Does Poverty Alleviation Increase Migration? Evidence from Mexico

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Abstract

What is the long term effect of cash transfers (CT) on rural migration? CT programs have demonstrated to increase human capital investments of poor families by increasing nutrition, health and schooling levels. However, there is little evidence on the long term effects of CT programs particularly on migration decisions. Progresa-Oportunidades, the pioneer Mexican CT program that started in 1997, would give some evidence for this open question. I examine the sudden drop in the population size and gender composition of Mexican rural villages where this program was implemented between 1998 and 2005. I use a regression discontinuity design to identify the effects of the program on villages located on the margin of the poverty distribution and close to the cutoff point of the eligibility criteria. The average population in a fully covered village decreased by 70 people in 2005 compared to 1995 (almost 10 percent of the average population of 1995). Sixty five percent of this reduction corresponds to adults who left their villages and forty percent of this reduction can be attributed to Progresa-Oportunidades. The reduction of adult population of males is 6 times higher than for females, a clear sign of a significant increase in the migration patterns of this population.

Keywords: Cash transfers, Progresa, Oportunidades, migration, regression discontinuity design.

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1 Introduction

What is the long term effect of cash transfers (CT) on rural migration? What is the effect of CT programs on the demographic composition of recipient households of poor rural villages? CT programs have demonstrated to increase human capital investments of poor families increasing nutrition, health and schooling levels. In other words, this kind of programs is effective in reducing poverty levels and increase human capital levels of beneficiaries.

Cash transfer programs has become the most popular type of development programs around the world. They have been implemented in many different countries and regions, including Argentina, China, Colombia, Honduras, Indonesia, Jamaica and Nicaragua. Some others like Turkey, India, Pakistan and Philippines are also using cash transfers as the main strategy for development. In general, these programs distributes cash to mothers conditional on their children being enrolled in school and engaging in a series of health-promoting activities with the objective of equipping them with human capital needed to break the inter-generational transmission of poverty.

There is little evidence on the long term effects of these programs, particularly their effects on the demographic trends, including fertility and migration. The empirical importance of this effect is unsolved, partly because the time since this kind of programs has been implemented is relatively short.

This paper tests the hypothesis that the implementation of a program that includes a cash transfer conditioned on assistance to school, better health habits will increase the human capital of beneficiaries, and those who are in the margin of the schooling distribution –beneficiaries with higher educational levels will try to search for an occupation with higher return outside their town homes.

I use the evidence of Progresa-Oportunidades, the pioneer Mexican CT program that started 12 years ago. I examine the sudden drop in the population size Mexican rural villages where the program was implemented between 1995 and 2005 and the change in the gender composition of villages by using the variation across villages and time to identify the effects of the program. In order to identify the effect of the program on migration, I use a regression discontinuity design to the information reported in the national partial censuses of 1995 and 2005 and the census of 2000. I find that during the period 1995-2005 the average population size in a fully covered village decreased by 68 poople. Two thirds of this decrease (65% percent) was given by of this reduction corresponds to adults who leave their villages and the rest a reduction in of new born. This represented a decrease of almost 2 percentage points of the males-female ratio, which indicates a migration pattern of the adult population in those villages covered by the program.

The short term effects of Progresa-Oportunidades have been well documented during the previous years. The unique experimental design of the program provided a rich set of information that was the base to analyze its impact on assistance to school, health and nutritional habits. Some authors have used the information contained in the evaluations to estimate the effect o Progresa-Oportunidades on migration with no clear evidence. Stecklov, Ben-

jamin, ET AL. (2005) found a short run positive effect on national migration and no effect on the international. Angelucci, Manuela. (2005) using a similar technique but with different specification finds completely opposite: "Overall, the program generates an increase in international migration but no change in domestic migration (P. 14)". Ruvalcaba, Luis. (2005). Using a new comparison group of the original universe, find a positive and significant effect in both national and international migration. My purpose is to analyze this phenomenon using different data given the restrictions of the experimental framework and the samples used for it.

The rest of the paper is organized as follows. Section II describes the conceptual framework used to construct the working hypothesis to be tested. Section III provides a brief description of the main features of Progresa-Oportunidades a. Section IV lays out the types of data used in the analysis. Section V shows the identification strategy: difference in difference, longitudinal analysis and heterogenous response according to the distance to the train tracks. Section VI presents the estimated impacts of Progresa-Oportunidades on the two variables used to approximate migration, adult population and gender ratio. Section VII concludes.

2 Conceptual Framework. Cash transfers and their effect in demographic trends

2.1 Working Theory

This paper tests the hypothesis that the implementation of a program that includes a cash transfer conditioned on assistance to school, better health habits will increase the human capital of beneficiaries, and those who are in the margin of the schooling distribution –poor beneficiaries with higher educational levels will try to search for an occupation with higher return outside their own villages.

It is important to differentiate the effect of the program depending on the age and cohort of beneficiaries. Older generations –individuals older than 12 in 1997 did not increased their own levels of human capital with the program, so they would be considered as pure income effect beneficiaries. On the other hand, new generations are more healthier and educated.

To analyze this difference, I will use a simple model of migration developed by Borjas (1987) and refined by Hanson and Chiquiar (2004) who use the Roy Model the negative selection of migration from a country with relative high returns to skill in comparison with other. In other words, individuals with lower levels of human capital of the entire distribution would have more incentives to migrate. An important element to be considered is the cost of migration, which is considered constant by the Borjas. However, this assumption can be relaxed and assume increasing costs for more educated population. As Hanson and Chiquar (2004) show, if there is a negative relation cost of migration with the negative selection can be overturned. In fact, the relaxation of constant cost of migration can result in having positive or negative selection in terms of skill, particularly depending on the size of migration.

2.1.1 The model

Decision of migration is taken only one time in life. Those who decide to stay in their local communities are indexed by 0 and those who decide to leave are indexed by 1. So, the first group face the next a wage equation

$$ln(w_0) = \mu_0 + \delta_0 S \tag{1}$$

where:

- w_0 is the wage in the village of origin
- μ_0 is the base wage in the village of origin
- S is the level of schooling

As pointed by Borjas and Hanson, the focus must be in observable skills, in specific schooling. However there are random components to wage determination, but for simplicity we leave such features in the background. Similarly, those who decide their villages or communities face the following equation.

$$ln(w_1) = \mu_1 + \delta_1 S \tag{2}$$

where:

- w_1 is the wage in the village of origin
- μ_1 is the base wage in the village of origin

It is normally assumed that returns to schooling in the local village are higher in comparison with the destiny. In other words $\delta_0 > \delta_1$

The cost of migration is defined as C and it can be expressed in hours of work to estimate the equivalence as a part of the full income. This last can be expressed as π=C/w_0. This allows us to express the difference between wages as:

$$ln(w_1) - ln(w_0 + C) = \mu_1 + \delta_1 S - \mu_0 - \delta_0 S - \pi \tag{3}$$

Individuals who decide to move must have a positive gain of doing so. In other words, the difference in salaries and the specific return to schooling must compensate the cost of migration. This can be formally expressed as:

$$ln(w_1) - ln(w_0 + C) = \mu_1 + \delta_1 S - \mu_0 - \delta_0 S - \pi \approx ln(w_1) - ln(w_0) - \pi \tag{4}$$

As it is mentioned before, it is feasible to relax the assumption of constant cost as expressed in the previous equation and instead using time-equivalent migration costs decrease with schooling, such that:

$$ln(\pi) = \mu_\pi + \delta_\pi S \tag{5}$$

Hanson and Chiquiar derive this expression by making two assumptions. The first is the standard cost of information assistance for finding and the relative lower cost for those with higher income in time equivalent wage units. Second, individuals would require borrowing money in order to complete the cost of migration, so those individuals with credit constraints will be impeded to get it. This is true for individuals in the lowest part of the wage distribution, who are less likely to have access to credit markets, both formal or informal.

If we combine the equations 1 to 5 we would be able to find the cutoff points of the population with higher incentives to migrate. The case of constant cost gives us only one cutoff point with only negative selection. However, if we use the decreasing cost of migration we can derive the following conditions:

1. $\delta_\pi > 0$
2. $\mu_1 - \mu_0 > \epsilon^{\mu_\pi}$

Figure 1 of the Appendix shows the distribution of population that migrates and the one that not. Time equivalence cost of migration represents a significant part of full income and it is decreasing with schooling. There are two cutoff points:

S_L and S_U. The first refers to the lowest level of education that would be able to pay for the migration cost; the second refers to the individuals with education level L who are indifferent between staying and leaving their communities.

Individuals to the left of S_L and to the right of S_U decide to stay in their communities. The figure assumes that the mean schooling level $\left(\overline{S}\right)$ is between these two values. This selection of migrants in terms of observable variables is related to the distribution of schooling in the country.

According to the graph, two are three possible cases in the migration phenomenon:

- *Negative selection.* Those individuals who are between $\overline{S}$and S_L. This population has a lower level of schooling than the upper part of the distribution. However, their schooling level is higher than those of the lowest part of the total distribution.

- *Positive selection.* Those individuals who are between $\overline{S}$ and S_U. Population with higher level of schooling, but not the highest of the distribution.

The final effect will depend on the composition of both types of selections: If the majority is from the lowest distribution, then the expected migration is going to be negative, while if the majority if from the right distribution, we will have positive selection. If the proportion is the same, then we can consider the distribution as "intermediate selection".

As pointed by Hanson and Chiquar, the caveat of this model is the non-incorporation of informational networks. The more information an individual has, the lower the cost of migration, especially for low income workers who have relatives and friends with an occupation in the other labor markets. However, I included this difference in the information by using the distance to train tracks of individuals.

2.1.2 CT and Migration in the sort and long run. Theoretical working hypothesis

Cash transfers have a different effect on the decision to migrate in the long and short runs. In both cases the benefit is related to horizon of analysis: immediate transfers can be considered as direct increase in the disposable income of individuals who would decide to leave their villages, especially the generation who is out of school age. The cash transfer may reduce the constraint faced by poor households and members may use the transfer to fund their decision. Once again, the final effect is not the same for households: only those households in the extreme portion of the distribution –the less poor– will be able to do this.

On the other hand, higher investments in human capital given by an increase in the levels of health, nutrition and education will give beneficiaries more incentives to find an occupation with higher returns. It is important to note that not all beneficiaries will be in the same situation: those in the extreme income distribution will not be able to increase their income such as it would be feasible to fund a possible migration decision, while those who were in the margin of

the distribution will be more able to do it. So if individual educational level is higher than the one of those living on the subsistence level beneficiaries may move to the location that pays highest relative wages, net of moving costs.

To include these elements in to the model we must change the cost of migration expressed in terms of units of labor. I will only use the model with decreasing costs. The equation 4 can be expressed as follows.

$$ln(\pi'|Poor) = \mu_\pi - \delta_\pi S' - CT \tag{6}$$

Where:

- S' is the level of schooling increased by the program
- CT is the value of the cash transfer

This change is illustrated in Figure 2, included in the Appendix. Note that this change only affects those individuals included in the program –below the poverty threshold and no the rest of the population. More education derived from the program will change the margin at which people decide to migrate. This does not mean that all beneficiaries will be in the possibility of leaving their communities, but only those who are less poor. It is important to emphasize this theoretical approach and the empirical strategy followed to estimate this effect. In particular, the use of a regression discontinuity design would be very useful for this purpose.

This change in the cost of migrating changes the equation of decision for the poor population as

- $\pi' < \pi$
- $\mu_1 - \mu_0 > \epsilon^{\mu_\pi} > \epsilon^{\mu_{\pi'}}$

As illustrated in Figure 2, the effect of the program is mainly focused in those individuals who increase their educational levels and are located at the margin. The reduction in the migration cost gives them the opportunity to leave their communities and find an occupation in other labor market different than the one in their village. Now the left cutoff point of the distribution is locate in S'L , which means that effect of the program is only on the beneficiaries of the program. The estimation of this effect is based first on the effect of the program in general and then only focusing in the population that is not as poor as the rest.

3 *Progresa-Oportunidades*

Progresa-Oportunidades was designed with the objective of breaking the intergenerational transmission of poverty by investing in food, health and education of new generations. Its design assumes that poverty is understood as the result of low acquisition of capabilities that translates into bad functioning during adulthood, a phenomenon that has been replicated every generation. It was created in 1997 under the name of *Programa de Educación, Salud y Alimentación* (Progresa). In 2002 it was transformed into *Programa de Desarrollo Humano Oportunidades*. It has allocated resources to the poorest localities in Mexico, which were classified since the very beginning.

The program has three main components:

1. Health and nutrition services
2. Food subsidy in cash equivalent to 35 kilograms of tortillas per month.
3. Educational cash transfer for basic education.

The first two refers to the a basic plan of preventive about health care, pregnancy care, nutritional supplements, and bimonthly cash subsidy to avoid malnutrition in children. The educational grants are granted to each member of the household under twenty one years old. They must be registered full-time in school between the third grade of primary school and the third year of intermediate school. Beneficiaries are required to take preventive care and attend at least 85% of classes in order to receive the cash transfer, which is given directly to the mother of the household.[1]

The idea of the educational grant is to compensate for the opportunity cost of child work or children working in the household. The amount of money each boy or girl receives increases with the academic year. The amount of educational cash transfers is differentiated for boys and girls, being higher for girls since secondary school because women in extreme poverty tend to leave their studies in greater numbers and at an earlier age than boys. The full description of this benefit is included in Table 1 of the Annex.

The design, implementation and resources are the responsibility of the federal government, but the program also involves the local governments in the provision of health and educational facilities. Also the civil society is involved in the program through the organization of *asambleas comunitarias* that participate in the selection and incorporation of the benefited households.

The change from *Progresa* to *Oportunidades* in 2002 included a redefinition of the methodology followed to select the eligible households, the inclusion of urban areas and the extension of the educational grants to the intermediate and higher education. The complete time line of the program is showed in Figure 3.

The program has showed to be efficient in terms of poverty reduction. The large academic work based on the experimental design implemented in 1997 has

[1] For more details see http://www.oportunidades.gob.mx

provided clear evidence that the program has worked.[2] The basic results are:

- Positive effect the school attendance of both boys and girls in primary, secondary and high-school

    1. Boys in secondary: 8 % (0.64 additional years)
    2. Girls in secondary: 14% (0.72 additional years)
       This represents 10% of additional education

- Negative impact on children's labor market (boys)
- Program effective in keeping children in school especially during the critical transition from primary to secondary
- Reduced stunting among children 1-3 years of age
- 12% lower incidence of illness in children ages 0-5
- Total coverage: 25% of total population

As it showed in Figure 4, the implementation of Progresa Oportunidades has coincided with the reduction of poverty levels in Mexico since 1997. Having more resources, in cash or in kind, alleviates immediately some of the basic needs of the poor families. However, the objective of the program is to reduce poverty conditions and expand capabilities of beneficiaries through out their life cycles. In this sense, it is highly relevant to evaluate the long term effects of the program, particularly the effects on the labor mobility of young beneficiaries.

[2]For more information about the results of the program see: IFPRI, Is Progresa Working? Summary of the Results of An Evaluation By IFPRI, July 2001. http://ageconsearch.umn.edu/bitstream/16418/1/fc010118.pdf

4 Empirical Strategy

I will not use the random experiment used for the estimation of the results of the program. As it is explained explained in the previous section, eligibility of the program in the rural areas was initially determined by the 1995 poverty index or marginalization index and to the provision of schools and health centers in or closer to the villages.[3] Authorities determined a plan of 18 phases to include all poor villages from 1998 to 2001. Only villages from middle, high and very high poor levels were eligible for the program.[4] This clear eligibility rule would work as a variable to determine differences in the effect of the program. The marginalization index is a continuous variable that reflects the poverty conditions in every village of the country. So, the vicinity around cutoff value in the marginalization between those who just qualified to the program (treatment group) and those who did not (control group). Using of regression discontinuity design (RDD) to estimate the effect of the *Progresa-Oportunidades* in the change of the demographic structure of the villages would be useful to identify the long term effect of the program without using the information contained in the experiment. In addition, there are other external validity reasons to not use the experiment as it is described in the next subsection.

The validity of all different RD techniques relies on the local continuity assumption which says that, in the absence of treatment, outcome variables would be continuous functions of the assignment variable that is contained in the 1995 marginalization index around the cutoff point of being in the program. The two following subsections describe the analysis to identify RD. The first is a graphic analysis that describes the probability of being in the program and changes in the dependent variables. The second is referred to the parametric estimation using a Difference in Difference and a longitudinal estimation.

4.1 Why not to use the experimental framework

Almost the entire research done on Progresa-Oportunidades is based on the random experiment designed to estimate the impact of the program on health, nutrition and educational outcomes of the beneficiaries. Authorities took advantage of Progresa-Oportunidades phase expansion and chose a random sample of villages that were incorporated in phase 1 of the program in 1998 —treatment villages—, and other group —comparison group- originally to be be incorporated in phase 18 or 2003 . Treatment group was composed by three hundred villages

[3] See Skoufias, ET AL (2001)

[4] The complete description of the Marginalization index 1995 is located can be fond in http://www.conapo.gob.mx. The index was obtained by principal components of the main characteristics of the villages:

- Illiteracy rate (>15 years old)
- Population between 6 and 14 years old who do not attend school (%)
- Households with illiterate individuals between 15 and 29 years old (%)
- Percentage of houses with no tap water
- Percentage of houses with no drainage
- Percentage of houses with no electricity

whose inhabitants received the benefits of the program in September 1998. The control group included two hundred villages.[5] It is important to note that two of the poorest states were not used as part of the universe for the randomization process: Oaxaca and Chiapas. In both cases, there was a risk of contamination of the experiment: the the governor of Oaxaca was hostile towards any program from the federal government and wanted to control the assignment of the beneficiaries. In the second case, the "Zapatista" rebellion of 1994 was present and authorities did not want to take the risk of doing an "experiment" under those conditions.[6] Figures 5 and 6 shows the discrepancy in the representativeness of the sample used in the experiment. Figure 6 includes the localization of control and treatment villages, while Figure 6 describes the expansion of the program across Mexico. It is easy to note that experimental villages are mainly located int he the central part of the country.

The original plan to evaluate the program changed in 2000. Political pressures derived from the federal election of 2000 forced authorities to incorporate the "control" group in January of 2000. The evidence used in these papers has a major caveat. The initial evaluation is only representative of 6 out of 32 states in the country. This lack of national representatives impeded to estimate the marginal effect of the program in those households that are located in the marginal distribution of the program, particularly in those states where migration has been present. As consequence the use of alternative identification strategies would provide a better estimation of the effect of the program in the migration decision. This represents the main contribution of this paper is to analyze the full effect of the program using a non-experimental method.

4.2 Non-parametric Analysis

The analysis begins by examining graphically the discontinuity of the treatment and the outcome variables used to see if there is a change in the migration of the villages. Similar to Bruhn (2007), it divides the marginalization index is constrained to a small interval (-1.0 to 1.35, which includes those villages point wide) starting from the cutoff and going in both directions. It takes the unweighted average of the outcome variables within each of these small intervals.

In Figure 7 and Figure 8 I show local I how local averages and the estimated polynomials against the marginalization index around the cutoff point between poor and non poor villages. The first figure shows the coverage of the program according to the poverty index of 1995, the original source to determine the eligibility of villages. The second shows the coverage in 2005 and the same index of 1995. In both cases, it is clear to see a discontinuity in the coverage of the program from those villages with low levels of poverty to those located in the middle. The rural expansion of Progresa-Oportunidades finished in 2002 and

[5]The randomization process was done in two strata: the first was done using poverty levels and the second the total population. For more details see: Behrman, Jere R. and Petra E. Todd. (1999) Randomness in the Experimental Samples of Progresa (Education, Health, and Nutrition Program). IFPRI.

[6]Interview with Daniel Hernandez, former Director of Progresa-Oportunidades Program.

the total families in the program has been stable since then. So, If the program had an effect, then there should be a clear discontinuity in outcome variables at the cutoff, meaning that the estimated points and polynomials should show a jump at the cutoff.

4.3 Parametric Analysis 1. Difference in difference using discontinuity

My empirical strategy uses differential values of changes in total adult population and change in gender composition of the villages around the cutoff point of poor and non poor villages. With two time periods, the estimation is equivalent to a Difference in Difference where each observation measures the change in the variables between two time periods. This means that I use an indicator variable if the village is included in the program.

$$P_{i,t}^{j} = \alpha + \phi_t + \beta D_t^j + \varepsilon_{i,t}^{j} \tag{7}$$

Where:

P	Total population in village i, according to the eligibility criteria j
α	is a vector of fixed characteristics of the village
ϕ	is a vector of variable characteristics of the village
D	is the indicator variable of the program of eligible village j in time t= 2000, 2005
ε	is a vector of unobservable characteristics

The equation in the pre-program period (1995) becomes:

$$P_{i,1995}^{j} = \alpha + \phi_{1995} + \varepsilon_{i,1995}^{j} \tag{8}$$

for the post program period, t= 2000 or 2005, we have:

$$P_{i,t}^{j} = \alpha + \phi_t + \beta D_i^j + \varepsilon_{i,t}^{j} \tag{9}$$

The difference in differences model is given by:

$$P_{i,t}^{j} - P_{i,1995}^{j} = (\phi_t - \phi_{1995}) + \beta D_i^j + \left(\varepsilon_{i,t}^{j} - \varepsilon_{i,1995}^{j}\right) \tag{10}$$

The parametric analysis in this paper uses only villages that lie the interval around the cutoff corresponding to -1 and -1.35 points of the marginalization index of 1995. This interval includes 3590 villages. The local continuity assumption is likely to be satisfied in small intervals around the cutoff since the villages are similar in terms of the marginalization index of 1995.

4.4 Parametric Analysis 2. Longitudinal analysis for the full and restricted samples

The second parametric estimation is based on the longitudinal analysis of the population in each village. In order to capture the long term effect I used the entire sample and also around the same cutoff point of the previous RD analysis. The estimated model is

$$P_{i,t}^{j} = \alpha + \phi_t + \beta D_i^j + \varepsilon_{i,t}^{j} \tag{11}$$

The first estimation includes a fixed effect at state level and the second a fixed effect at village level.

$$\left(P_{i,t}^{j} - \overline{P_{Statei}^{j}}\right) = \left(\phi_t - \overline{\phi}\right) + \beta D_i^j + \left(\varepsilon_{i,t}^{j} - \overline{\varepsilon_{Statei}^{j}}\right) \tag{12}$$

$$\left(P_{i,t}^{j} - \overline{P_{i,.}^{j}}\right) = \left(\phi_t - \overline{\phi}\right) + \beta D_i^j + \left(\varepsilon_{i,t}^{j} - \overline{\varepsilon_{i.}^{j}}\right) \tag{13}$$

4.5 Parametric Analysis 3. Heterogeneity of migration: Using distance to train tracks

My final parametric estimation looks to identify hetetogenity of the migration using the distance to railroad tracks. The reason to use this variation is quite simple: the infraestructure of the Mexican trains has been quite stable since the first half of the XX century. There is evidence on how migrants, not only from Mexico, but also from Central America use the trains as a "free ride" to cross the county and get in to the border. This means that population living closer to the tracks would have more information about the routes, time and conditions in remote labor markets. In other words, this distance is a good variable to measure the information required to find another ocupation.

Given that railroads are a fixed variable, my approach to analyze the heterogeneity of Progresa-Oportunidades given the information, was to intereact the distance to the train with the number of families in the program. So in the pre-program period we would have

$$Y_{i,t-1} = \beta X_{i,t-1} + \gamma Train_i + \varepsilon_{i,t-1} \tag{14}$$

Where,

Y: Adult population

X: set of covariates (poverty, inflation)

Train: Set of dummy variables that describe the distance of the village to the closest railroad track

After period afte the program is given by:

$$Y_{i,t} = \beta X_{i,t} + \alpha D_{i,t} + \gamma Train_i + \phi Train * D_{i,t} + \varepsilon_{i,t} \tag{15}$$

Once again, I will use a difference in difference estiamator, which can be described as:

$$\Delta Y_i = \beta \Delta X_i + \alpha D_i + \phi Train * D_{i,t} + \Delta \varepsilon_i \tag{16}$$

5 Data and descriptive Statistics

The data is organized in period of five years, where 1995 is the baseline period. Given that *Progresa-Oportunidades* initiated in 1997, this year is considered the pre-program period. The reason for doing so is the availability of demographic information is obtained by the Mexican Bureau of Census with this time spam since 1990's. Information on *Progresa-Oportunidades* is from the Mexican Ministry of Social Development (*Secretaría de Desarrollo Social*) and data on inflation and production is from Mexican Central Bank. The data is disaggregated geographically in villages and it is described in the data Appendix for the total rural poor population and those included in the discontinuity analysis.

To estimate the demographic dynamic of every village, several variables were used. Here I would like to emphasize that my analysis only includes the variation originated by changes in the demographic patterns of population living in the villages and presumably going to other villages or outside the country. However, a large effect in the population composition was given by changes in the fertility rates, which are not analyzed in this paper. The rest of this section describes all variables used in the analysis.

- *Villages.* The total number of villages in Mexico has a large variation in every period of 5 years, particularly those with less than 100 inhabitants. The total in the baseline period was 90,980. I only considered these villages as the universe and did not include new villages created in 2000 or 2005. So the total number of villages in 2000 with information in 1995 is 79,061 and 73,910 in 2005. The criteria used for the selection of villages eligible to the program are exactly the same as the used in 1997 in the original design of the program and are the following:

    1. *Rural.* Villages with less than 2500 inhabitants but more than 50. This criterion would guarantee the minimum people required for the correct functioning of the program. Total villages in 1995 that meet this criterion were 53,318; the survivors in 2000 were 52,092 and 51,155 in 2005.
    2. *Eligible.* Poor villages with access to health clinics and schools in order to being able to comply with the conditions of the program. Total villages in 1995 that meet this criterion were 29,791; the survivors in 2000 were 29,276 and 28,997 in 2005.

    – Villages in the range of poverty of the RDD are 3590.

- *Total population.* Variable defined as "pobtot". It averaged 450.5, 457.9 and 446.4 in 1995, 2000 and 2005 respectively. As we can see, there is a sharp decline in the average population size of the village during the period, which can be explained by four possible reasons: a sharp decrease in the fertility rate, an increase in the death rates, and a significant increase in the migration rates. I will only focus on this last in my analysis. For the 3590 villages of the RDD, the values were 623, 625 and 606.

- *Total female population.* Variable defined as "pobfem". It averaged 224, 231 and 227 in 1995, 2000 and 2005 respectively. There is a net average increase of female population in this period. However, the reduction from 2000 to 2005 suggests a demographic change. Villages in the RDD the values are 313, 319 and 310.

- *Total male population.* Variable defined as "pobmas". It averaged 226, 226 and 218 in 1995, 2000 and 2005 respectively. This change is significantly different than the one for females. During a period of 10 years, there was a 5 percent average reduction of the male population of rural villages. For the RDD villages the values are 310, 306 and 295. This represents a higher effect for this sub-sample.

- *Male-female population ratio.* Variable defined as "masc". This variable is fundamental to understand demographic trends in the village. If a change of the population is given by changes in the migration patters, we could expect a change in the gender composition towards male, while female would remain constant. We define change of gender ratio in the village as:

$$MR_t - MR_{t-1} = (Males_t/Females_t) - (Males_{t-1}/Females_{t-1}) \qquad (17)$$

It reduced its average value from 1.03 to 0.95 during the period.

For the RDD sub-sample, this ratio decreased seven percentage points from 1.01 to 0.94.

- *Total infant population.* Variable defined as "infant". It is defined as population between zero and 4 years old. It averaged 60, 55 and 48 in 1995, 2000 and 2005 respectively. This represents 20 decrease in ten years, making this group the one with the deepest demographic transition. However, given that the main focus of this paper is the migration element of the demographic transition, it will not be analyzed. This group reduced its average weight in the population from 0.13 to 0.10 and reduced its average absolute size 20 percent. For the RDD sample the this population decreased from 73 to 60, a reduction of 16 percent.

- *Total child population.* Variable defined as "child". It is defined as population between 5 and 14 years old. It averaged 112, 111, and 100 in 1995, 2000 and 2005 respectively. The average percent of this group went from 25 percent in 1995 to 22.5 in 2005 and it had a reduction of 12 percent in absolute value.

- *Total adult population.* Variable defined as "adults". It is defined as population between 5 and 14 years old. It averaged 265, 273 and 283 in 1995, 2000 and 2005 respectively. This is the only group that increased its absolute and relative size during the period. However, the variation in the total number of families in the program is large for this group. For the RDD sample, this group increased from 390 to 406 individuals on average.

- *Poverty.* Variable defined as "poverty". This variable refers to the poverty level of the village in every period. It goes from 1 to 5, where the lowest represents villages with lower levels of poverty and 5 the highest. The criteria used by authorities for eligible villages include only those classified as 3, 4 and 5. The discontinuity approach uses different ranges between values 4 and 3 to see difference in the demographic change. Villages in the RDD vicinity showed a reduction from 2.61 in 1995 to 2.54 in 2005.

- *Inflation.* Variable defined as "inflation". This variable refers to the regional variation of prices taking as base 1995. In 2000 the average value increased to 3.03 and to 4.06 in 2005.

- *State GDP per capita.* Variable defined as "gdppc". This variable refers to the state variation of production from 1995 to 2005. It will be used as control in order to capture the variation in the demographic trends derived from the economic conditions in the state. It varies from 9,219 in 1995 to 10,569 in 2000 and 11,175 in 2005.

- *Progresa.* Variable defined as "progresa". This variable refers average number of families covered in the program in the village. The average value is 0 in 1995 –pre-treatment period , 207 in 2000 and 253 in 2005. Villages in the sample of the RDD showed 101 and 145 for 2000 and 2005, respectively.

- *Coverage of Progresa.* Variable defined as "coverage". This variable refers to the coverage of the program by village as a percent of the total population. The average values are 0 for 1995, 0.51 in 2000 and 0.63 in 2005. For the RDD sample it showed values of 0.19 in 2000 and 0.29 in 2005.

- *Average coverage of Progresa.* Variable defined as "mcov". This variable refers to the average coverage of the program by village as a percent of the total population during a period of 5 or 10 years, in 2000 and 2005 respectively. Average coverage of the program from 1995 (baseline) to 2005:

$$Avg_{j,t} = \sum_{t=1995}^{t} \sum_{j}^{n} \frac{\text{coverage}_{i,t}}{t}$$

The value for 2005 was 0.32 and 0.48 for 2005. The value for 1995, the pre-program period.

- *Distance to the tracks.* This is a set of variables that indicates if the village is within 1, 2, 5, 10 or more miles from the closest train trac. I used the ArcView GIS to determine this distance. The command used for this purpose is "buffer" and it gives the area covered around the plane it is analyzed. In this case the railroad grid. Once this distance is obtained, then the program allows to intersect the location of the villages with the area estimated by the "buffer"command.

Other explanatory variables.

- *Indicator variables of the program.* Variable defined as "ind_prog". It indicates if the program is present. The values are zero for 1995 and one for 2000 and 2005.

$$D_t = \begin{cases} 0, t=1995 \\ 1, t=2000,2005 \end{cases}$$

- *Indicator variables of inclusion of the village in the program.* Variable defined as "inclusion". It indicates if the program is present. The values are zero for 1995 and one for 2000 and 2005.

-

$$D_{j,t} = \begin{cases} 0, t=1995 \\ 1, t=2000,2005 \end{cases}$$

6 Estimation

This section quantifies the impact of *Progresa-Oportunidades* on the total population, the adult population and gender composition of villages covered by the program using the three different strategies described before using the full and restricted samples: Difference in difference, longitudinal analysis and the heterogeneous effect of relative location to train tracks. The hypothesis to being tested is if those villages that are on the margin of the poverty distribution decreased their adult population and reduced the relative number of males with respect to females. Both variables would indicate an increase in the rate of migration.

The Difference in Difference (DD) approach is divided in two parts. The first describes the short run analysis using the information from 1995 (pre-program period) to 2000 (post program). The second part analyzes the long run effect using the information from 1995 to 2005. Table 3 to Table 9 contains the results of this analysis.

In the case of the short run analysis, there is no clear evidence of demographic changes during the first years of the program. As we can see in tables 4 and 5, using the first interval for the estimation both the total and adult average population of the villages increased from 1995 to 2000. The effect of the coverage of the program, after controlling for changes in local the local poverty rate and state production level is not statistically significant but has a negative sign. Similarly, the effect of the program on the change in gender ratio is close to zero and not statistically significant, but it shows a negative sign.

The long term effects have a higher magnitude and are statistically significant. Tables 7 to 9 show a permanent effect of the program in the composition of the total and population and a decrease in the number of males. The total population of a fully covered village decreased by 68.2 people, which represents a 10 percent decrease in the average size during the period. Restricting the analysis to only population 15 or older, the reduction is 44.3 people, or sixty five percent of the total decrease. Both estimates are significant at 1% level. Similarly, the gender ratio male to female decreased almost 2 percentage points, which is a clear sign of males leaving their communities, or increase in the migration intensity.

The longitudinal analysis is divided in two parts. The first was done using the universe of villages and the second is using the restricted sample used for the DD. Both subsections include the effect of the program in the three variables of interest: total population, adult population and gender composition. The estimation for the the full sample are included in tables 10 to 12. In the first table we can see that Progresa increases up to 72 people once we control for state and year fixed effects. This effect is mainly driven by te change in the the adult population, which decreases betwen 40 and 60 individuals. In the case of the change in the gender ratio, the reduction of male population is around 2 percentage points. However, once we include year fixed effects, the effect of Progresa-Oportunidades is not significant. The analysis with fixed effects at the village levels is included in tables 13 to 15. These results show that the effect

is the same for total population and the male-female ratio shows a significant reduction. However, the effect in the adult population is not significant.

The analysis for the restricted sample of the RDD is included in Tables 16 to 21. The effect of Progresa-Oportunidades on total and adult population, and male-female ratio is negative in all cases. Column 5 of tables 16 to 18 contains the estimation of the full model with controls for poverty, gross state product and dummy variables by state and years. As we can see, the effect of Progresa Oportunidades in a fully covered village is a decrease in the total population of 70 people. A fully covered village reduced the number of adults by 45. The analysis for the gender composition is contained in table 12. As we can see, there is a consistent reduction in the number of males per females in the villages around 2 percentage points only including state fixed effects and the estimation using village fixed effects is quite similar. The reduction of total population is almost 59 people, 25 corresponds to adults and the male female ratio decreases 1.6 percentage points. All significant at 1 percent level. A better approach would be differentiating among group ages, but this is not available at village level.

The last part of the analysis is included in tables 22 to 24 and shows the results of the with heterogeneous effect of the program controlling for the distance to the train tracks using the full sample of rural villages. As it can be seen, the main effects increse with as we control for the economic conditions in the region. The effect of these interactions in the gender composition of the villages showed in table 24 show the unbalanced reduction of males living close to the tracks. As we can see, the closer the village to the trains, the higher the decrease in the number of males per females. The evidence of this secction would susggest the positive effect of the program on migration patterns of male beneficiaries towards other places, particularly to the north.

7 Conclusions

Cash transfers have been largely expanded over the last decade as a very effective public policy to effectively reduce poverty level. More than twenty countries have initiated efforts to expand this kind of programs and increase human capital levels of their poorest populations. These positive short term results of CT programs have been largely documented, particularly using the evidence provided by Progresa-Oportunidades and its unique evaluation design.

However there are some open questions on the long term effects of CT programs. New generations who already have better health and educational levels are now better prepared than previous ones. As they are grow up, they become part of the labor force. If this extra labor supply is not cleared at the local market, individuals would decide to leave their communities and find an occupation. This paper presented some empirical evidence of this phenomenon. The evidence supports the hypothesis that conditional cash transfers would be accelerating migration patters of marginal individuals who once increase their human capital levels decide to leave their villages and go to another location. This means that not all poor population will be in conditions to abandon their communities, but only those who once the program has increased their marginal productivity will decide to leave.

I used evidence of Progresa-Oportunidades from 1995 to 2005. The census information of this period and the variation in the coverage of the program since 1997 was exploited to estimate the effect of the program in three main variables: total population, total adult population and the gender composition, all at village level. It should be emphasized that demographic information at this level is only available for three age groups: 0 to 4 years; 5 to 14 years and 15 or older. Other age groups are available at higher administrative units as municipios and state. During this period of analysis, rural villages of 1995–defined as those with population less than 2,500 inhabitants decreased their total population stop their population growth and even decreased by almost 2 percentage points.

Using a regression discontinuity design and I found that the average population in a fully covered village decreased by 70 people in 2005 compared to 1995 (almost 10 percent of the average population of 1995). Sixty five percent of this reduction corresponds to adults who left their villages and forty percent of this reduction can be attributed to Progresa-Oportunidades. The reduction of adult population of males is 6 times higher than for females, a clear sign of a significant increase in the migration patterns of this population.

The evidence found in this paper has two main implications. It is clear that Progresa-Oportunidades has decreased the population size of covered villages. The reasons for this phenomenon would be two folded. On the one hand the reduction in the fertility rates and on the other the increase of migration of beneficiaries. In both cases, the consequences of both phenomenons are new and more research is needed in order to analyze their consequences.

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8 Annex

Figure 1. Theoretical prediction of Migration Decision Given Returns to Schooling

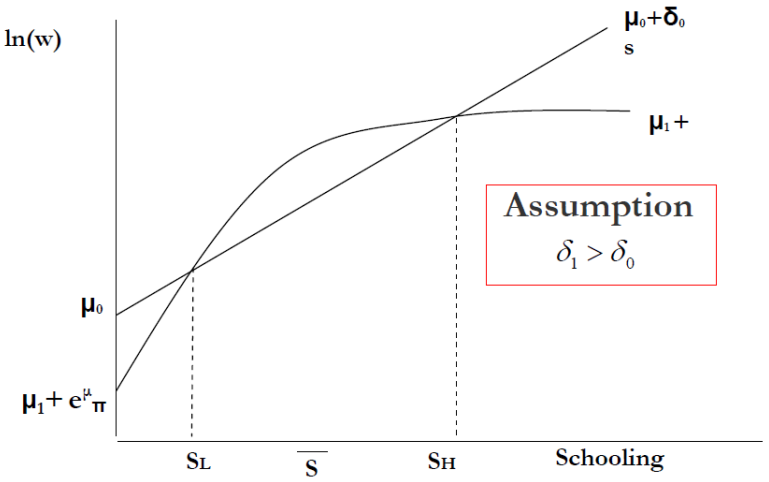


Figure 2. Theoretical prediction of CT Programs in Individual Migration Decision

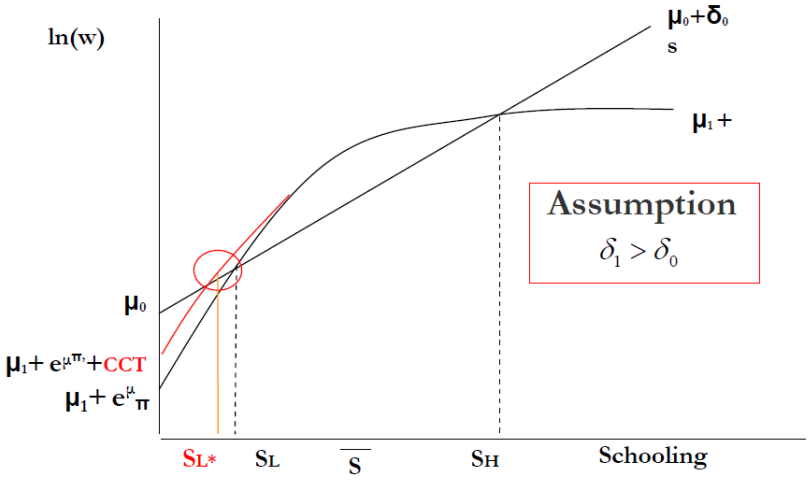
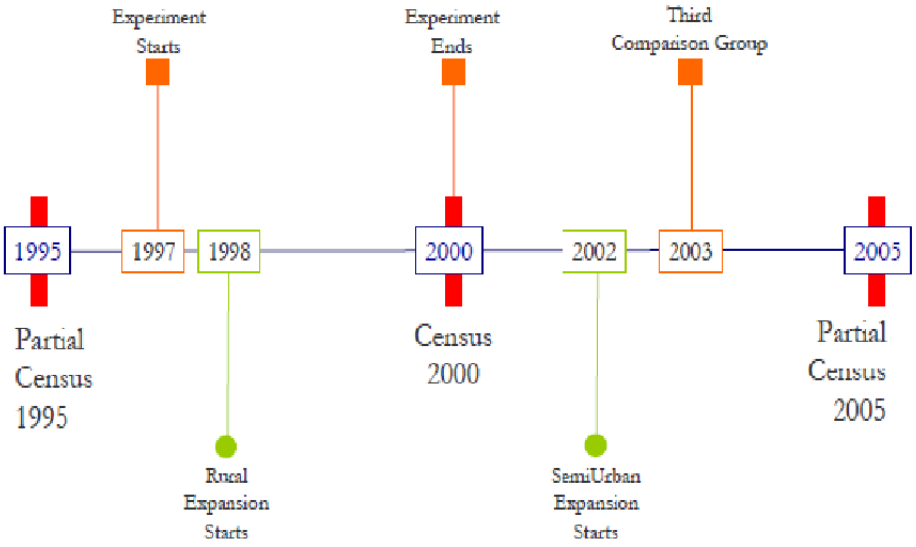
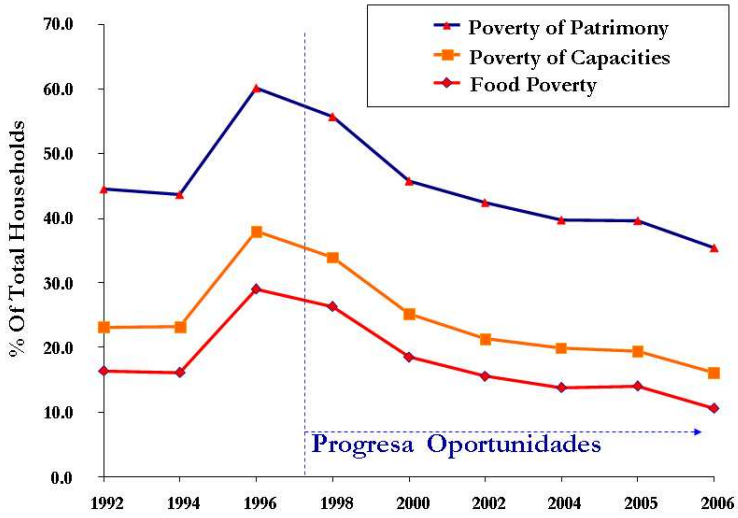


Figure 3. Time-line of *Progresa-Oportunidades*



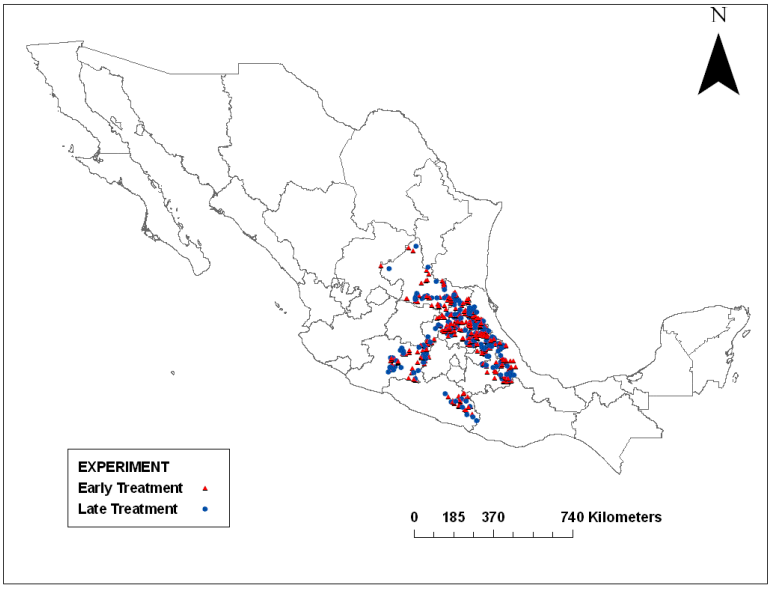
Source: Author's with information of Progresa-Oportunidades.

Figure 4. Total Poverty Levels in Mexico 1992-2006



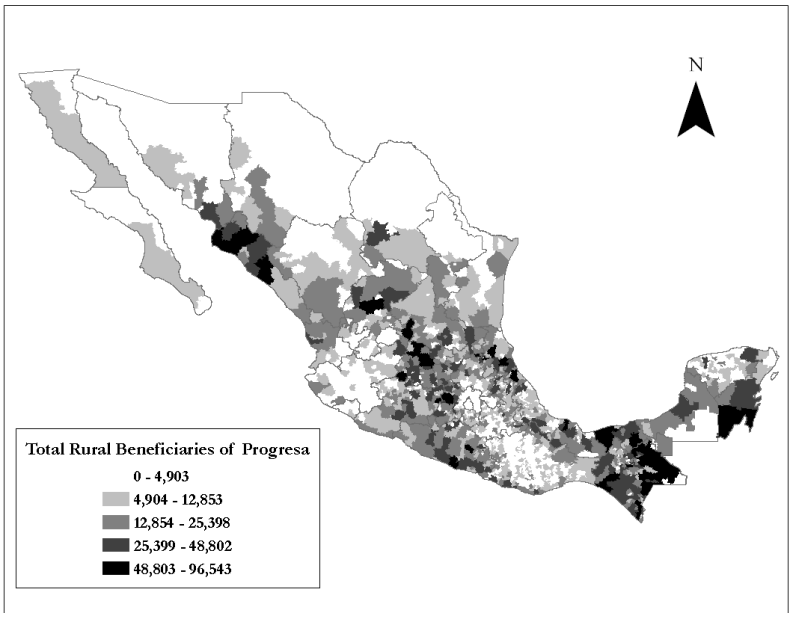
Source: Consejo Nacional de Evaluacion. http://www.coneval.gob.mx

Figure 5. Location of Experimental Villages



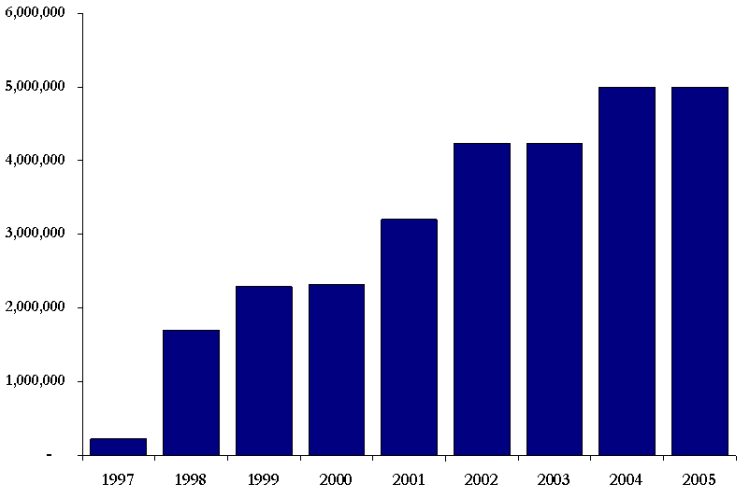
Source: Secretaria de Desarrollo Social.

Figure 6. Distribution of Progresa-Oportunidades by Municipio



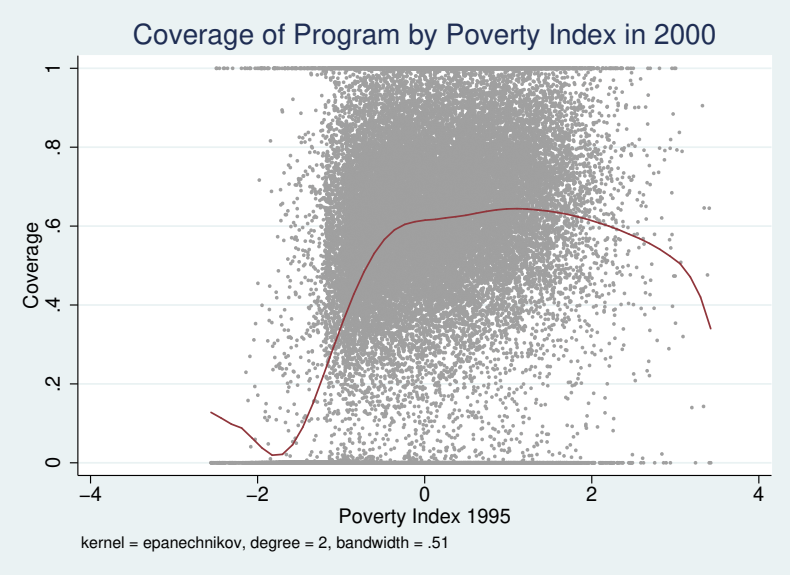
Source: Coordinacion Nacional del Programa Oportunidades

Figure 5. Annual Coverage of *Progresa-Oportunidades*



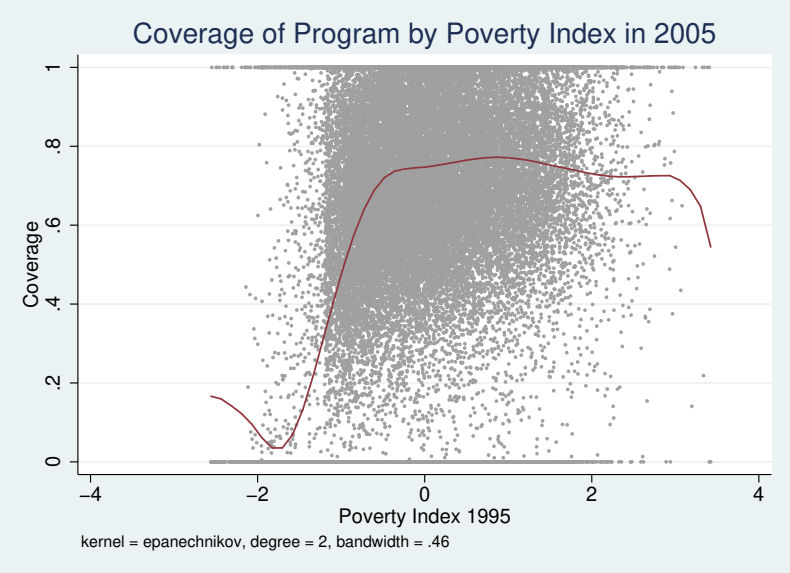
Source: Progresa-Oportunidades. http://www.oportunidades.gob.mx

Figure 8.



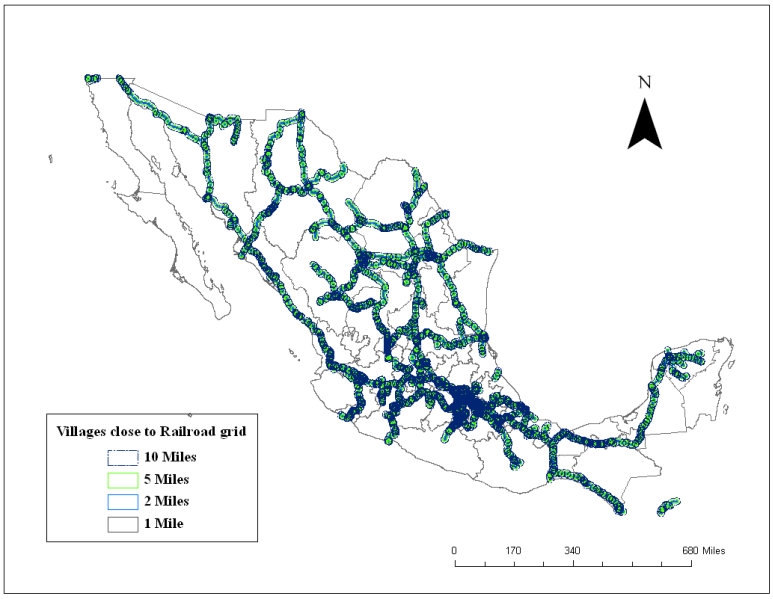
Source: Author's estimation using data from Progresa-Oportunidades.

Figure 9.



Source: Author's estimation using data from Progresa-Oportunidades.

Figure 10. Villages Close to Railroad Grid



Source: Author's estimation using data from Progresa-Oportunidades.

Table 1. Cash Transfers of Oportunidades by School Levels (2005)

School Level		Grant Boys	Grant Girls	Maximum
Elementary	3	$12.00		$110.00
	4	$14.00		$110.00
	5	$18.00		$110.00
	6	$24.00		$110.00
Secondary	1	$35.00	$37.00	$110.00
	2	$37.00	$41.00	$110.00
	3	$39.00	$45.00	$110.00
High School	1	$58.50	$67.50	$185.00
	2	$63.00	$71.50	$185.00
	3	$66.50	$76.00	$185.00

Source: Oportunidades. http://www.oportunidades.gob.mx
Exchange rate: 10 pesos per USD

Table 2. Summary statistics of Variables of all Elegible Villages

Variable	Year	Obs	Mean	Std. Dev.	Min	Max
Total population[1]	1995	40078	450.51	432.68	100.00	2,500.00
	2000	40078	457.93	465.38	0.00	5,408.00
	2005	40078	446.45	495.82	0.00	12,603.00
Females[1]	1995	40078	224.18	218.32	2.00	1,407.00
	2000	40078	231.77	238.14	0.00	2,720.00
	2005	40078	227.94	254.52	0.00	6,558.00
Males[1]	1995	40078	226.33	215.22	31.00	1,322.00
	2000	40078	226.36	228.18	0.00	2,688.00
	2005	40078	218.68	242.38	0.00	6,045.00
Male Ratio[1]	1995	40078	1.04	0.36	0.06	57.00
	2000	40078	0.98	0.21	0.00	14.01
	2005	40078	0.95	0.25	0.00	14.61
Infants (0-4)[1]	1995	40078	60.44	57.69	0.00	465.00
	2000	40078	55.90	58.08	0.00	762.00
	2005	40078	48.92	57.17	0.00	1,410.00
Children (5-14)[1]	1995	40078	112.26	106.54	0.00	736.00
	2000	40078	111.02	111.67	0.00	1,268.00
	2005	40078	100.58	110.11	0.00	2,560.00
Adults (15 or more)[1]	1995	40078	265.32	264.56	19.00	1,752.00
	2000	40078	273.18	285.13	0.00	3,206.00
	2005	40078	283.51	317.96	0.00	8,023.00
Older than 5[1]	1995	40078	390.07	378.26	50.00	2,266.00
	2000	40078	402.03	410.17	0.00	4,695.00
	2005	40078	397.53	441.39	0.00	11,193.00
Percent infants	1995	40078	0.14	0.04	0.00	0.53
	2000	40078	0.12	0.04	0.00	0.31
	2005	40078	0.10	0.04	0.00	0.33
Percent Adults	1995	40078	0.58	0.07	0.06	0.98
	2000	40078	0.58	0.11	0.00	0.96
	2005	40078	0.62	0.13	0.00	1.00
Percent older than 5	1995	40078	0.58	0.07	0.06	0.98
	2000	40078	0.58	0.11	0.00	0.96
	2005	40078	0.62	0.13	0.00	1.00
Families Progresa[2]	1995	40078	0.00	0.00	0.00	0.00
	2000	40078	207.31	255.58	0.00	2,826.00
	2005	40078	253.65	294.67	0.00	3,604.00
Coverage Progresa[2]	1995	40078	0.00	0.00	0.00	0.00
	2000	40078	0.51	0.33	0.00	1.00
	2005	40078	0.63	0.34	0.00	1.00

[1] *Source: INEGI. Partial and Total Censuses 1995, 2000 and 2005*

[2] *Source: Progresa-Oportunidades Office of Statistics*

Table **3.** Summary statistics of Variables for Villages around the cutoff point

Variable	Year	Obs	Mean	Std. Dev.	Min	Max
Total population[1]	1995	3590	623.95	542.34	100.00	2500.00
	2000	3590	625.52	581.54	0.00	5333.00
	2005	3590	606.37	620.00	0.00	8641.00
Females[1]	1995	3590	313.13	273.82	40.00	1333.00
	2000	3590	319.10	297.69	0.00	2653.00
	2005	3590	310.94	316.68	0.00	4306.00
Males[1]	1995	3590	310.82	269.58	37.00	1322.00
	2000	3590	306.42	285.08	0.00	2680.00
	2005	3590	295.85	305.46	0.00	4335.00
Male Ratio	1995	3590	1.01	0.22	0.57	12.29
	2000	3590	0.96	0.20	0.00	6.15
	2005	3590	0.94	0.25	0.00	8.47
Infants (0-4)[1]	1995	3590	73.41	67.59	1.00	411.00
	2000	3590	68.74	69.12	0.00	762.00
	2005	3590	60.97	68.86	0.00	1109.00
Children (5-14)[1]	1995	3590	144.48	129.90	8.00	683.00
	2000	3590	138.53	134.31	0.00	1204.00
	2005	3590	122.02	130.82	0.00	2043.00
Adults (15 or more)[1]	1995	3590	390.70	337.58	19.00	1747.00
	2000	3590	395.08	362.65	0.00	3124.00
	2005	3590	406.25	405.76	0.00	5144.00
Percent infants	1995	3590	0.12	0.03	0.00	0.25
	2000	3590	0.10	0.03	0.00	0.26
	2005	3590	0.09	0.03	0.00	0.25
Percent Adults	1995	3590	0.63	0.06	0.06	0.98
	2000	3590	0.63	0.10	0.00	0.96
	2005	3590	0.66	0.13	0.00	0.95
Poverty[2]	1995	3590	2.61	0.49	2.00	3.00
	2000	3522	3.08	0.63	1.00	5.00
	2005	3488	2.54	0.81	1.00	5.00
Log GDPpc[3]	1995	3590	9.20	0.31	8.68	10.33
	2000	3590	9.34	0.36	8.72	10.52
	2005	3590	9.40	0.36	8.75	10.53
Families Progresa[4]	1995	3590	0.00	0.00	0.00	0.00
	2000	3590	101.77	223.72	0.00	1695.00
	2005	3590	145.09	276.75	0.00	2062.00
Coverage Progresa[4]	1995	3590	0.00	0.00	0.00	0.00
	2000	3590	0.19	0.30	0.00	1.00
	2005	3590	0.29	0.37	0.00	1.00

[1] *Source: INEGI. Partial and Total Censuses 1995, 2000 and 2005*

[2] *Source: Consejo Nacional de Poblacion (CONAPO). http://www.conapo.gob.mx*

[3] *Source: Mexican Central Bank. Office of Statistics. http://www.banxico.org.mx*

[4] *Source: Progresa-Oportunidades Office of Statistics*

Table 4. Change of Total population. Short Run 1995-2000.

VARIABLES	(1) Ch. Total Population	(2) Ch. Total Population	(3) Ch. Total Population
Coverage Progresa 2000	-32.61**	-23.95	-11.99
	(15.17)	(15.07)	(14.80)
Change Poverty 1995-2000		12.18**	7.087*
		(4.540)	(3.978)
Change GDPpc 1995-2000		63.90	0
		(91.76)	(0)
State FE	NO	NO	YES
Constant	13.17*	-2.579	63.49***
	(7.565)	(15.90)	(2.903)
Observations	3524	3522	3522
R^2	0.005	0.009	0.063

Robust standard errors in parentheses. Clustered by State.

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

Source: Author's estimation.

Table 5. Change of Male Total population. Short Run 1995-2000.

VARIABLES	(1) Ch. Adult Population	(2) Ch. Adult Population	(3) Ch. Adult Population
Coverage Progresa 2000	-19.55*	-15.20	-6.804
	(9.738)	(9.990)	(9.332)
Change Poverty 1995-2000		7.237**	3.294
		(2.716)	(2.510)
Change GDPpc 1995-2000		-7.364	0
		(65.44)	(0)
State FE	NO	NO	YES
Constant	11.39**	8.543	39.88***
	(5.365)	(12.11)	(1.863)
Observations	3524	3522	3522
R^2	0.004	0.008	0.072

Robust standard errors in parentheses. Clustered by State.

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

Source: Author's estimation.

Table 6. Change of Male/Female Ratio. Short Run. 1995-2000.

VARIABLES	(1) Ch. Male/Female	(2) Ch. Male/Female	(3) Ch. Male/Female
Coverage Progresa 2000	-0.00408	-4.88e-05	-0.00937
	(0.00947)	(0.00887)	(0.00978)
Change Poverty 1995-2000		-0.00400	-0.00234
		(0.00284)	(0.00394)
Change GDPpc 1995-2000		-0.0427	0
		(0.0416)	(0)
State FE	NO	NO	YES
Constant	-0.0317***	-0.0240***	-0.0358***
	(0.00424)	(0.00609)	(0.00247)
Observations	3524	3522	3522
R^2	0.000	0.001	0.017

Robust standard errors in parentheses. Clustered by State.

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

Source: Author's estimation.

Table 7. Change of Total population. Long Run 1995-2005.

VARIABLES	(1) Ch. Total Population	(2) Ch. Total Population	(3) Ch. Total Population
Coverage Progresa 2005	-100.5***	-83.37***	-68.21***
	(14.85)	(15.83)	(15.54)
Change Poverty 1995-2005		1.795	-1.406
		(8.301)	(6.293)
Change GDPpc 1995-2005		-128.3	0
		(160.1)	(0)
State FE	NO	NO	YES
Constant	15.58	39.47	171.7***
	(16.00)	(34.90)	(7.664)
Observations	3524	3488	3488
R^2	0.023	0.019	0.089

Robust standard errors in parentheses. Clustered by State.

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

Source: Author's estimation.

Table 8. Change of Male Total population. Long Run. 1995-2005.

VARIABLES	(1) Ch. Total Adults	(2) Ch. Total Adults	(3) Ch. Total Adults
Coverage Progresa 2005	-63.35***	-52.56***	-44.35***
	(9.754)	(10.79)	(9.582)
Change Poverty 1995-2005		3.527	-2.199
		(5.426)	(3.755)
Change GDPpc 1995-2005		-146.0	0
		(119.9)	(0)
State FE	NO	NO	YES
Constant	36.77***	64.80**	108.8***
	(11.99)	(26.72)	(4.554)
Observations	3524	3488	3488
R^2	0.022	0.024	0.107

Robust standard errors in parentheses. Clustered by State.

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

Source: Author's estimation.

Table 9. Change of Male/Female Ratio. Long Run 1995-2005.

VARIABLES	(1) Ch. Male/Female	(2) Ch. Male/Female	(3) Ch. Male/Female
Coverage Progresa 2005	-0.0661***	-0.00810	-0.0196**
	(0.0193)	(0.00981)	(0.00806)
Change Poverty 1995-2005		-0.00352	0.00182
		(0.00275)	(0.00302)
Change GDPpc 1995-2005		-0.000979	0
		(0.0363)	(0)
State FE	NO	NO	YES
Constant	-0.0341***	-0.0395***	-0.0181***
	(0.00547)	(0.00791)	(0.00432)
Observations	3524	3488	3488
R^2	0.018	0.001	0.016

Robust standard errors in parentheses. Clustered by State.

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

Source: Author's estimation.

Table 10. Total Population 1995-2005. Longitudinal Analysis for full sample

VARIABLES	(1) Total Population	(2) Total Population	(3) Total Population	(4) Total Population	(5) Total Population
Coverage Progresa	-15.53***	-13.03**	-18.35**	-29.45**	-72.82***
	(6.012)	(5.990)	(8.419)	(11.66)	(11.71)
Poverty Index		-12.86***	-12.40***	-14.38***	-17.45***
		(2.175)	(2.035)	(1.891)	(2.298)
Log GDPpc			32.78	90.83*	-66.65
			(36.30)	(48.11)	(57.99)
State FE	NO	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES
Constant	464.1***	513.9***	213.8	-315.0	1204**
	(13.11)	(17.12)	(320.7)	(468.4)	(562.9)
Observations	118071	117436	117436	117436	117436
Number of id	40078	40078	40078	39357	39357

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's estimation.

Table 11. Adult Population 1995-2005. Longitudinal Analysis for full sample

VARIABLES	(1) Total Adults	(2) Total Adults	(3) Total Adults	(4) Total Adults	(5) Total Adults
Coverage Progresa	8.061**	7.641**	-0.178	-8.622	-47.66***
	(3.862)	(3.892)	(5.932)	(8.240)	(8.178)
Poverty Index		-12.56***	-11.59***	-12.84***	-11.81***
		(1.399)	(1.334)	(1.327)	(1.395)
Log GDPpc			49.28**	94.26***	-61.21
			(24.38)	(32.10)	(39.56)
State FE	NO	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES
Constant	274.7***	323.8***	-128.5	-548.6*	944.8**
	(7.545)	(9.582)	(216.5)	(312.3)	(383.8)
Observations	118071	117436	117436	117436	117436
Number of id	40078	40078	40078	39357	39357

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's estimation.

Table 12. Male Ratio 1995-2005. Longitudinal Analysis for full sample

VARIABLES	(1) Male / Female	(2) Male / Female	(3) Male / Female	(4) Male / Female	(5) Male / Female
Coverage Progresa	-0.0627***	-0.0516***	-0.0486***	-0.0272***	0.00138
	(0.00560)	(0.00381)	(0.00404)	(0.00421)	(0.00278)
Poverty Index		0.00357**	0.00287*	0.0112***	0.00905***
		(0.00167)	(0.00169)	(0.00191)	(0.00179)
Log GDPpc			-0.0198	-0.114***	0.0184
			(0.0250)	(0.0265)	(0.0325)
State FE	NO	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES
Constant	1.025***	1.012***	1.195***	2.209***	0.939***
	(0.0102)	(0.0104)	(0.226)	(0.260)	(0.318)
Observations	118071	117436	117436	117436	117436
Number of id	40078	40078	40078	39357	39357

Robust standard errors in parentheses

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

Source: Author's estimation.

Table 13. Total Population 1995-2005. Longitudinal Analysis Fixed Effects for Full Sample

VARIABLES	(1) Total Population
Coverage Progresa	-16.96***
	(1.496)
Poverty Index	1.086
	(1.207)
Log GDPpc	76.17***
	(6.850)
Constant	-236.3***
	(61.71)
Observations	118169
Number of id	40078
R^2	0.003

Robust standard errors in parentheses

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

Source: Author's estimation.

Table **14.** Adult Population 1995-2005. Longitudinal Analysis Fixed Effectsfor Full Sample

VARIABLES	(1) Adult Population
Coverage Progresa	0.592
	(0.921)
Poverty Index	-1.391*
	(0.752)
Log GDPpc	83.50***
	(4.251)
Constant	-481.6***
	(38.35)
Observations	118169
Number of id	40078
R^2	0.018

Robust standard errors in parentheses

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

Source: Author's estimation.

Table **15.** Male Ratio 1995-2005. Longitudinal Analysis Fixed Effects

VARIABLES	(1) Male / Female
Coverage Progresa	-0.0362***
	(0.00129)
Poverty Index	0.000962
	(0.000875)
Log GDPpc	-0.101***
	(0.00546)
Constant	1.944***
	(0.0502)
Observations	118169
Number of id	40078
R^2	0.040

Robust standard errors in parentheses

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

Source: Author's estimation.

Table 16. Total Population 1995-2005. Longitudinal Analysis for restricted sample

VARIABLES	(1) Total Population	(2) Total Population	(3) Total Population	(4) Total Population	(5) Total Population
Coverage Progresa	-72.23***	-54.53***	-45.70***	-61.83***	-70.27***
	(10.47)	(12.36)	(15.54)	(13.14)	(11.79)
Poverty Index		11.19***	11.11***	9.045**	2.194
		(3.919)	(3.870)	(3.693)	(5.163)
Log GDPpc			-40.64	31.94	-66.48
			(53.99)	(56.30)	(119.4)
State FE	NO	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES
Constant	639.0***	606.9***	983.8**	152.0	1117
	(37.92)	(40.33)	(485.1)	(550.8)	(1162)
Observations	10572	10534	10534	10534	10534
Number of id	3590	3590	3590	3524	3524

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's estimation.

Table 17. Adult Population 1995-2005. Longitudinal Analysis for restricted sample

VARIABLES	(1) Total Adults	(2) Total Adults	(3) Total Adults	(4) Total Adults	(5) Total Adults
Coverage Progresa	-18.53**	-8.474	-13.31	-27.60***	-44.97***
	(8.203)	(8.537)	(11.42)	(9.577)	(8.155)
Poverty Index		2.952	3.003	1.375	2.000
		(2.415)	(2.463)	(2.484)	(3.317)
Log GDPpc			21.80	85.85**	-97.87
			(39.30)	(39.10)	(89.27)
State FE	NO	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES
Constant	406.4***	397.5***	195.2	-535.2	1241
	(24.03)	(24.79)	(350.6)	(381.0)	(867.5)
Observations	10572	10534	10534	10534	10534
Number of id	3590	3590	3590	3524	3524

Robust standard errors in parentheses

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

Source: Author's estimation.

Table 18. Male Ratio 1995-2005. Longitudinal Analysis for restricted sample

VARIABLES	(1) Male / Female	(2) Male / Female	(3) Male / Female	(4) Male / Female	(5) Male / Female
Coverage Progresa	-0.0893***	-0.0471***	-0.0486***	-0.0143***	-0.00205
	(0.0138)	(0.00541)	(0.00736)	(0.00545)	(0.00644)
Poverty Index		-0.00625***	-0.00605**	-0.00279	0.000279
		(0.00210)	(0.00237)	(0.00190)	(0.00215)
Log GDPpc			0.00818	-0.158***	-0.00527
			(0.0232)	(0.0233)	(0.0348)
State FE	NO	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES
Constant	0.995***	1.009***	0.933***	2.644***	1.162***
	(0.0148)	(0.0119)	(0.213)	(0.229)	(0.339)
Observations	10572	10534	10534	10534	10534
Number of id	3590	3590	3590	3524	3524

Robust standard errors in parentheses

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

Source: Author's estimation.

Table 19. Total Population 1995-2005. Longitudinal Analysis Fixed Effects for restricted sample

VARIABLES	(1) Total Population
Coverage Progresa	-58.72***
	(5.762)
Poverty Index	10.89***
	(2.513)
Log GDPpc	28.70*
	(17.01)
Constant	340.2**
	(159.5)
Observations	10600
Number of id	3590
R^2	0.018

Robust standard errors in parentheses

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

Source: Author's estimation.

Table **20.** Adult Population 1995-2005. Longitudinal Analysis Fixed Effects for restricted sample

VARIABLES	(1) Adult Population
Coverage Progresa	-25.27***
	(3.701)
Poverty Index	2.781*
	(1.608)
Log GDPpc	83.42***
	(10.82)
Constant	-376.6***
	(101.2)
Observations	10600
Number of id	3590
R^2	0.019

Robust standard errors in parentheses

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

Source: Author's estimation.

Table **21.** Male Ratio 1995-2005. Longitudinal Analysis Fixed Effects for restricted sample

VARIABLES	(1) Male / Female
Coverage Progresa	-0.0160***
	(0.00508)
Poverty Index	-0.00508***
	(0.00181)
Log GDPpc	-0.155***
	(0.0138)
Constant	2.439***
	(0.128)
Observations	10600
Number of id	3590
R^2	0.044

Robust standard errors in parentheses

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

Source: Author's estimation.

Table **23.** Change in Total 1995-2005. Heterogeneous effect by distance to Train Tracks Full sample

VARIABLES	(1) Change Total Population	(2) Change Total Population	(3) Change Total Population
Coverage Progresa	-69.66***	-64.44***	-76.45***
	(17.27)	(15.56)	(15.14)
1 mile range	8.966	4.733	12.62
	(13.92)	(11.98)	(14.34)
2 miles range	18.28	14.68	17.30
	(11.00)	(8.970)	(10.25)
5 miles range	9.293	4.317	7.891
	(12.25)	(10.37)	(12.04)
10 miles range	4.280	-1.603	0.711
	(9.501)	(7.858)	(9.034)
Change Poverty		-4.992	-8.827***
		(3.846)	(3.076)
Ch. Log GDPpc		-89.12	0
		(59.74)	(0)
State FE	NO	NO	YES
Constant	48.33***	63.68***	127.8***
	(15.41)	(16.59)	(3.986)
Observations	39357	38818	38818
R^2	0.014	0.013	0.045

Robust standard errors in parentheses

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

Source: Author's estimation.

Table **23.** Change in Adult Population 1995-2005. Heterogeneous effect by distance to Train Tracks Full sample

VARIABLES	(1) Ch. Adult Population	(2) Ch. Adult Population	(3) Ch. Adult Population
Coverage Progresa	-47.01***	-43.57***	-52.88***
	(11.85)	(10.96)	(10.04)
1 mile range	11.47	9.824	14.43*
	(7.564)	(6.097)	(7.723)
2 miles range	12.68*	11.61**	12.75**
	(6.336)	(5.041)	(5.905)
5 miles range	10.14	7.375	9.111
	(7.337)	(5.872)	(6.866)
10 miles range	5.616	2.719	3.443
	(5.836)	(4.679)	(5.193)
Change Poverty		-0.396	-3.661*
		(2.423)	(1.879)
Ch. Log GDPpc		-74.76	0
		(45.43)	(0)
State FE	NO	NO	YES
Constant	52.48***	66.01***	96.59***
	(11.16)	(12.70)	(2.736)
Observations	39357	38818	38818
R^2	0.016	0.016	0.058

Robust standard errors in parentheses

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

Source: Author's estimation.

Table **24.** Change in Male Ratio 1995-2005. Heterogeneous effect by distance to Train Tracks Full sample

VARIABLES	(1) Ch. Male / Female	(2) Ch. Male / Female	(3) Ch. Male / Female
Coverage Progresa	-0.0484***	-0.00682	-0.000179
	(0.00644)	(0.00504)	(0.00565)
1 mile range	0.0149	-0.0123*	-0.0138***
	(0.00917)	(0.00640)	(0.00489)
2 miles range	0.0175*	-0.00799	-0.00711
	(0.00921)	(0.00758)	(0.00808)
5 miles range	0.00776	-0.0161***	-0.0165***
	(0.00584)	(0.00450)	(0.00350)
10 miles range	0.0153*	-0.0114**	-0.0105***
	(0.00783)	(0.00492)	(0.00342)
Change Poverty		0.000839	0.00335*
		(0.00235)	(0.00169)
Ch. Log GDPpc		0.0157	0
		(0.0383)	(0)
State FE	NO	NO	YES
Constant	-0.0330***	-0.0450***	0.00464**
	(0.00501)	(0.00874)	(0.00192)
Observations	39357	38818	38818
R^2	0.005	0.001	0.011

Robust standard errors in parentheses

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

Source: Author's estimation.