipalities, since the program’s beneficiaries were disproportionately the young population who had no formal work nor were studying, program implementers naturally expected it to have an indirect violence reduction effect.

Figure 4: Homicide rate, 2007



Source: Own calculations based on official database

Figure 5: Homicide rates and PATI by municipalities, 2012



Source: Own calculation based on official database.

4. Data and Methodology

The data set used in this study consists of monthly panel data at the municipal level (263 municipalities) for the period 2007–2014. The data have information on whether the municipality participated in the PATI program or not, per month in a given period. In addition, it contains detailed information on different types of crimes (property crimes, murder, homicides, rape, and so on). For each type of crime, there is information on the number of cases that occurred per month and per municipality. Data from the 2007 national census were also collected to obtain some demographic variables at the municipal level, such as total population to normalize the number of crimes in a given area.

Panel data information at the municipal level allows controlling for individual-specific, time-invariant, and unobserved heterogeneity (which can make the Ordinary Least Squares estimator both inconsistent and inefficient). Unobserved factors that affect a municipality's crime rate in 2007 would also affect the municipality's crime rate in 2014. Fixed effect estimations are thus important for controlling for those unobservable characteristics. In particular, the following municipal-level fixed-effects equation is estimated:

$$crime_{i,s,t} = \beta_0 + \beta_1(PATI)_{s,t} + \theta_s + \delta_t, \quad (1)$$

where $crime_{i,t}$ denotes the crime rate of type i in municipality s and time t ; $(PATI)_{s,t}$ is a dummy variable that takes the value of 1 if the municipality s participated in the program in time t ; and θ_s and δ_t are municipalities and time fixed effects. The unobserved municipality effect θ_s represents all factors affecting municipal crime rates that do not change over the time period of analysis. These might include certain demographic features of the population (age, education), geographic location, historical factors, and different attitudes toward crime that are typically slow to change. In addition, time fixed effects δ_t is included to control for temporal variation or special events that may affect the crime rates in all municipalities. Our estimator of interest, β_1 , provides the effect of the program on the different types crime rates.

The gradual introduction of the program also allows us to identify the effects of PATI at different months of exposure of the selected municipalities. We thus identify a similar estimator that detects changes in crime rates up to five months after the implementation of the program in each municipality.

$$crime_{i,s,t} = \beta_0 + \beta_1(PATI)_{s,t} + \sum_{t=1}^{t=5} \beta_{2t} + \theta_s + \delta_t, \quad (2)$$

where β_{2t} is the dummy variable denoting the treatment status of each municipality after the intervention started. The significance of β_{2t} implies that the program generated effects on crime rates months after the implementation.

As a complementary exercise, we also check the presence of spillover effects from treated municipalities to those where the program was not introduced. We thus carried out a single test that consists of accounting for the number of treated municipalities within a radius of 50 kilometers

for each treated or untreated municipality. From equation (1) we specify a new linear equation that considers the number of nearby treated municipalities for each municipality:

$$crime_{i,s,t} = \beta_0 + \beta_1(PATI)_{s,t} + \beta_2(N)_{s,t} + \theta_s + \delta_t, \quad (3)$$

where N is the number of treated municipalities within a radius of 50 kilometers. The coefficient β_2 captures the spillover effects. If significant, then the spillover effects cannot be rejected.

5. Results

Table 1 summarizes the main descriptive statistics in our study. We present data on different types of crime provided by the National Police Department, as well as the number of municipalities receiving PATI for the 263 country municipalities. The average is calculated over the eight-year period between 2007 and 2014 on a monthly basis, comprising a total of 24,960 observations. The average crime rate per municipality per year is 56.9 per 100,000 people. Theft, injury, and homicide are the most commonly reported crimes.

Table 1: Descriptive Statics

Variables:	Mean	Std Deviation	25th percentile	Median	75th percentile	# Obs
PATI	0.04	0.21	0.00	0.00	0.00	24,960
Total Crimes	56.85	45.08	27.14	48.69	76.34	24,960
Extortion	2.73	6.76	0.00	0.00	2.68	24,960
Homicide	4.93	9.17	0.00	0.00	7.95	24,960
Vehicle theft	1.28	4.22	0.00	0.00	0.00	24,960
Theft	11.12	16.05	0.00	6.70	16.52	24,960
Injury	5.88	11.83	0.00	0.00	8.15	24,960
Other (other + kidnapped)	24.68	28.10	4.07	17.74	35.10	24,960
Robbery	5.41	10.30	0.00	0.00	8.20	24,960
Rape	0.82	3.75	0.00	0.00	0.00	24,960

Source: Program administrative data and National Police Reports.

Table 2 presents the estimations of β_1 in (1). Each column shows the results for each type of crime and the total. As noted, all econometric models include municipality and time fixed effects

(monthly). Results show that the program incidence is associated with a reduction in crime rates except for rape and robbery. On average, in periods where the program operated at the municipal level, the total crime rate is on average 8.6 per 100,000 people lower than in municipalities without the program. By types of crime, the program seemed to have a larger effect in reducing theft and extortion, followed by injury and homicide. These results support the idea that PATI helped supplement lower incomes, and thus reduce mostly economically motivated crimes. Reduction in homicide rates, and in not-economically-motivated crimes, could be due to social capital factors such as the community participation nature of the program, as well as its intense work requirements.

Table 2: Effects of PATI on several types of crimes

VARIABLES	Total	Extortion	Homicide	Vehicle theft	Theft	Injury	Other	Robbery	Rape
PATI	-8.603** (-5.113)	-0.768** (-2.552)	-0.608*** (-1.669)	-0.500** (-2.970)	-0.826*** (-1.850)	-0.687** (-2.502)	-4.614** (-4.946)	-0.567 (-1.427)	-0.032 (-0.343)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.037	0.017	0.015	0.008	0.018	0.009	0.036	0.009	0.008
Observations	24,960	24,960	24,960	24,960	24,960	24,960	24,960	24,960	24,960

Note: Robust standard errors in parentheses. FE: Fixed Effects.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Our second specification allowed us to test the effects of the program on crime rates during different months of exposure. We also test for temporal spillovers considering that crime exhibits high degrees of persistence (Chioda 2017). Results can be seen in Table 3. The effects of PATI on crime hold several months after the program is introduced in a selected municipality. The effects are again particularly driven by economically motivated crimes such as extortion and theft. No significant effect on the homicide rate is found.

Table 3: Effects of PATI on several types of crimes on time

Variables	Total	Extortion	Homicide	Vehicle theft	Theft	Injury	Other	Robbery	Rape
PATI	-3.965** (-2.793)	-0.605** (-2.096)	0.025 (0.072)	-0.418** (-2.080)	-0.061 (-0.117)	-0.562 (-1.507)	-2.055** (-2.207)	-0.158 (-0.370)	-0.132*** (-1.773)
PATI t+1	-0.295 (-0.207)	-0.102 (-0.368)	0.031 (0.095)	0.355 (1.561)	-0.287 (-0.570)	0.392 (1.063)	-0.706 (-0.652)	0.084 (0.176)	-0.062 (-0.499)
PATI t+2	-2.585*** (-1.890)	-0.499 (-1.533)	-0.612 (-1.613)	-0.438*** (-1.816)	0.434 (0.878)	-0.097 (-0.294)	-1.312 (-1.049)	-0.304 (-0.792)	0.242*** (1.838)

Variables	Total	Extortion	Homicide	Vehicle theft	Theft	Injury	Other	Robbery	Rape
PATI t+3	-2.750** (-2.169)	0.506*** (1.663)	0.504 (1.193)	0.011 (0.044)	-1.346*** (-1.811)	-0.392 (-1.270)	-1.410 (-1.311)	-0.679*** (-1.742)	0.057 (0.415)
PATI t+4	3.250*** (1.832)	-0.133 (-0.481)	0.040 (0.122)	0.238 (1.149)	0.607 (0.713)	0.017 (0.051)	1.909*** (1.827)	0.559 (1.527)	0.013 (0.108)
PATI t+5	-4.963** (-4.013)	-0.044 (-0.163)	-1.127** (-3.297)	-0.371*** (-1.897)	-0.718 (-1.176)	-0.084 (-0.268)	-2.229** (-2.884)	-0.324 (-1.022)	-0.066 (-0.668)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.037	0.017	0.015	0.009	0.019	0.009	0.036	0.009	0.008
Observations	23,660	23,660	23,660	23,660	23,660	23,660	23,660	23,660	23,660

Note: Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

We further check the existence of spillover effects of the program for municipalities within a radius of 50 kilometers. The magnitude of decline in violence in a given municipality may depend on the actions of neighboring municipalities; one municipality's crime reduction efforts in one year spill over to future years and to neighbors (Chioda 2017). In our estimation, we find that spillover effects are sizable and significant for almost all types of crimes, except homicides, robberies, and rapes (Table 4). We find that proximity to a treated municipality also seems to diminish crime rates.

Table 4: PATI Spillover Effects: Municipalities within 50 km of distance

Variables	Total	Extortion	Homicide	Vehicle theft	Theft	Injury	Other	Robbery	Rape
PATI	-8.275** -4.768	-0.826** -2.664	-0.539 -1.228	-0.445** -2.295	-0.506 -0.910	-0.531 -1.405	-4.848** -4.634	-0.456 -1.059	-0.124 -1.080
Municipalities 50 km	-2.973** -2.007	-0.386*** -1.889	-0.193 -0.439	-0.258** -2.211	0.838 1.219	-1.015** -2.249	-1.964** -2.086	0.005 0.011	0.001 0.006
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.041	0.019	0.018	0.012	0.026	0.011	0.039	0.013	0.009
Number of observations	12,813	12,813	12,813	12,813	12,813	12,813	12,813	12,813	12,813

Note: Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

6. Conclusions

The purpose of this paper was to determine the effects of a public works program, PATI, on crime rates in municipalities in El Salvador. The results show that this program can play an important role in reducing crime and violence in the country. Taking advantage of the existing panel database at the municipal level of crimes and the treated municipalities in the past few years, we estimated the effects of PATI on crime rates at the municipality level.

The results of this paper show that PATI reduced crime rates in treated municipalities. These results are consistent with earlier impact evaluation findings that suggested that the program improved satisfaction with the neighborhood as well as civil participation in treated communities. Most of the reduction is explained by income effects, as the program provided a cash benefit to beneficiaries, which substituted the lack of income and, potentially, the need to engage in illegal activities. This is the case of theft and extortion. Decrease in non-economically motivated crimes is mostly potentially driven by social capital factors related to community participation and work requirements that leave less time to commit crime. Strong crime reducing effects may be the result of the fact that most of PATI's beneficiaries were youth, particularly from an age group at high risk of engaging in antisocial and criminal behavior (15–24 years).

In summary, while PATI was not specifically designed to prevent crime, it seems to have had a significant and important effect on violence and crime levels in threatened municipalities in El Salvador. This paper shows that the effects of a public works program can extend beyond the typical ones affecting labor market outcomes. They can also complement other critical preventive measures to reduce conflict and crime in their areas of operation.

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