Property Rights as a Public Policy Tool: An Empirical Analysis of the Social and Economic Effects

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Abstract

Secure property rights are considered a key determinant of economic development. However, the evaluation of the causal effects of land titling is a difficult task. The Brazilian government through a program called "Papel Passado" has issued titles, since 2004, to over 85,000 families and has the goal to reach 750,000. This thesis examines the direct impact of securing a property title on income, labor supply, happiness and child labor force participation.

In order to isolate the causal role of ownership security, this study uses a comparison between two close and very similar communities in the City of Osasco (a town with 654,000 people in the São Paulo metropolitan area). The key point of this case is that some units get the program and others do not. One of them, Jardim Canaã, was chosen to receive the titles in 2007, but the other, Jardim DR, given fiscal constraints, only will be part of the program schedule in 2012, and for that reason became the control group in this research.

In terms of Public Policy response to economic growth, understand the effect on income is relevant to measure the "Papel Passado" developmental impact. Furthermore, another topic in Public Policy, that is crucial for developing economies, is child labor force participation. Particularly, in Brazil, about 5.4 million children and teenagers between 5 and 17 years old are still working full time. Last, but not least, how could such subject be related with happiness? The economics of happiness has been applied to a range of issues. These include the relationship between income and happiness, inequality and poverty, the effects of macro-policies on individual welfare and the effect of institutional conditions such as democracy, federalism and security. An evaluation of happiness as a causal effect of land titling has never been applied and such thesis intends to provide an additional input regarding this topic.

The estimates suggest, using basically the Difference-in-Difference (DD) econometric approach, that titling results in increase of income and decrease of child labor hours. Also, applying ordered probit model, the property rights have positive impact on happiness as well. Hence, the thesis has presented new evidence on the value of formal property rights in urban squatter community in a developing country.

Key Words: Property rights, land titling, income, labor supply, happiness, child labor

JEL classifications: P14, Q15, J22, O18, O54.
1 Introduction

The role played by private rights in the economic development of the Western world has been powerfully documented by economic historians such as North & Thomas (1973). The fragility of property rights is considered a crucial obstacle for economic development (NORTH, 1990). The main argument is that individuals underinvest if others can seize the fruits of their investment (DEMSETZ, 1967). Torstensson (1994) and Goldsmith (1995) found a significantly positive association between secure property rights and economic growth.

In such context, strengthening economic institutions is widely argued to foster investment in physical and human capital, bolster growth performance, reduce macro-economic volatility and encourage an equitable and efficient distribution of economic opportunity (ACEMOGLU et al., 2002). In the current developing world scenario, a pervasive sign of feeble property rights is the 930 million people living in urban dwellings without possessing formal titles to the plots of land they occupy (United Nations, Habitat Report, 2005). The lack of formal property rights constitutes a severe limitation for the poor. The absence of formal titles creates constraints on using land as collateral to access credit markets (BESLEY, 1995).

De Soto (2000) emphasizes that the lack of property rights limits the transformation of the wealth owned by the poor into capital. Proper titling could allow the poor to collateralize the land. Field & Torero (2002) mentioned that this credit could be invested as capital in productive projects, promptly increasing labor productivity and income. Among policy-makers as well, property titling is increasingly considered one of the most effective forms for targeting the poor and encouraging economic growth (BAHAROGLU, 2002; BINSWANGER et al., 1995) as translated in the Figure 1 below.
The most famous example is Peru in Latin America. The Peruvian government issued property titles to 1.2 million urban households during the 1990’s. In Asia, millions of titles are being issued in Vietnam and Cambodia as shown in the *The Economist* magazine in the March 15, 2007 edition. The same edition has on the front page: "Property Rights: China’s Next Revolution". The survey shows that China
intends to put into place the most ambitious land-titling program in the world’s history and includes this initiative as one of the main points of the Chinese economic development model.

In Brazil, President Luiz Inácio Lula da Silva announced during his first week in office, back in 2003, a massive plan to title 750,000 families from all over the country. The Brazilian federal government created a program called "Papel Passado". Since launched, the program has spent US$ 15 million per year from the federal budget, providing titles to over 85,000 and reaching 49 cities in 17 different Brazilian states. The official goal of the program is "to develop land titles in Brazil and promote an increase in the quality of life for the Brazilian population". However, the country still faces a very difficult scenario regarding land property rights: the Brazilian government estimates that 12 million people live under illegal urban conditions (IBGE, 2007).

This thesis investigates the impact of property rights on labor markets and people’s living conditions in an emerging economy such as Brazil by analyzing household response regarding income, supply of labor force and happiness to an exogenous changes in formal ownership status. In particular, the study assesses the value to a squatter household of increases in tenure security associated with obtaining a property title in terms of labor supply, child labor, income and happiness.


In urban settings, the value of property titles has been measured far less often
and empirical work has focused on real estate prices. A major contribution is from the paper by Jimenez (1984), involving an equilibrium model of urban squatting in which it is shown that the difference in unit housing prices between the non-squatting (formal) sector of a city and its squatting (informal) sector reflects the premium associated with security. The accompanying empirical analysis of real estate markets in the Philippines finds equilibrium price differentials between formal and informal sector unit dwelling prices in the range of 58.0% and greater for lower income groups and larger households.

For Besley (1995), the findings were ambiguous; land rights appear to have a positive effect on agricultural investment in the Ghananian region of Angola but less noticeable impact on the region of Wassa. Using a similar approach, Jacoby et al. (2002) find positive effects in China, where as Brasselle et al. (2002) find no effects for Burkina Faso. Field & Torero (2002), in Peru, exploit timing variability in the regional implementation of the Peruvian titling program using cross-sectional data on past and future title recipients midway through the project, and also find positive effects, particularly in credit access, labor supply and housing investments. In Brazil, Andrade (2006) using cross-section data from a sample of 200 families of the Comunidade do Caju, an urban poor community in Rio de Janeiro, has demonstrated an increase effect on the income of those that had received the land title.

A common obstacle, faced by all studies mentioned above, is how to measure the influence of tenure security considering the potential endogeneity of ownership rights as pointed by Demsetz (1967) and Alchian & Demsetz (1973). Direct evidence of this is provided by Miceli et al. (2001), who analyze the extent of endogeneity of formal agricultural property rights in Kenya.

In order to isolate the causal role of ownership security, this study uses a natural experiment, basically a comparison between two neighboring and very similar com-
munities in the City of Osasco (a town with around 654,000 people located in the São Paulo - Brazil metropolitan area). Osasco is part of the Papel Passado’s map and has 6,000 families informally living on urban property. One of them, Jardim Canaã, was fortunate to receive titles in 2007, the other, Jardim DR, will be part of the program schedule in 2012, and for that reason became the control group. This enables a comparison of households in a neighborhood reached by the program with households in a neighborhood not yet reached.

Furthermore, the present research, different from the previous studies, is based on two-stage survey, from a random sample from Jardim Canaã and Jardim DR, and produced from a two-stage survey with focus on the property right issue. The first part of the survey was collected in March 2007, before titles had been issued to Jardim Canaã, and the second collected in August 2008, almost one year and half after the titles. As Ravallion et. al (2005) argue, the best ex-post evaluations are designed and implemented ex-ante – often side-by-side with the program itself.

And, based on the first survey, 95.0% of the survey participants (from Canaã and DR) were not aware about receiving land titles and the meaning of it (which avoids any behavior deviation generated by the expectation of having a land title). From the second stage of the survey, most of households that received the land title felt that it improved their lives (see Figure 2) even if they had not previously expected the land title.
Figure 2: How land title affected household’s life?

Source: Research from the Osasco Land Title survey - 2008

Regarding *Jardim DR* households expectation during the process, from the interviewers feedback, most of them heard about the program but not fully understand.

First of all, an important contribution of this work is the specific focus on non-agricultural households and the value to urban residents and their families of increased ownership security. As shown, in developing economies, large proportions of urban and rural residents alike lack tenure security. As Field (2002) demonstrated, presumably because of historic interests in agricultural investment and related politics of land reform, the majority of both academic and policy attention to property rights has centered on rural households tenure security. Nevertheless, in most of the developing world, the population - particularly the impoverished population - is
increasingly urban.

Secondly, this research provides an unique-two stage survey through a natural experiment that helps to minimize the endogeneity aspect related to most of the studies on such subject (property rights).

Third, the economics of happiness has been applied to a range of issues. These include the relationship between income and happiness, inequality and poverty, the effects of macro-policies on individual welfare and the effect of institutional conditions such as democracy, federalism and security. However, an evaluation of happiness as a causal effect of land titling has never been applied in such particular way.

Last, but not least, this paper provides an initial measure, in terms of applied public policy, for the "Papel Passado" program and gives a partial feedback for policy-makers about the effects of land titling in variation of adult and child labor supply. Certainly, increasing adult labor force participation and reducing child labor force are priority goals of the Brazilian Government. Social programs such as PETI (Programa de Erradicação de Trabalho Infantil), an initiative that focus on providing education opportunities for children engaged in labor activities and extra income for their poor families, is a great example of Government’s concern.

Hence, given the main points described above, understanding the potential positive effects of land titling and property rights in such matter could be valuable as a public policy tool to impact economic development and growth.

2 The Data

The empirical analysis of household responses to changes in formal property rights relies on a data survey developed, especially and exclusively for this thesis, in the City of Osasco, an important town in the São Paulo metropolitan area with a population
of 654,000 people.

The federal government has chosen Osasco, as one of the participants of the "Papel Passado" - a program that intends, as mentioned earlier, to provide land titles to families living under illegal conditions - given its relevant economic and social role.

The city of Osasco has 30,000 people (about 6,000 families) living under informal conditions, which represents almost 4.5% of its total population. The program timetable for Osasco establishes that all the communities living in illegal condition will be part of the "Papel Passado" during the period between 2007 and 2014 (the main reason that all communities are not receiving the land title at the same time is because fiscal resources are limited). Officially, as released by the Osasco City Hall, the priority follows random criteria. Unofficial sources from local communities in Osasco express the feelings that a "political" agenda is present in the decision.

The first community to receive the land title was Jardim Canaã, in 2007, which has 500 families. The closest neighbor of Jardim Canaã is a community called DR, with 450 families. The DR’s households will be part of the "Papel Passado" program schedule in 2012. Hence, the data of this particular paper consist of 326 households distributed across Jardim Canaã and DR (185 from Jardim Canaã and 141 from DR).

The master list used to sample the families was provided by the Osasco municipality and 2nd Cartório de Osasco (2nd Osasco’s Office of Registration). Both entities have worked together to map all families from that area.
2.1 Minimizing Endogeneity Bias Concerns

Given the nature of the research conducted in the city of Osasco, some steps were taken to minimize the bias related to the data collected.

First of all, a technique from Bolfarine & Bussab (2005) was used to choose randomly 326 sample households. The approach was basically to choose the first 150 households (from the Canaã and DR) that have the closest birth dates (day and month) in comparison with the three field researchers that conducted the survey interviews (important to mention that the field researchers are not from Osasco). Each researcher got 50 names initially as first base. Additionally, after reaching each of those households, they could go and pick the third and the fifth neighbor on the right hand side.

Secondly, Heckman & Hotz (1989) states that constructing counterfactuals is the central problem in the literature evaluating social programs given the impossibility of observing the same person in both states at the same time. The goal of any program evaluation is to compare only comparable people. An important step to minimize such issue in this study was to use a comparison between those two neighbors (Jardim Canaã and DR) with very similar characteristics. Canaã and DR are not only official neighbors but there is no physical “borderline” among them, both are geographically united (if someone walks there, it is hard to identify the boundaries – even for the local households).

One of them, Jardim Canaã, fortunate to receive the titles in 2007, is qualified, for the thesis proposal, as the main sample. The other, DR, only part of the program schedule in 2012, became the control group. This approach enables a comparison of households in a neighborhood reached by the program with households in a neighborhood not yet reached and makes it possible to produce a panel of data.
Another aspect to be mentioned about the data collected is that it produced unique match within the same geographic area which helped to ensure that comparison units come from the same economic environment. Rubin & Thomas (2000) indicate that impact estimates based on full (unmatched) samples are generally more biased, and less robust to miss-specification of the regression function, than those based on matched samples.

Given such conditions, the data were produced from a two-stage survey focused on the property right issue. However, to minimize bias, the way that survey was prepared and conducted by the researchers does not provide any direct information for the households on what exactly the research is about. Officially for the people interviewed, the study was about general living conditions in the City of Osasco.

The survey was based on a 39 questions questionnaire applied to the 326 families randomly sampled as described above. The survey instrument, in many of its questions and methodologies, closely mirrors the IBGE (PNAD - *Pesquisa Nacional de Amostra de Domicílios do Instituto Brasileiro de Geografia e Estatística*) in content, and therefore contains a variety of information on household and individual characteristics. In addition, there are six questions designed to provide information on a range of economic, social and personal benefits associated with property formalization (See Appendix A for the complete stage I and stage II questionnaires.).

The first stage of the survey was conducted in March 2007, before titles had been issued to *Jardim Canaã*, and the second collected in August 2008, almost a year and a half after the first titles had been issued (with exactly the same households and with 98.0% recall – or 2.0% missing, which means that almost all the households interviewed in the first survey were found and interviewed during the second stage). The reason for the time gap was to give the an opportunity to all the households interviewed during the first survey stage to have at least 1 year with the land title.
The exactly dates that each household interviewed received the title were provided by the 2nd Cartório de Osasco (2nd Osasco’s Office of Registration) along with the formal authorization from the Osasco’s City Hall to conduct the research.

Heckman & Hotz (1989) add that it is not necessary to sample the same persons in different periods – just persons from the same population. This particular survey instrument design has clearly the advantage that the same households were tracked over time to form a two-stage survey set. Ravallion *et al.* (1995) argue that making a panel data with such characteristics should be able to satisfactorily address the problem of miss-matching errors from incomplete data, a very common issue regarding public policy evaluation.

Furthermore, it is also important to emphasize again another aspect that helps minimize the selection bias. Based on the first survey, 95.0% of the survey participants (from Canaã and DR) did not expect to receive any land title, i.e., they were not aware of "Papel Passado" and the meaning of it. Such lack of information about the subject provides the study a non-bias aspect regarding the importance of property rights because it avoids a potential behavior deviation from households included in the program.

Finally, the study also tracks the households that moved outside both communities to check if the land title effect stands. From the original sample only 8.0% of the households that received the land title have moved away from Canaã (one of the main concerns from local authorities in Osasco was that most citizens would receive the land title, sell the property right away and return to an informal living conditions and that not has been materialized). From the control group, only 1 household (out of 140) has moved during the same period.

On the other hand, such environment of circumstances increase the chance of spillover effects (an economic activity or process upon those who are not directly
involved in any event) considering that the control group is so close to treated group, it is likely that they were affected as well.

3 Econometric Model: Difference-in-Difference Estimates


The econometric method used was Difference-in-Difference Estimation, known as DIFF-in-DIFF (DD), given the data characteristics described above. As Bertrand et al. (2004) define, Differences-in-Differences consists of identifying a specific intervention or treatment (often a passage of a law). One then compares the difference in outcome after and before the intervention for groups affected by the intervention to the same for unaffected groups.

Such approach involves basically two regimes: “0” and “1” given an observed outcome $Y$, which means $Y_1 = dY_1 + (1 - d)Y_0$. Given $d = 1$, we observe $Y_1$ and with $d = 0$, $Y_0$ is observed.

As Heckman & Hotz (1989) state the parameter most commonly invoked in the program evaluation literature, although not the one actually estimated in social experiments is the effect of randomly picking a person with characteristics $X$ and moving from “0” to “1”:

$$E(Y_1 - Y_0/X) = E(\Delta/X)$$

In practice, most non-experimental and experimental studies do not estimate
Instead, studies usually estimate the effect of treatment on the treated.

\[ E(\Delta/X) \]

Given the data characteristics, this particular study aims, as previously mentioned, to provide a comparison between “treated” and “untreated” to estimate the impact of treatment on the treated with a counterfactual.

Again as Heckman & Hotz (1989) point out, it is impossible to form change in outcomes between “treated” and “untreated” states for anyone. However, it is possible to form one or the other terms for everyone with the counterfactual mechanism.

Under such scenario, the current study also has the “before-after” estimator which incorporates time \( t \) in the model.

Let’s assume that the program/treatment occurs only at the time period \( k \) and \( t > k > t_0 \).

Furthermore, \( y_{it} \) is the “treated” group at period \( t \), if \( i = 1 \) and “untreated” if \( i = 0 \). Additionally, consider \( d = 1 \) is the “treated” group and \( d = 0 \) the “untreated” group.

Hence, the main focus is to estimate the following:

\[ E(y_{1t} - y_{0t}|d = 1) = E(y_{1t} - y_{0t}) \]

and given that, it is possible to decouple the equation above between “treated” and “untreated” given two different periods, or \( t > t' \). The Difference-in-Difference estimator is:

\[ E(y_{1t} - y_{0t})_1 = E(y_{1t} - y_{0t'})_1 - E(y_{0t} - y_{0t'})_1 + E(y_{0t} - y_{0t'})_0 - E(y_{0t} - y_{0t'})_0 \]
And, the assumption is:

\[ E(y_{1t} - y_{0t})_1 = E(y_{1t} - y_{0t})_0, \]

The basically means that between periods \( t \) and \( t', \) the variation of the “treated” and “untreated”, but not participants, averages is the same. Hence:

\[ E(y_{1t} - y_{0t})_1 = E(y_{1t} - y_{0t})_1 - E(y_{0t} - y_{0t})_0 \] \hspace{1cm} (5)

Given the fact that there is no treatment at \( t' \), the “treated” differentiates from the “untreated” as \((y_{0t}|d = 1) = y_t^1\) and \((y_{0t}|d = 0) = y_t^0\). Following the equation above:

\[ E(y_{1t} - y_{0t})_1 = E[(y_t^1 - y_{1t}^0) - (y_t^0 - y_{t'}^0)] = E(\Delta y_1 - y_0) \]

given that \( \Delta y_1 \equiv (y_t^1 - y_{1t}^0) \) and \( \Delta y_0 = (y_t^0 - y_{t'}^0). \)

Finally, the estimator can expressed as follows:

\[ \Delta y = d\Delta y_1 + (1 - d)\Delta y_0 = \Delta y_0 + d(\Delta y_1 - y_0) \] \hspace{1cm} (6)

Given the case the \( \Delta y_i = \Delta X \beta_i + u_i, \) the regression is:

\[ \Delta y = \Delta X \beta_0 + d(\Delta X \beta_1 - \Delta X \beta_0) + u_0 + d(u_1 - u_0) \]

Assuming that \( \beta_1 - \beta_0 = 0, \) except for the constant, follows:

\[ \Delta y = \Delta X \beta_0 + d\delta + u_0 + d(u_1 - u_0) \] \hspace{1cm} (7)

and \( \delta \) is the focus parameter.
3.2 Difference-in-Difference Estimates: The Basic Regression Model

Difference-in-Difference estimates and their standard error, according to Greene (2002), most often derive from using Ordinary Least Squares (OLS) in repeated cross sections (or a panel) data on individuals in treatment and control groups (no treatment) for a period before and after a specific intervention. As Meyer (1995) argues, the great appeal of DD estimation comes from its simplicity as well its potential to circumvent many of the endogeneity problems that typically arise when making comparisons between individuals.

The standard DD estimates the following regression ($\Delta y = Y_{ist}$), as Bertrand et al. (2004) mentioned ($i$ for individuals):

$$Y_{ist} = As + Bt + \alpha X_{ist} + \delta I_{ist} + \epsilon_{ist} \tag{8}$$

(given that $s = \text{group/state}$ and $t = \text{years}$ and $I$ is a dummy for whether the intervention has affected group $s$ at time $t$).

where $As$ and $Bt$, as defined by Bertrand et al. (2004), are fixed effects for states (or group) and years respectively, $X_{ist}$ are relevant individual controls and $\epsilon_{ist}$ is a error term. The estimated impact of the intervention is the OLS estimate $\hat{\delta}$. Standard errors used to form confidence interval for $\hat{\delta}$ are usually OLS standard errors sometimes corrected to account for correlation of shocks within each year. Considering the data characteristics mentioned earlier, this study will assume that the estimated coefficient of intervention is variable but does not help to determine program participation (land titles were given randomly and households were mostly unaware about receiving the title).
Hence, this specification is a common generalization of the most basic DD, and it will be the foundation for this particular study’s econometric technique. The basic assumption is that changes in the outcome variable over time would have been exactly the same in both the treatment and the control group in the absence of the intervention.

4 How Does Land Title Affect Income and Labor Supply?

4.1 Basic Findings - Hours Worked and Income

This study has used basically four questions to address the issues of labor supply and income: a) How many hours do you work each day?; b) How many days per week?; and only for the stage II (2008) c) These hours are greater, equal or lower to one year ago?. (Please refer to Appendix A for the complete stage I and stage II questionnaires). From the sample, 52.0% answered that are working greater hours compared to the previous year, a percentage above if related with the 16.0% from the control group. If the households that moved after receiving the title are not included, the trend remains the same (53.0% from the sample declared to be working more hours).

Also note that working-age members who are not in the labor force and those who are but report not having worked during the previous month were assigned hours value 0. Furthermore, this thesis also focus on an intensive group (households working in 2007 and 2008).

Additionally, the diagram below summarizes the household’s answers (2007 and 2008) about weekly hours of work. The main issue that arises is related to the fact
that for the sample is visible that working are working greater hours and for the control group the scenario remains almost constant overtime. Again, even excluding the ones that moved from Canaã, the overall picture does not change (Please refer to Appendix C).

![Chart: Adult Labor Force Hours Worked Weekly x Number of Households](image)

**Figure 3:** Adult Labor Force Hours Worked Weekly x Number of Households  
Source: Research from the Osasco Land Title survey - 2008

The last question is related to income and was applied as follow using the table below: “Now, I will read some income groups and I would like you tell me what group is your monthly familiar income included. I mean, the sum of all people living in your home, including you. Your monthly familiar income (last month) was?”.
1 Until R$ 380,00 Until 1 SM
2 R$ 381,00 to R$ 760,00 More than 1 to 2 SM
3 R$ 761,00 to R$ 1140,00 More than 2 to 3 SM
4 R$ 1141,00 to R$ 1.520,00 More than 3 to 4 SM
5 R$ 1.521,00 to R$ 2.660,00 More than 4 to 7 SM
6 R$ 2.660,00 to R$ 4.560,00 More than 7 to 12 SM
7 R$ 4.560,00 to R$ 8.740,00 More than 12 to 23SM
8 More than R$ 8.741,00 More than 23 SM

Table 1: Income Card
SM = Minimum Wage.

Exchange rate US/R-BRL was 1.77 in 12/31/2007 and 2.33 in 12/31/2008.

Source: Central Bank of Brazil

The results have shown, please refer to the diagram below, that the sample group has advanced in terms of the distribution of minimum wage compared to the control group. (Appendix shows that the same applies considering only the land title households that stayed at Canaã).
Figure 4: Level of Income (Minimum Wage) x Number of Households

Source: Research from the Osasco Land Title survey - 2008

The basic program effect interpretation of such picture is that titling program leads households (from sample that received the title) to shift outward their distribution of work and that generates a similar effect in terms of distribution of income level.
Furthermore, only if included the intensive margin households, i.e., those that were working in 2007 and 2008, the trend remains the same.

### 4.2 Difference-in-Difference Estimates: Land Title Specification

In this thesis, formally, the dependent variable is level of income (measured in number of minimum wages), $Y_{ist}$ (the outcome of interest for household $i$ in group $s$ by time or year $t$). The dependent variable would be posted as the difference among level of income in 2008 and 2007.

Also, $\delta$ indicates whether the household lives in a neighborhood that has been...
reached by the program – being the dummy for whether the land title has affected the group s at time t; with fixed effects and Xi is a vector of characteristic controls.

Hence, the coefficient δ is the estimated program effect, which provides a measure of conditional average difference households level of income in program area versus the non-program area.

Also, the regression will be based on the labor intensive households from the sample/control group, i. e, those that were working both in 2007 and 2008.

In addition, Xi includes the following controls: sex (dummy), marital status (dummy, example: single) and ethnicity (dummy, example: African Brazilian).

Another set of variables included, to extend to include fixed effects are: worked weekly hours. However, a robustness check without worked weekly hours will be applied to seek avoiding a potential endogenity.

The number of household members and years of education of family’s head are also in. For weekly hours, years of education and number of household members, the difference between the survey collection results in 2008 and 2007 is applied (example: the independent variable of weekly hours worked is = Weekly hours worked 2008 – Weekly hours worked 2007 and so on with the other variable mentioned).

This study also estimates a regression including the households that moved from Canaã (households that got the title, sold the property and moved right away). The goal is to check if the land title still has positive effect even considering those that are not living in the original community. Moving out from Canaã is potentially an effect of treatment and will be included as "moved" dummy.

Given all the conditions mentioned above, the basic econometric structure is the following:
\[ Y_i = \alpha + \delta (\text{Land title}) + \beta (\text{Hours worked weekly}) + \beta (\text{Households number}) + \beta (\text{Years of education}) + \beta (\text{moved}) + \alpha' X_i + \epsilon_i \]

Furthermore, the main hypothesis to be tested is the following:

\[ H_0 : \delta > 0 \]

\[ H_1 : \delta \leq 0 \]

\((\star \text{ - Robustness check}).\)

### 4.3 Results

The summary of basic statisticals results is presented below. Consistent with the study’s basic findings, one main aspect demands special attention. The average weekly hours has increased in the program households and remained the same in the non-program households. Additionally, for land title owners, income level is higher (see Table 2).

<table>
<thead>
<tr>
<th></th>
<th>Pre-Program (N=326)</th>
<th>Post-Program (N=326)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std deviation</td>
</tr>
<tr>
<td>Mean Age</td>
<td>40.89</td>
<td>14.68</td>
</tr>
<tr>
<td>Years of education</td>
<td>7.25</td>
<td>4.34</td>
</tr>
<tr>
<td>Households number (# members)</td>
<td>3.89</td>
<td>1.61</td>
</tr>
<tr>
<td>Income (# MW)</td>
<td>2.34</td>
<td>3.10</td>
</tr>
</tbody>
</table>

Table 2: Basic statistics for 2007 and 2008

Source: Research from the Osasco Land Title Survey
First of all, as Imbens & Wooldridge (2008) pointed the DD calculates the difference between "after" and "before" values of the mean outcomes for each treatment and control group. The difference between two mean differences is the impact estimate. In the table above, the impact estimate is 0.5 (minimum wages).

Secondly, econometric results appear in Table 3. This study default estimates include the entire set of regressors consistent with the current theory regarding level of income and land titles and the data collected during the survey. In such specification, the estimate of the land title \( \delta \) coefficient is 1.21, with a standard error of 0.11.

This outcome is highly consistent with our hypothesis, that property rights (Land Title) increases level of income by 1.21.
### Table 4: Income Regression

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Dependent variable</th>
<th>Robustness check (without hours worked)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Income</td>
<td></td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>0.04 (0.23)</td>
<td>0.04 (0.23)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td>0.03 (0.10)</td>
<td>0.02 (0.10)</td>
</tr>
<tr>
<td><strong>Single</strong></td>
<td>-0.13 (0.11)</td>
<td>-0.14 (0.11)</td>
</tr>
<tr>
<td><strong>African Brazilian</strong></td>
<td>0.03 (0.10)</td>
<td>0.04 (0.10)</td>
</tr>
<tr>
<td><strong>Years of education</strong></td>
<td>0.006 (0.012)</td>
<td>0.007 (0.01)</td>
</tr>
<tr>
<td><strong>Households number</strong></td>
<td>-0.03 (0.03)</td>
<td>-0.03 (0.03)</td>
</tr>
<tr>
<td>(# members)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hours worked weekly</strong></td>
<td>0.005 (0.084)</td>
<td>–</td>
</tr>
<tr>
<td><strong>Moved from Canaã</strong></td>
<td>0.12 (0.20)</td>
<td>0.13 (0.20)</td>
</tr>
<tr>
<td><strong>Land title</strong></td>
<td>1.21* (0.11)</td>
<td>1.25* (0.10)</td>
</tr>
</tbody>
</table>

| $R^2/Pseudo R^2$       | 0.11               | 0.10                                    |
| **N**                 | 165                | 165                                     |

(*) Standard Error - significant at 5%

The robustness part of the table provides our robustness check, excluding (as mentioned previously) to the regression analysis, the variable hours worked. The robustness outcome remains significant (1.25). This result should help to reinforce the conclusion that land titling has a positive effect on individuals.

Hence, the effect of land titling, given the conditions and variables applied, is
clearly positive, and helps to increase the level of income.

4.4 Labor Supply of Low Income Households

Furthermore, this thesis focused on estimates of impacts of property rights on labor supply of low income households. In fact, it has not been used a poverty measure for separating households according to their standard of living. Based on the sample, the assumption that there are a some of reasons to classify all households as low income\(^1\). The table below presents a rough picture of standard of living of households by comparing the quantiles of income distribution in 2007.

<table>
<thead>
<tr>
<th></th>
<th>Q10</th>
<th>Q50</th>
<th>Q80</th>
<th>Q90</th>
<th>Q95</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>0</td>
<td>2 MW</td>
<td>3 MW</td>
<td>4 MW</td>
<td>7 MW</td>
</tr>
</tbody>
</table>

Table 5: Quantiles of income (Minimum Wages) in 2007 for complete sample

Source: Research from the Osasco Land Title Survey

Only 5.0% from the head of households earned more than 7 minimum wages monthly. About 50.0% of household units earned no greater than 2 minimum wages monthly at that time. Furthermore, dividing this amount by family members, households per capita income becomes even lower. Therefore, it has been considered all families as low income.

As mentioned before, in average, the “hours worked weekly” (by adult) increased sharply between the two phases of the field research. However, in average, the two scenarios have similar trends.

Again, by the designing of the experiment, it is assumed at this thesis that the program (provision of land title) was randomized at some extend. Such assumption

\(^1\)Deaton (2006) provides an overview for the differences between lots of categories of poverty.
of means for covariates before the implementing of policy gives some support, as long as, in average, the treatment and control groups are similar to each other.

4.5 Quantile Regression Methodology

This subsection describes briefly the methodology of quantile regression (QR) which will be used to estimates the parameters of interest. There are two arguments which support the adoption of QR. The first one is when there are doubts on the homoscedasticity assumption. The presence of heteroscedasticity on the distribution of errors becomes the OLS estimator less efficient than the median estimator, for example (DEATON, 1997).

The second argument is applied even when there is no direct concerned about the efficiency of estimates. The QR can be used in order to stress the impact of a policy or variable on the outcome of interest. It is used to being done every time there is some suspect of impact is diverse through the distribution of interest (KOENKER & HALLOCK, 2001; ANGRIST & PISCHKE, 2009).

However, before to delve into the QR methodology, it is worth to describe the problem which has to been solved.

Under randomization, the average treatment effect (ATE) of a treatment is obtained by the simple difference of means of “hours worked weekly” on the treatment and control groups \( t = 1 \) (time/period, \( t = 0, 1 \)); i.e., for \( Y(1), Y(0) \perp Land \).

\[
\hat{ATE} = E[\hat{Y}(1) - \hat{Y}(0)|Land \text{ title}] = E[\hat{Y}(1) - \hat{Y}(0)] = E[\hat{Y}(1)] - E[\hat{Y}(0)]
\]

where \( \hat{Y}(1) \) and \( \hat{Y}(0) \) are the average of “hours worked weekly” of families which received and did not receive the treatment, respectively.

Even under randomization, Duflo et al. (2006) advocate the estimation of ATE
and ATT (the average treatment effect on the treated) – controlling for covariates since it can improve the efficiency of estimates and mitigate some noisy on the sample when randomization is not perfect. In other words, if there is some hesitation by assuming the independence between the intervention and potential results, it can be control for covariates so as to reducing the correlation between the treatment and the potential results. It is the same of assuming selection on observables\(^2\), i.e:

\[ Y(1), Y(0) \perp Land \; title | X \]

\[ ATE = E[Y(1) - Y(0) | Land \; title, X] = E[Y(1) - Y(0) | X] \]

where \(X\) represents the vector of covariates\(^3\).

This part purposes to estimate the quantile treatment effect (QTE) of land title on the labor supply of adults. The strategy of estimation depends crucially on the assumption that experiment was successfully randomized. This implies that self-selection on the sample (selection on unobservables) it is not an issue to be concerned with.

In that way, the QTE can be obtained following the same steps described above. It could be estimated just by comparing quantiles of “hours worked weekly” distribution for the treated and non-treated or run a quantile regression controlling for covariates.

It has opted for the second strategy and the quantile regression was run to get estimates for quartiles of “hours worked weekly” distribution.

The estimators of QR can be obtained by solving the following minimization

\(^2\)This assumption is known as unconfoundedness or ignorability of treatment.
\(^3\)For a recent survey of this literature, see Imbens & Wooldridge (2008).
problem:

\[ Q_\tau(Y_i|X_i) = \arg \min_{q(X)} E[\rho_\tau(Y_i - q(X_i))] \]

where \( Q_\tau(Y_i|X_i) = F_y^{-1}(\tau|X_i) \), the conditional quantile function, is the distribution function for \( Y_i \) at \( y \), conditional on \( X_i \); \( \rho_\tau(u) = 1(u > 0)\tau|u| + 1(u \leq 0)(1-\tau)|u| \) is called the "check function" (or asymmetric loss function) and it provides the QR estimator, \( \delta_\tau \). Given there is no assumption for the distribution of errors, the QR is considered a semiparametric regression technique.

Considering the small sample size, the impact of policy will be checked on the quartiles of “hours worked weekly” distribution. According to the hypothesis supported by theoretical literature, it should be observed a positive but decreasing impact of property rights on the labor supply distribution of the treated\(^4\).

Before discussing the QR estimates, it is worth to explore an important "tricky point" of QR (ANGRIST & PISCHKE, 2009). The effects on distribution are not equal to effects on individuals. They will be the same only if an intervention is a rank-preserving – when intervention does not alter the individuals ordering. If it is not the case, it can just be said that the treated adults of a specific quantile are better (or worse) off than control adults of the same quantile. In fact, it is a comparison between quantile of different distributions – for the treated and control groups. It is the so called QTE.

In that follow, both the OLS and QR estimates are available. As can be seen, the points estimated are different across the “hours worked weekly” distribution. The first two column show that OLS with and without controls are quite similar. This gives support to assumption of natural experiment.

\(^4\)The regression line should be at least weakly concave.
The models have been specified as follow:

\[ \text{Hours worked weekly}_i = \alpha + \delta l_1 \text{Land title} + X'_i \alpha + \varepsilon_i, \]

\[ \text{Hours worked weekly}_\tau = \alpha + \delta \tau \text{Land title} + X'_i \alpha + \varepsilon_i \]

where \( X_i \) is a vector which includes all variables, a dummy whether the family has at least one child (son or daughter), and three interactions, “sex” with “ethnicity”, “sex” with “marital status” and “ethnicity” with “marital status”. In the QR, the symbol \( \tau \) denotes the quantile of interest.
### 4.6 Results

<table>
<thead>
<tr>
<th></th>
<th>OLS (1)</th>
<th>OLS (2)</th>
<th>Q25 (3)</th>
<th>Q50 (4)</th>
<th>Q75 (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>10.89***</td>
<td>10.39</td>
<td>-7.68</td>
<td>9.14</td>
<td>20.32*</td>
</tr>
<tr>
<td>Mean age</td>
<td>0.32</td>
<td>-0.03</td>
<td>-0.89</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>-0.21</td>
<td>4.05</td>
<td>7.84</td>
<td>-7.22</td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
<td>-6.24**</td>
<td>-1.52</td>
<td>-5.87*</td>
<td>-9.25**</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-2.87*</td>
<td>-1.31</td>
<td>-4.28</td>
<td>-3.20</td>
<td></td>
</tr>
<tr>
<td>Sex*Ethnicity</td>
<td>0.56</td>
<td>2.16</td>
<td>1.78</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>Sex*Marital status</td>
<td>1.08</td>
<td>-2.81</td>
<td>-3.89</td>
<td>3.08</td>
<td></td>
</tr>
<tr>
<td>Ethnicity*Marital status</td>
<td>1.67**</td>
<td>0.66</td>
<td>2.20*</td>
<td>1.99*</td>
<td></td>
</tr>
<tr>
<td>Years of education</td>
<td>0.32</td>
<td>-0.03</td>
<td>0.67***</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>Household number (# members)</td>
<td>0.19</td>
<td>-0.06</td>
<td>-0.24</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td>Income (# MW)</td>
<td>1.52</td>
<td>1.66</td>
<td>1.08</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>Land title</td>
<td>9.52***</td>
<td>7.28***</td>
<td>12.49**</td>
<td>10.76***</td>
<td>7.47**</td>
</tr>
<tr>
<td>Child</td>
<td>-0.52</td>
<td>1.28</td>
<td>3.02</td>
<td>-1.79</td>
<td></td>
</tr>
<tr>
<td>Child labor hours weekly</td>
<td>-0.04</td>
<td>0.01</td>
<td>-0.23</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>$R^2$ / Pseudo $R^2$</td>
<td>0.11</td>
<td>0.20</td>
<td>0.05</td>
<td>0.21</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Table 6: Estimates of impact of property rights on labor supply

Note: N = 326. // The OLS standard errors are robust to heterocedasticity. The QR standard errors were obtained by bootstrap with 100 repositions. (*), (**), (***]) denotes statistical significance at 10%, 5% and 1%, respectively.
<table>
<thead>
<tr>
<th></th>
<th>$OLS_{(1)}$</th>
<th>$OLS_{(2)}$</th>
<th>$Q_{25}$</th>
<th>$Q_{50}$</th>
<th>$Q_{75}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>10.89***</td>
<td>23.57***</td>
<td>13.33</td>
<td>21.89**</td>
<td>31.40***</td>
</tr>
<tr>
<td>Mean age</td>
<td>-0.85</td>
<td>3.42$^{-10}$</td>
<td>-0.11</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>-3.86</td>
<td>-0.22</td>
<td>2.79</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
<td>-6.16**</td>
<td>-6.67</td>
<td>-6.76**</td>
<td>-7.72**</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-2.55</td>
<td>-3.33</td>
<td>-4.79*</td>
<td>-2.70</td>
<td></td>
</tr>
<tr>
<td>Sex*Ethnicity</td>
<td>0.91</td>
<td>2.89</td>
<td>2.01</td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td>Sex*Marital status</td>
<td>2.86</td>
<td>-1.34</td>
<td>-1.54</td>
<td>3.12</td>
<td></td>
</tr>
<tr>
<td>Ethnicity*Marital status</td>
<td>1.19**</td>
<td>1.67</td>
<td>2.09*</td>
<td>1.30</td>
<td></td>
</tr>
<tr>
<td>Years of education</td>
<td>0.40**</td>
<td>8.35$^{-10}$</td>
<td>0.66**</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>Household number (# members)</td>
<td>-0.7</td>
<td>1.34$^{-10}$</td>
<td>-0.22</td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>Land title</td>
<td>9.52***</td>
<td>7.21***</td>
<td>10.00*</td>
<td>10.46***</td>
<td>7.97***</td>
</tr>
<tr>
<td>Child</td>
<td>-0.05</td>
<td>-3.38$^{-08}$</td>
<td>3.69</td>
<td>-2.44</td>
<td></td>
</tr>
<tr>
<td>Child labor hours weekly</td>
<td>-0.06</td>
<td>-8.12$^{-11}$</td>
<td>-0.26</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>$R^2$ / Pseudo $R^2$</td>
<td>0.11</td>
<td>0.20</td>
<td>0.03</td>
<td>0.17</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Table 7: Robustness Check without Income

Note: $N = 326$. // The OLS standard errors are robust to heterocedasticity. The QR standard errors were obtained by bootstrap with 100 repositions. (*), (**) (*** denotes statistical significance at 10%, 5% and 1%, respectively.

First of all, the impact of property rights is positive and significant statistically in all regressions. Secondly, the naïve estimates of average treatment effects (ATE) are not relevant greater than ATE after controlling for covariates. These estimates suggest that adults of households which were affected by program have work raised from 7.28 to 9.52 hours per week when compared with the adults of the control group.
Secondly, the average estimates of ATE (column 2) are similar compared to the upper quartile of the “hours worked weekly” distribution. This evidence shows that, particularly on this case, the average can underestimate the impact of policy on the result of interest. In fact, the adults who used to work less hours before receiving the treatment were those reacted who to intervention. It could be argued that low income households started work more hours after having the land title.

Last, the impact is minor from median of the “hours worked weekly” distribution upwards, suggesting a concave shape of regression line.
<table>
<thead>
<tr>
<th></th>
<th>( OLS ) (1)</th>
<th>( OLS ) (2)</th>
<th>( Q25 ) (3)</th>
<th>( Q50 ) (4)</th>
<th>( Q75 ) (5)</th>
<th>( Q100 ) (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>22.45***</td>
<td>30.05***</td>
<td>21.86***</td>
<td>27.42***</td>
<td>30.33***</td>
<td>41.09***</td>
</tr>
<tr>
<td>Mean age</td>
<td>-2.33</td>
<td>0.05</td>
<td>0.01</td>
<td>0.05</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>-4.95</td>
<td>-3.13</td>
<td>3.80</td>
<td>-5.06</td>
<td>-8.16</td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
<td>-5.76**</td>
<td>-5.79</td>
<td>-5.86</td>
<td>-4.25</td>
<td>-5.93**</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-1.22</td>
<td>-1.92</td>
<td>-2.02</td>
<td>-0.72</td>
<td>-2.90</td>
<td></td>
</tr>
<tr>
<td>Sex*Ethnicity</td>
<td>-0.04</td>
<td>0.16</td>
<td>-1.29</td>
<td>-0.49</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>Sex*Marital status</td>
<td>3.06</td>
<td>1.45</td>
<td>0.75</td>
<td>4.69</td>
<td>3.68</td>
<td></td>
</tr>
<tr>
<td>Ethnicity*Marital status</td>
<td>0.90</td>
<td>1.14</td>
<td>1.31</td>
<td>0.34</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td>Years of education</td>
<td>-0.13</td>
<td>0.06</td>
<td>0.16</td>
<td>-0.15</td>
<td>-0.38</td>
<td></td>
</tr>
<tr>
<td>Household number (# members)</td>
<td>-0.11</td>
<td>0.33</td>
<td>0.15</td>
<td>-0.21</td>
<td>0.58</td>
<td></td>
</tr>
<tr>
<td>Land title</td>
<td>3.65**</td>
<td>4.01*</td>
<td>4.18*</td>
<td>2.68</td>
<td>6.65**</td>
<td>1.45</td>
</tr>
<tr>
<td>Child</td>
<td>0.10</td>
<td>-0.42</td>
<td>-4.27</td>
<td>-2.11</td>
<td>-4.48</td>
<td></td>
</tr>
<tr>
<td>Child labor hours weekly</td>
<td>-0.06</td>
<td>-0.07</td>
<td>0.03</td>
<td>0.02</td>
<td>-0.08</td>
<td></td>
</tr>
<tr>
<td>( R^2 ) / Pseudo ( R^2 )</td>
<td>0.04</td>
<td>0.12</td>
<td>0.12</td>
<td>0.02</td>
<td>0.08</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Table 8: Labor Intensive Quantile Regression (without income)

Note: \( N = 165 \). // The OLS standard errors are robust to heterocedasticity. The QR standard errors were obtained by bootstrap with 100 repositions. (*), (**), (***) denotes statistical significance at 10%, 5% and 1%, respectively.

On the top of the regressions mentioned above, we also create a specific regression for the labor intensive households (those working in 2007 and 2008). The results has demonstrated that the effect of land title is lower compared with the one with all households. However, it is still significant (specially on the 3rd quantile).

Last, the impact is minor from median of the “hours worked weekly” distribution
upwards, suggesting a concave shape of regression line.

5 How Does Land Title Affect Child Labor?

5.1 Child Labor Force Participation: The Economic Context

Investing in and focusing on human capital development is a critical factor to increase economic growth, as stated by Becker & Lewis (1973), and given such a key assumption, The United Nations Millennium Development Goals include eliminating child labor as a crucial step into a better and equal world.

According to the International Labour Organization (2002), 246 million children and teenagers between 5 and 17 years old are engaged in child labor around the world. Furthermore, 75.0% of those children work for their own family activities. Asia, Africa and Latin America are the continents with the most the child labor in the world. Asia has the highest number of children in terms of volume but Africa is the leader relative to the total size of the work force.

In Brazil, data from PNAD (IBGE, 2007) has shown that from a 44.7 million population between 5 and 17 years old, 10.8% (4.8 million) are directly involved in child labor. The worst region of Brazil regarding this subject is the Northeast, with 13.4% of the 5-17 year old population working; Southeast holds the lowest average (7.9%). These statistics represent a positive evolution over the last 4 years (see Figure 6 below).
Figure 6: Occupation level among the 5-17 year-old population (Percentual of total 5-17 population)

Source: IBGE, PNAD 2007

However, child labor is still a major issue for Brazilian policy makers and PNAD (IBGE, 2007) also indicates that. For example, 60.0% of the children between 5 and 13 years old are involved in non-paid activities. In the rural areas of Brazil, 40.0% of the 5-17 years old population works between 30 and 40 hours per week. In the Southeast, the richest region in the country, 30.0% work at least 40 hours per week.

Economic science has developed a range of potential theories to explain child labor. As Becker & Lewis (1973) state, child labor is an activity that generates current benefits in terms of income, but also creates future costs by reducing study and leisure. Given that, families evaluate the cost-benefits related to sending their
children to school or to work. Rosenzweig (1981) has demonstrated that children’s time allocation depends on the production capacity of the children and their parents and the substitution degree of the work force between both.

Basu & Van (1998) have built a model using one basic assumption: luxury. They consider that poverty is the main factor that makes parents send children to work. Hence, the children’s time that is not allocated (school and leisure) to generate income is luxury, which low-income parents cannot afford. Ray (2001) has created a theory for emerging economies: child labor occurs mainly because of poverty and credit market imperfections. He has shown that if poor families had access to credit, in the presence of high returns for education, they would willing to send children to school instead of work. Furthermore, the same study showed the relationship between income inequality and child labor under credit constraints. The main conclusion states that a more equal income distribution would reduce child labor.

Kassouf (2002) demonstrates that an increase in the household’s income reduces the probability of child labor and increases school attendance. Another element that affects the probability of child labor is the parent’s education degree. Bhalotra & Heady (2003) find a negative effect given the mother’s level of education and the child’s labor participation in Ghana. The effect of the mother’s education profile is higher compared with the father’s. Kassouf (2002), in Brazil, obtains the same negative effect. Family composition is another relevant factor. Patrinos & Psacharopoulos (1994) for Paraguay and Bhalotra & Heady (2003) for Pakistan, concluded that the more people there are in the family, the greater chances of having child labor.

Wahba (2002), using data from Egypt, shows a phenomenon called "dynastic poverty traps" which means that the probability of children being sent to work increases 10% when their parents had worked during their childhood. Emerson & Souza (2003)
reached the same conclusion and explain such event as "social norms", parents that worked during its childhood years face child labor more naturally. As mentioned earlier, this paper aims to provide an additional element for that discussion and test the relation between land titling and child labor force participation using the case of the City of Osasco.

5.2 Basic Findings – Child Labor Force

This section has used basically four questions to address the issue of child labor using the survey. The first question was: “Do you have any children?” (Please refer to Appendix A for the complete stage I and stage II questionnaires). Of the combined sample and control group, about 75.0% of the households said they have children (about 73.0% of the sample and 76.0% of the control group).

After the initial question mentioned above, the survey included the following: a) “Are there any children helping in the family’s income? How many? (under 18 years old)”, b) “How many hours do they work daily?” and c) “How many days per week do minors work?”. On top of that, from those households that have children, 25.5% responded that have minors helping the family’s income.
Figure 7: Are there any child/teenager helping in family income? How many?

Source: Research from the Osasco Land Title survey - 2008

Additionally, the diagram below summarizes the household’s answers (2007 and 2008) about weekly hours of child labor. The main issue that arises is related to the fact that for the sample children are working lower hours (and even households that have children working in 2007 changed path in the survey’s second round) and for the control group the scenario gets worst over time.
Figure 8: Child Labor Force Hours Worked Weekly x Number of Households (Sample)

Source: Research from the Osasco Land Title survey - 2008
5.3 Difference-in-Difference Estimates: Land Title Specification

In this paper, formally, the dependent variable is hours weekly hours of work of child labor force $Y_{ist}$ (the outcome of interest for household $i$ in group $s$ by time $t$). The dependent variable would be posted as the difference among weekly hours of child labor in 2008 and 2007.

Also, $\delta$ indicates whether the household lives in a neighborhood that has been reached by the program – being the dummy for whether the land title has affected the group $s$ at time $t$; with fixed effects and $X_i$ is a vector of characteristic controls.
Hence, the coefficient $\delta$ is the estimated program effect, which provides a measure of conditional average difference in time worked by children in households in the program area versus the non-program area.

In addition, $X_i$ includes the following controls: sex (dummy), marital status (dummy, example: single) and ethnicity (dummy, example: African Brazilian).

Another set of variables included, weekly hours of adult work is an essential variable to understand child labor according to Rosenzweig (1981) and Becker & Lewis (1973).

Patrinos & Psacharopoulos (1994) for Paraguay, Grootaert (1998) for Ghana, and Heady (2003) for Pakistan, conclude that the more people there are in the family, the higher are the chances of having child labor. Given such a framework, the number of household members is also included. The same applies for the years of education of the family head. For income, weekly hours, number of household members and years of education, also the difference between the survey collection results in 2008 and 2007 is applied (example: the independent variable of hours worked is $= \text{Hours Worked 2008} - \text{Hours Worked 2007}$ and so on with the other variables mentioned).

This study also estimates a regression including the households that moved from Canaã (households that got the title, sold the property and moved right away). The goal is to check if the land title still has a positive effect even considering those that are not living in the original community. Moving out from Canaã could potentially be an effect of treatment. Hence, a variable denominated "moved" will be applied as a dummy.

The Robustness check will exclude this "moved" variable.

Given all the conditions mentioned above, the basic econometric structure is the following:
\[ Y_i = \alpha + \delta(Land\ title) + \beta(Hours\ worked\ weekly - adult) + \beta(Households\ number) + \beta(\text{Years of education}) + \beta(moved)^* + \alpha'X_i + e_i \]

Furthermore, the main hypothesis to be tested is the following:

\[ H_0 : \delta < 0 \]
\[ H_1 : \delta \geq 0 \]

(*-Robustness check).

### 5.4 Results

The summary of basic statistics results is presented below. Consistent with the study’s basic findings, one main aspect demands special attention. The average weekly hours of child labor has decreased in the program households and increased in the non-program households. Additionally, for land title owners, weekly hours worked of adults increase more. This could provide a potential signal that child labor is being substituted by adult work.
<table>
<thead>
<tr>
<th></th>
<th>Pre-Program (N=251)</th>
<th>Post-Program</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ia (program)</td>
<td>Ib (non-prog)</td>
</tr>
<tr>
<td>Mean age</td>
<td>42.0</td>
<td>45.0</td>
</tr>
<tr>
<td>Time in residency (# months)</td>
<td>146.2</td>
<td>158.4</td>
</tr>
<tr>
<td>Households number (# members)</td>
<td>3.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Number of rooms</td>
<td>3.3</td>
<td>3.7</td>
</tr>
<tr>
<td>Income (# MW)</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Years of Education</td>
<td>9.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Hours Worked Weekly</td>
<td>9.8</td>
<td>9.2</td>
</tr>
<tr>
<td>Child Labor Hours Weekly</td>
<td>3.5</td>
<td>9.1</td>
</tr>
</tbody>
</table>

Table 9: Sample means - with all households that have children

Source: Author’s Estimates

First of all, the DD calculates the difference between "after" and "before" values of the mean outcomes for each treatment and control group. The difference between mean differences is the impact estimate. In the table above, the impact estimate for children labor hours weekly is -5.8 hours.

Econometric results appear in Table 10. This study default estimates include the entire set of regressors consistent with the current theory regarding child labor and land title and the data collected during the survey. In such specification, the estimate of the land title δ coefficient is -6.08, with a robust standard error of 0.93.
<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Child Labor (hours worked weekly)</th>
<th>Child Labor (with households that moved variable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.68 (1.88)</td>
<td>4.28 (1.33)</td>
</tr>
<tr>
<td>Sex</td>
<td>-0.21 (0.87)</td>
<td>-0.20 (0.87)</td>
</tr>
<tr>
<td>Single</td>
<td>-1.67* (0.96)</td>
<td>-1.68* (0.96)</td>
</tr>
<tr>
<td>African Brazilian</td>
<td>-0.90* (0.84)</td>
<td>-0.91* (0.84)</td>
</tr>
<tr>
<td>Years of Education</td>
<td>0.17 (0.10)</td>
<td>0.16 (0.10)</td>
</tr>
<tr>
<td>Households number</td>
<td>-0.45 (0.25)</td>
<td>-0.45 (0.25)</td>
</tr>
<tr>
<td>(# members)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hours worked weekly</td>
<td>0.01 (0.03)</td>
<td>0.01 (0.03)</td>
</tr>
<tr>
<td>Moved from Canaã</td>
<td>-0.48 (1.63)</td>
<td>- (1.63)</td>
</tr>
<tr>
<td>Land title</td>
<td>-6.08* (0.93)</td>
<td>-6.04* (1.22)</td>
</tr>
<tr>
<td>(R^2/Pseudo R^2)</td>
<td>0.13</td>
<td>0.13</td>
</tr>
<tr>
<td>N</td>
<td>251</td>
<td>251</td>
</tr>
</tbody>
</table>

Table 10: Child Labor and Land Title

(*) Standard Error - significant at 5%

This outcome is highly consistent with our hypothesis, that property rights (Land Title) decrease child labor by 6.08 hours worked per week. With a t-statistic of over 5, the coefficient is different from zero at any reasonable level of statistical significance.

The robustness part of the table provides our robustness check, adding (as mentioned previously) to the regression analysis, households that moved. The robustness outcome not only remains but also makes it significant (-6.04). This result should
help to reinforce the conclusion that land titling has a positive effect on individuals, and not only on property.

Hence, the effect of land titling, given the conditions and variables applied, is clearly positive, and helps to minimize the number of weekly hours worked by children in the case of Osasco.

6 How Does Land Title Improve Happiness?

6.1 Happiness in Economics: Theory and Data

Aristotle to Bentham, Mill, and Smith, incorporated the pursuit of happiness in their work. Even within a more orthodox approach framework, focusing purely on income can miss key elements of welfare. People have different preferences for material and non-material goods. They may choose a lower-paying but more personally rewarding job, for example. They are nonetheless acting to maximize utility in a classically Walrasian sense.

The study of happiness or subjective well-being is part of a more general move in economics that challenges these narrow assumptions. The introduction of bounded rationality and the establishment of behavioral economics, for example, have opened new lines of research. Happiness economics - which represents one new direction - relies on more expansive notions of utility, and the interaction between rational and non-rational influences in determining economic behavior.

Di Tella & MacCulloch (2005) pointed that to measure how policies affect social welfare; economists have traditionally operated in two steps. First, they look at how policies affect behavior. Then, using these predictions, they connect policies to welfare through some theoretical model. A common problem with this approach is
that, even if agreement exists on how a policy affects behavior, there is often a lack of consensus on the consequences of the policy will affect welfare.

The literature of well-being economics is currently growing at a remarkable rate. If one takes the view that human happiness is ultimately the most important topic in social science.

Richard Easterlin was the first modern economist to revisit the concept of happiness, beginning in the early 1970s. Specifically Easterlin (1974) observed happiness responses are positively correlated with individual income at any point in time: the rich report greater happiness than the poor within the United States in a given year. Yet since World War II in the United States, happiness responses are flat in the face of considerable increases in average income. A similar pattern has been observed in a large number of countries, including France, the United Kingdom, Germany and Japan, and for different periods of time (EASTERLIN, 1995; BLANCHFLOWER & OSWALD, 2004).

The economics of happiness does not purport to replace income-based measures of welfare but instead to complement them with broader measures of well-being. These measures are based on the results of large-scale surveys, across countries and over time, of hundreds of thousands of individuals who are asked to assess their own welfare.

The happiness data typically available for the United States have only three response categories. Starting 1972, the General Social Survey carried out by the National Opinion Research Center has asked: "Taken all together, how you would say things are these days - would you say that you are very happy, pretty happy or not too happy?" The European Eurobarometer Surveys recommends, on the top of the question mentioned above, asking also: "On the whole, are you very satisfied, fairly satisfied or not at all satisfied with the life you lead?". Hence, the definition
of happiness is the degree to which an individual judges the overall quality of his or her life as favorable as pointed Veenhoven (2003).

Micro-econometric happiness equations have the standard form: \( W_{it} = \alpha + \beta x_{it} + \varepsilon_{it} \), where \( W \) is the reported well-being of individual \( i \) at time \( t \), and \( X \) is a vector of known variables including socio-demographic and socioeconomic characteristics.

Happiness data are being used to tackle important questions in economics. Part of this approach is quite natural, as many questions in economics are fundamentally about happiness.

Happiness data addressed some of the issues in the unemployment-inflation literature. Wolfers (2003) presents a comprehensive set of estimates, using data on the happiness responses of more than half million people in a maximum of 16 European countries for the period 1973-1998 (for total of 274 country-years). The calculations show that inflation and unemployment both reduce happiness. Di Tella, MacCulloch & Oswald (2003) estimates that an additional percentage point of unemployment causes twice as much of a reduction in happiness as an additional percentage point of inflation in a smaller sample that includes country-specific time trends as controls. Furthermore, other cross-sectional and panel studies reveal that unemployed individuals tend to report low happiness scores (CLARK & OSWALD, 1994; WINKELMANN & WINKELMANN, 2003).

Alesina, Di Tella & MacCulloch (2004) obtain measures of inequality and happiness for the United States for the period 1981-1996 and for Europe 1875-1992. They observe that individuals have a tendency to report themselves less happy when inequality is high, even after controlling for individual income, year and country (or state, in the case of United States) dummies. The effect, however, is more precisely defined statistically in Europe (where the happiness regression coefficient on inequality is more negative and standard error lower) than in the United States.
Some authors have used happiness data to study other, more permanent institutional features of the economy, such as the role of direct democracy. Frey & Stutzer (2000) exploit the large cross-sectional variation in the institutional rights to political participation across the 26 Swiss cantons. They find that average happiness and an index of direct democracy in a canton are positively correlated. Furthermore, political arrangements also matter. Much of the literature finds that both trust and freedom have positive effects on happiness (HELLIWELL, 2003; LAYARD, 2005).

In Brazil, Corbi & Menezes Filho (2005) investigates the role that economic variables play in the determination of happiness, using reported happiness as a proxy to individual well-being. The authors use microdata extracted from the World Values Survey for five countries, emphasizing the Brazilian case. Their findings suggest that there is a positive and significant correlation between happiness and income. Unemployment is also a large source of unhappiness. In most cases, happiness appears to be positively correlated to being married. Moreover, happiness is apparently U-shaped in age (minimizing at 50’s).

### 6.2 Basic Statistics – Happiness and Land Title

This study has used basically two questions to address the issue of happiness along the survey. The first question was *"Taken all together, how you would say things are these days - would you say that you are very happy, pretty happy or not too happy?"* (Please refer to Appendix A for the complete stage I and stage II questionnaires). That question lead to some outputs. For example, in 2007, from the sample, 13.8% of the households were *not too happy* and 11.8% from the control group regarding the same answer. In 2008, the *not too happy* from the control group were 9.6% and from the sample only 2.7% declared to be *not too happy.*
Additionally, the diagram below summarizes the household’s answer (stage I and stage II) about level of happiness. There is clear, among the sample, an increase (from 2007 to 2008) in the number of very happy households. On the other hand, the control shows a different trend, a decrease among the very happy people.

Figure 10: Taken all together, how would you say things are these days - would you say that you are...?

Source: Research from the Osasco Land Title Survey - 2008
Figure 11: Taken all together, how would you say things are these days - would you say that you are...?

Source: Research from the Osasco Land Title Survey - 2008

The survey also included a different question "On the whole, are you very satisfied, fairly satisfied or not at all satisfied with the life you lead?" (recommended by the European Eurobarometer as previously mentioned) to provide robustness for the happiness measure. The trend remains the same compared to the question above.
Figure 12: On the whole, about the life that you lead, are you...?

Source: Research from the Osasco Land Title survey - 2008
6.3 The Multinomial Probit Model

As Wooldridge (2005) stated that one kind of multinomial response is an ordered response. As the name suggests, if $y$ is an ordered response, then the values assigned to each outcome are no longer arbitrary. For example, $y$ might be a level of happiness on a scale from zero to two, with $y = 2$ representing the highest level (very happy) and $y = 0$ the lowest level (not too happy).
The fact that two is a higher level than one conveys useful information even though level of happiness itself only has ordinary meaning.

Let $y$ be an ordered response taking on the values $(0, 1, 2)$ for a known integer $J$. The ordered probit model for $y$ (conditional on explanatory variables $x$ - in the case of happiness, those variables would be, for example, sex, age, employment, income and etc.) can be derived from a latent variable model.

Assume that a latent variable $y^*$ is determined by:

$$y^* = x_\beta + e_i \quad e/X \sim \text{Normal } (0, 1) \quad (9)$$

where $\beta$ is $K \times 1$ and $x$ does not contain a constant. Let $\alpha_1 < \alpha_2 < \ldots < \alpha_J$ be unknown cut points (or threshold parameters) and define:

- $y = 0 \text{ se } y^* \leq \alpha_1$
- $y = 1 \text{ se } \alpha_1 < y^* \leq \alpha_2$
- $\ldots$
- $\ldots$
- $y = J \text{ se } y^* > \alpha_J$

In the case of happiness, if $y$ takes on values 0, 1 and 2, then there are two cut points, $\alpha_1$ and $\alpha_2$.

Given the standard normal assumption for $e_i$, it is direct to derive the conditional distribution of $y$ given $x$; simply compute each probability:
\begin{align*}
P(y = 0|x) &= P(y^* \leq \alpha_1|x) = P(x \beta + e \leq \alpha_1|x) = \Phi(\alpha_1 - x \beta) \\
P(y = 1|x) &= P(\alpha_1 < y^* < \alpha_2|x) = \Phi(\alpha_2 - x \beta) - \Phi(\alpha_1 - x \beta) \\
&\quad \ldots \\
P(y = J-1|x) &= P(\alpha_{j-1} < y^* \leq \alpha_j|x) = \Phi(\alpha_j - x \beta) - \Phi(\alpha_{j-1} - x \beta) \\
P(y = J|x) &= P(y^* > \alpha_J|x) = 1 - \Phi(\alpha_j - x \beta)
\end{align*}

where \( \Phi \) is the cumulative distribution function. The sum of the probabilities is 1.

When \( J = 1 \), it is a binary probit model:

\begin{equation}
P(y = 1|x) = 1 - P(y = 0|x) = 1 - \Phi(\alpha_1 - x \beta) = \Phi(x \beta - \alpha_1) \tag{10}
\end{equation}

is the intercept inside \( \Phi \). That is the main reason that \( x \) does not contain an intercept in this formulation of the ordered probit model. As Greene (2002) points, when there are only two outcomes, zero and one, a single cut is set to zero to estimate the intercept, such approach leads to the standard probit model.

The parameters \( \alpha \) and \( \beta \) can be estimated by maximum likelihood. For each \( i \), the log-likelihood function is:
\[ l_i(\alpha, \beta) = 1[y_i = 0] \log[\Phi(\alpha_1 - x\beta)] + \\
1[y_i = 1] \log[\Phi(\alpha_2 - x\beta) - \Phi(\alpha_1 - x\beta)] + \ldots + \\
1[Y_i = N - 1] \log[\Phi(\alpha_J - x\beta) - \Phi(\alpha_{J-1} - x\beta)] + \\
1[y_i = N] \log[1 - \Phi(\alpha_J - x\beta)] \]

While the direction of the effect of \( X_k \) on the probabilities \( P(y = 0|x) \) and \( P(y = J|x) \) is determined by the sign of \( \beta_k \), the sign of \( \beta_k \) does not always determine the direction of the effect for the intermediate outcomes 1, 2, ..., \( J - 1 \).

For example, suppose there are three possible outcomes for level of happiness, \( J = 3 \) (or \( y = 0, y = 1, y = 2 \)) and \( \beta_k > 0 \), then:

\[
\begin{align*}
y = 0 & \Rightarrow \frac{\partial P}{\partial X_k}(Y = 0|x) = -\beta \Omega(\alpha_1 - x\beta) < 0 \quad (11) \\
y = 2 & \Rightarrow \frac{\partial P}{\partial X_k}(Y = 2|x) = \beta \Omega(\alpha_2 - x\beta) > 0 \quad (12)
\end{align*}
\]

where \( \Omega \) is the density function.

However, for \( y = 1 \), \( \frac{\partial P}{\partial X_k}(Y = 1|x) \) could be either sign. If \( |\alpha_1 - x\beta| < |\alpha_2 - x\beta| \), then \( \Omega(\alpha_1 - x\beta) - \Omega(\alpha_2 - x\beta) \) will be positive, and if not, negative.

### 6.3.1 Predicted Probabilities

The first issue to find regarding the ordered probit is the predicted probabilities, i.e., the probabilities for the average household of belonging in each group. There are several ways to calculate the probabilities. One of those is the "calculation from
average individuals". This method consists on calculating the probability of each household following on each group.

As an example, consider 3 categories, once estimated the vector $\beta$ and the cut points, the probability for household $i$ of following within each one of them is:

\[
P(y_{it} = 1|x_{it}) = P(y_{it}^* \leq \mu_1|x_{it}) = \Phi(\mu_1 - x_{it}\beta)
\]
\[
P(y_{it} = 2|x_{it}) = \Phi(\mu_2 - x_{it}\beta) - \Phi(\mu_1 - x_{it}\beta)
\]
\[
P(y_{it} = 3|x_{it}) = \Phi(\mu_3 - x_{it}\beta) - \Phi(\mu_2 - x_{it}\beta)
\]

Hence, "optimal" group predicted for household $i$ is the outcome with the highest probability.

6.3.2 Partial Effects of Continuous Covariates

The parameters of vector $\beta$ estimated at ordered probit are not equal to the marginal effects of the regressors. The main input is given by the marginal effect of each covariate in response probabilities $P(y_{it} = J|x_{it})$.

\[
\frac{\partial P(y_{it} = 1|x_{it})}{\partial x_k} = -\beta_k \phi(\mu_1 - x_{it}\beta)
\]
\[
\frac{\partial P(y_{it} = 2|x_{it})}{\partial x_k} = \beta_k [\phi(\mu_1 - x_{it}\beta) - \phi(\mu_2 - x_{it}\beta)]
\]
\[
\frac{\partial P(y_{it} = 3|x_{it})}{\partial x_k} = \beta_k [\phi(\mu_2 - x_{it}\beta) - \phi(\mu_3 - x_{it}\beta)]
\]

Where $\phi$ reflects p.d.f. of normal distribution function, i.e, derivative of $\Phi(\Phi')$. 

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The marginal effect of $x_k$ have the opposite sign of the estimated $\beta_k$ for the first group and same sign for the last. Intermediate effects will rely on the probability densities.

### 6.3.3 Partial Effects of Discrete Covariates

In order to calculate partial effects of discrete variables, the approach is to compare the probabilities calculated along with dummy variables (values 0 and 1, for example). The partial effect of the dummy variable $x_k$ for the case of 3 groups, for instance, is given by

\[
PE_{i,1}(x_i, k) = P(y_i = 1|x_i,k = 1) - P(y_i = 1|x_i,k = 0)
\]
\[
PE_{i,2}(x_i, k) = P(y_i = 2|x_i,k = 1) - P(y_i = 2|x_i,k = 0)
\]
\[
PE_{i,3}(x_i, k) = P(y_i = 3|x_i,k = 1) - P(y_i = 3|x_i,k = 0)
\]

It is assumed by such approach that the difference in probabilities is all due to the effect of the dummy variable, therefore that is the partial effect.

### 6.4 Multinomial Probit Model: Land Title Specification for Happiness

The dependent variable is level of happiness change from 2007 to 2008 surveys round. As mentioned earlier, two questions were applied regarding happiness during both periods ("would you say that you are very happy, pretty happy or not too happy?" – please refer to question number P.18 at Appendix A for details).

Households were divided among three groups of answers. First of all, if the 2008
level of happiness was lower compared to 2007 (example: if, in 2007, the answer was “pretty happy” and 2008 is “not too happy”). Second, if the answer has remained exactly the same and third if a greater level occurred (example: “not too happy” in 2007 and “pretty happy” in 2008).

For each possibility mentioned above a numerical outcome was assigned: 0, 1 and 2. Additionally, an ordered probit was applied to estimate effects of various factors on the probability of each outcome.

Also, $\beta$ indicates whether the household lives in a neighborhood that has been reached by the program – being the dummy for whether the land title has affected the each group.

Hence, the coefficient $\beta$, in this case of happiness, is the estimated of program effect, which provides the effect of land title on the probability of each happiness level change.

In addition, other social and economic factors were applied such as sex (dummy), marital status (dummy: single), ethnicity (dummy, example: African Brazilian), years of education (of the family head) and number of household members.

Another variable included, and convergent with Corbi & Menezes Filho (2005) findings, is the income level (please refer to question number P.38 at Appendix A for details). Furthermore, Wolfers (2003) and Tella, MacCulloch & Oswald (2003) conclude that employment has positive impact on happiness. Hence, if the household is formally employed will also be applied.

As robustness check, this research estimates the same ordered probit but applying the outcome of a different question: “are you not all satisfied, fairly satisfied or very satisfied?” (please refer to question number P.35 at Appendix A for details) based on the European Eurobarometer Surveys.
6.5 Results

The Table 11 presents the results from the estimation of the ordered probit described above. Basically, the outcome provides the predicted coefficients of key independent variables given a 5.0% level of significance. Furthermore, the number of categories (three) implies two cut points for the probit model.

Econometric results appear in the Table 11. Such outcome has demonstrated that the estimate of land title coefficient is -1.04, with a standard error of 0.17. That, in the case of ordered probit, implies that land title significantly impacts the level of happiness.

The robustness part of the table provides the robustness check, adding the “satisfaction” level. The robustness outcome also address the significant impact of the variable land title related to “satisfaction”. The estimate coefficient for land title is -0.62 with a standard error of 0.15.

Both are relevant signs regarding the impact of the variable land title in terms of happiness. However, it does not fully address the probability of a household becomes part of “higher (or lower) happiness level group” given its participation on the program.
<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Happiness</th>
<th>Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>−0.13</td>
<td>−0.17</td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td>(0.15)</td>
</tr>
<tr>
<td>Single</td>
<td>0.01</td>
<td>−0.17</td>
</tr>
<tr>
<td></td>
<td>(0.18)</td>
<td>(0.18)</td>
</tr>
<tr>
<td>African Brazilian</td>
<td>0.25</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>(0.22)</td>
<td>(0.21)</td>
</tr>
<tr>
<td>Years of Education</td>
<td>0.01</td>
<td>−0.01</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>Households number</td>
<td>−0.03</td>
<td>−0.04</td>
</tr>
<tr>
<td>(# members)</td>
<td>(0.04)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Income</td>
<td>−0.00005</td>
<td>0.00005</td>
</tr>
<tr>
<td>(number of Minimum Wage)</td>
<td>(0.00004)</td>
<td>(0.0004)</td>
</tr>
<tr>
<td>Hours worked weekly</td>
<td>−0.20</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>(0.15)</td>
<td>(0.15)</td>
</tr>
<tr>
<td>Land title</td>
<td>−1.04*</td>
<td>−0.62</td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td>(0.15)</td>
</tr>
<tr>
<td>Robustness check</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LR chi2</td>
<td>51.43</td>
<td>25.40</td>
</tr>
<tr>
<td>Prob &gt; chi2</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>−227.80</td>
<td>−243.25</td>
</tr>
<tr>
<td>Cut 1</td>
<td>−2.51</td>
<td>−2.18</td>
</tr>
<tr>
<td></td>
<td>(0.45)</td>
<td>(0.43)</td>
</tr>
<tr>
<td>Cut 2</td>
<td>−0.72</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>(0.43)</td>
<td>(0.41)</td>
</tr>
<tr>
<td>$R^2/Pseudo R^2$</td>
<td>0.10</td>
<td>0.09</td>
</tr>
<tr>
<td>N</td>
<td>326</td>
<td>326</td>
</tr>
</tbody>
</table>

Table 11: Happiness and Land Title

(*) Standard Error - significant at 5%

Both are relevant signs regarding the impact of the variable land title in terms
of happiness. However, it does not fully address the probability of a household becomes part of “higher (or lower) happiness level group” given its participation on the program.

6.5.1 Predicted Probabilities – The Partial Effects of Land Title

The Table 12 below shows the predicted probabilities, i.e, the probability for an average household being in each of the ranges described above (higher level of happiness comparing 2008 and 2007 surveys, same level and lower level).

An average household reflects an individual that carries the average levels of income, years of education, number of family members, age, marital status, race and sex from the complete sample (N=326).

Given the average household profile, this particular research tests two scenarios: a) average individual in the program (with land title); b) average individual without the program (no land title).

Basically, the difference among the two scenarios (Program / Non-Program) provides, in basis points, the partial effect of land title related to level of happiness (and “satisfaction” as robustness check). All the values presented below are normalized to range from 0 to 100 in order to facilitate the interpretation, i.e, the probabilities sum to 1.
<table>
<thead>
<tr>
<th></th>
<th>Happiness</th>
<th>Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>program</td>
<td>non-program</td>
</tr>
<tr>
<td>Higher level</td>
<td>18.0%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Same level</td>
<td>75.0%</td>
<td>66.0%</td>
</tr>
<tr>
<td>Lower level</td>
<td>6.0%</td>
<td>31.0%</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 12: Predicted Probabilities

Source: Author’s Estimates

The ordered probit analysis mainly shows that the probability of an average household to be in the first range (“higher level of happiness”) is 18.0% with land title and 3.0% without. Hence, the program increases 16 basis points the probability of a household qualifies into the happier group. Furthermore, the probability of being in the lower level of happiness decreases 25 basis points.

The robustness check with the “satisfaction level” question follows the same trend (with lower intensity). The probability of an average household qualifies for the “higher level” group is greater with the land title about 12 basis points (18.0% against 6.0%). Additionally, also decreases approximately 15 basis points the probability of qualifying for the “lower level”.

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7 Conclusion

This research has presented new evidence on the value of formal property rights in urban squatter community in a developing country. By studying the relationship between the exogenous acquisition of a land title in income, labor force and happiness, the study has provided additional empirical decrease support for the evidence that property title appear to increase household income, labor supply and decrease child labor force. Additionally, has presented a positive effect of land title in happiness.

Although existing studies indicate significant effect on access to credit, home investment, fertility, labor supply and even income, especially and most recent by Field (2007) and Andrade (2006), this particular study aims helping to fill an important gap in the literature on property rights concerning the issue of isolating the causal role of ownership security. Moreover, introduce the positive relation among land title and happiness.

Furthermore, the results indicate that unlike employment responses to most welfare programs, which tend to involve an income effect that potentially removes adult households from the adult labor force, government property titling programs appear to have the opposite effect - and also removes child labor from the labor force.

Regarding further research, it will certainly be interesting to apply the same survey in different locations and compare outcome results. Ravallion (2000) argues that the same program works well in one village but fails in another. An example is the Bangladesh’s Food for Education Program. The program worked well in reaching the poor villages but not in others, even in relatively close proximity.

However, it is clear that understanding the multiple channels through which land titles influence economic outcome is a particular important given governments across the world are considering titling programs as a public policy tools to address urban
informality. In addition, the results have potential implications for understanding labor market frictions in developing countries (Goldsmith, 1995). In places characterized by high levels of residential informality such as most of developing and poor countries, informal property protection may constitute an important obstacle to labor market adjustment and economic growth.
Bibliography


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8 Appendix A: Complete Stage I and Stage II Questionnaires

STAGE I

Good morning/Good afternoon. My name is ___________. We are doing a research to develop an academic study about the local living conditions. I would like to count on have your cooperation on that.

<table>
<thead>
<tr>
<th>NAME</th>
<th>HOME PHONE</th>
<th>COML.</th>
<th>MOBILE PHONE</th>
<th>SAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 2 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FAMILY'S HEAD NAME</th>
<th>LISTCODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

PF1. Gender
1. Male  2. Female

COMPLEXION

PF2. How old are you? (TAKE NOTE ON THE BOX AND FILL THE AGE GROUP)

<table>
<thead>
<tr>
<th></th>
<th>1. 18 to 24</th>
<th>2. 25 to 34</th>
<th>3. 35 to 44</th>
<th>4. 45 to 59</th>
<th>5. 60 - more</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
P1. Are you working now?
1. YES (Continue)  2. NO (Go to P.8)

P2. What is your main activity?
(GIVEN THE OCCUPATION, IDENTIFY THE MOST ACCURATE SITUATION).

PEA (Active Economic Population)
1. Employee - Formal
2. Employee - Informal
3. Public Servant
4. Regular Self-Professional (Contributes to Social Security - e. g.: maid)
5. Self Professional (with college degree - e. g.: lawyer)
6. Entrepreneur
7. Free-Lancer
8. Intern (with salary)
9. Others (TAKE NOTE) ____________________________

P3. What’s your main activity? ............................................

P4. Where do you work? (READ UNTIL THE QUESTION MARK)
(STIMULATED ONCE)
1. At home     2. Own neighborhood   3. Other neighborhood  4. Other town
P5. How many hours do you work daily?
(TAKE NOTE TOTAL NUMBER OF HOURS)
........................................................................................................................................

P6. How many days weekly? (STIMULATED ONCE)
(THE HIGHEST AVERAGE FREQUENCY)
1 day 2 days 3 days 4 days 5 days 6 days 7 days (everyday)

P7. Are you a student / Are you retired / Are you housewife only / Are you unemployed?
(IF UNEMPLOYED) Are you looking for a job or not?
NON PEA (Non-Active Economic Population)
11 Only housewife
12 Only retired
13 Only student
14 Other sources of income
15 Other (TAKE NOTE) _______________________
16 Unemployment (not seeking for a job) - NON PEA
17 Unemployed (seeking for a job) - PEA

P8. Do you have any children? (STIMULATED ONCE)
1. Yes ....................... 2. No

P9. How many people, including yourself, live in your place? (TAKE NOTE)
........................................................................................................................................

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P10. Are there any children/teenager helping in the familiar income? How many?
(= UNDER 18 years old)

...........................................  99 There are no children working (GO TO P.13)

P11. How many hours do they work daily? (if there are more than one working, please check the worked average hours among them all (per day)
(DON’T PROVIDE THE SUM)

........................................... TAKE NOTE - NUMBER OF WORKED HOURS

P12. How many days weekly do minors work?
(SPONTANEOUS) (HIGHEST AVERAGE FREQUENCY)

1 day  2 days  3 days  4 days  5 days  6 days  7 days (everyday)

P13. Do you have some other source of income? ....
(READ UNTIL THE QUESTION MARK)

1 Alimony  2 Pension  3 Retirement
4 Unemployment insurance  5 Any rent  6 Donations
7 Occasional job  8 Social programs
98 Other. Which?  ____  99 NO ONE

P14. Are you (or someone in your home) benefited by any Government social program?
1. Yes  2. No (GO TO P18)
P15. Which social program benefits you (or someone in your home)?
1 Bolsa Família 2 Bolsa Escola 3 Student Pass
4 Unemployment pass 5 LOAS/BPC 6 Basket good
7 Housing Program 8 Medicines 9 Donations
10 PRONAF 11 PROGER 98 Other. Which? _____________

P16. What’s your marital status? (SPONTANEOUS)

P17. About the house where you live, you consider you as . . .
(READ UNTIL THE QUESTION MARK)
(STIMULATED)
1. Housewife / Head of family / mother / wife (ONLY FOR WOMEN)
2. Head of family / husband / father (ONLY FOR MEN)
3. Son / daughter (older than 18 years old) OR
4. Other adults (18 or older)

P18. "Taken all together, how would you say things are these days -
Would you say that you are . . .
(READ UNTIL THE QUESTION MARK)

P19. On the whole, about the life that you lead, are you...
(READ UNTIL THE QUESTION MARK)
1. Not at all satisfied 2. Fairly satisfied 3. Very satisfied
LET'S TALK ABOUT YOUR HOME

P20. How long have you and your family lived here? (TAKE NOTE)
Year ...................................... months ................................

P21. What's the size of your property?
1 Until 20m²  2 More than 20 m² - 40m²  3 More than 40m² - 60m²
4 More than 60m²  5 Don't know

P22. How many rooms does your place have? (TAKE NOTE)

P23. Do you use your place only as residency?
1. Yes (GO TO P26)   2. No (CONTINUE)

P24. What kind of trade/service has been applied in your home?
1. Bar
2. Mini-market
3. Beauty and cosmetics
4. Homemade food and candies
5. Mechanics and auto-service
6. Deposit of recycle material
7. Church
8. Other. Which one? ___________________
P25. How long are you doing that in your home?
1. Less than 1 year
2. 1 to 3 years
3. More than 3 to 5 years
4. More than 5 to 10 years
5. More than 10 to 15 years
6. More than 15 years
7. Don’t know

P26. How did you acquire this residence? (SHOW THE CARD AND READ IT)
1. Bought the property from the Householders Association
2. Bought the property from the other household and built the house
3. Bought and already build house
4. Occupied the property and built the house
5. The property was conceded DEFINITELY by the former owner
6. The property was inherited by a relative that passed away
7. Rent the house
8. The property was TEMPORARILY borrowed by the current owner
9. WAS OFFICIALLY TRANSFERRED BY THE LOCAL GOVERNMENT /
   HAS RECEIVED THE LANDTITLE FROM THE LOCAL OFFICIALS
10. Other. Which one? (TAKE NOTE) _______________________________
96. Don’t know / Don’t remember

P26a. (TO P26 = 1,2,3) Could you tell me how much did you pay for this property?
(TAKE NOTE) R$ ................................
P26b. (TOP27# 7 and 8) Have you ever have rented this property to another household?
1. Yes. How much? R$ .......................... (TAKE NOTE)  2. No

P26c. Do you know what is the market value the property today?
(TAKE NOTE) .................................

P27. Could you tell me if during the last year have you purchased something by credit?
(SPONTANEOUS)
1. Yes 2. No (GO TO P30)

P28. What was the payment method chosen to make this purchase?
(READ THE ALTERNATIVES) (STIMULATED AND MULTIPLE)
1. Credit card 2. Debit card 3. Postdated check
7. Financing 8. Other (TAKE NOTE)

P29. Last year did you take any personal loan? (SPONTANEOUS ONCE)
1. Yes 1. Bank/financing company/insurance 2. Family/Friends
   3. Credit card 4. Other .................
96. No

P30. Have you delayed any payment of personal loan or purchase on credit?
(TO P.28=1 or P30 =1)
1. Yes 2. No (GO TO P33)
P31. (For those who delayed payments last year) How past due was/is the delay?

(TO P.27=1 or P29 =1)

(READ THE ALTERNATIVES) (STIMULATED AND MULTIPLE)

1. Less than 30 days  
2. Between 31 to 60 days  
3. Between 61 to 90 days  
4. More than 90 days  
5. More than 180 days

P32. Thinking about the payment methods which you use regularly,
I would like to know which of them you use more frequently: (READ EACH ITEM)

P33. FOR EACH PAYMENT METHOD THAT YOU REGULARLY USE,
I would like to know the level/degree that you use between 1 and 5
(1 is the lowest and 5 the highest) (STIMULATED)

<table>
<thead>
<tr>
<th>Method</th>
<th>Yes</th>
<th>No</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Check</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>B) Postdated check</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>C) Debit card</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>D) Credit Card</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>E) Store card</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>F) Installment payment slip</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>G) Cash</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>H) Others? (TAKE NOTE)</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
P34 Now, I will ask some questions about your home. Such information is required only for socioeconomic classification.

Do you have in your house ............... (Ask to each item below)? How many?

<table>
<thead>
<tr>
<th>Items</th>
<th>There’s no</th>
<th>THERE IS (QUANTITY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color TV</td>
<td>1 2 3 4</td>
<td></td>
</tr>
<tr>
<td>Videocassette / DVD</td>
<td>0 1 2 3 4</td>
<td></td>
</tr>
<tr>
<td>Radios</td>
<td>0 2 2 2 2</td>
<td></td>
</tr>
<tr>
<td>Baths</td>
<td>0 1 2 3 4</td>
<td></td>
</tr>
<tr>
<td>Vehicles</td>
<td>0 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Maid</td>
<td>0 4 7 9 9</td>
<td></td>
</tr>
<tr>
<td>Washing machines</td>
<td>0 3 4 4 4</td>
<td></td>
</tr>
<tr>
<td>Refrigerator</td>
<td>0 4 4 4 4</td>
<td></td>
</tr>
<tr>
<td>Freezer (*)</td>
<td>0 2 2 2 2</td>
<td></td>
</tr>
</tbody>
</table>

P35. Which level of education have the head of the family reached?

<table>
<thead>
<tr>
<th>English</th>
<th>Points Fill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate / Elementary school incomplete</td>
<td>0</td>
</tr>
<tr>
<td>Elementary school completed / middle school incomplete</td>
<td>1</td>
</tr>
<tr>
<td>Middle school completed / High school incomplete</td>
<td>2</td>
</tr>
<tr>
<td>High school completed / College incomplete</td>
<td>4</td>
</tr>
<tr>
<td>College complete</td>
<td>8</td>
</tr>
</tbody>
</table>
Now, I will read some income groups and I would like you tell me what group is your monthly familiar income included. I mean, the sum of income of all people living in your home, including you. Your monthly familiar income (last month) was?

(READ THE INCOME GROUPS) (STIMULATED AND ONLY)

<table>
<thead>
<tr>
<th></th>
<th>Until R$ 380,00</th>
<th>Until 1 SM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>R$ 381,00 to R$ 760,00</td>
<td>More than 1 to 2 SM</td>
</tr>
<tr>
<td>3</td>
<td>R$ 761,00 to R$ 1140,00</td>
<td>More than 2 to 3 SM</td>
</tr>
<tr>
<td>4</td>
<td>R$ 1141,00 to R$ 1.520,00</td>
<td>More than 3 to 4 SM</td>
</tr>
<tr>
<td>5</td>
<td>R$ 1.521,00 to R$ 2.660,00</td>
<td>More than 4 to 7 SM</td>
</tr>
<tr>
<td>6</td>
<td>R$ 2.660,00 to R$ 4.560,00</td>
<td>More than 7 to 12 SM</td>
</tr>
<tr>
<td>7</td>
<td>R$ 4.560,00 to R$ 8.740,00</td>
<td>More than 12 to 23 SM</td>
</tr>
<tr>
<td>8</td>
<td>More than R$ 8.741,00</td>
<td>More than 23 SM</td>
</tr>
</tbody>
</table>

(SM = Minimum wage)

P37. Do you expect to receive any land title from the local officials or the Household Association during the next year?

1. Yes  
2. No
Thank you for the cooperation.
STAGE II

Good morning/Good afternoon. My name is ___________. We are doing a research to develop an academic study about the local living conditions. I would like to have your cooperation on that.

<table>
<thead>
<tr>
<th>NAME</th>
<th>HOME PHONE</th>
<th>COML.</th>
<th>MOBILE PHONE</th>
<th>SAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1  2  3</td>
</tr>
<tr>
<td>FAMILY’S HEAD NAME</td>
<td>LISTCODE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADDRESS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PF1. Gender

1. Male  
2. Female

COMPLEXION

1. White-Caucasian  
2. African-Brazilian  
3. Asian  
4. African-Indian  
5. Indian

PF2. How old are you? (TAKE NOTE ON THE BOX AND FILL THE AGE GROUP)

................................  1. 18 to 24  
2. 25 to 34  
3. 35 to 44  
4. 45 to 59  
5. 60 - more

P1. Are you working now?

1. YES (CONTINUE)  
2. NO (GO TO P.8)
P2. What is your main activity?
(GIVEN THE OCCUPATION, IDENTIFY THE MOST ACCURATE SITUATION).

PEA (Active Economic Population)
1 Employee - Formal
2 Employee - Informal
3 Public Servant
4 Regular Self-Professional (Contribute to Social Security - e.g.: maid)
5 Self Professional (with college degree - e.g.: lawyer)
6 Entrepreneur
7 Free-Lancer
8 Intern (with salary)
9 Others (TAKE NOTE) _____________________________

P3. What’s your main activity?
..........................................................................................................................

P4. Where do you work? (READ UNTIL THE QUESTION MARK)
(STIMULATED ONCE)
1. At home         2. Own neighborhood    3. Other neighborhood     4. Other town

P5. How many hours do you work daily?
(TAKE NOTE THE TOTAL NUMBER OF HOURS)
........................................................................................................................................

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P6. How many days weekly? (STIMULATED ONCE)
(THE HIGHEST AVERAGE FREQUENCY)
1 day 2 days 3 days 4 days 5 days 6 days 7 days (everyday)

P7. These hours are greater, equal to or lower compared to one year ago?
(STIMULATED AND ONLY)
1. Greater 2. Equal to 3. Lower

P8. Are you a student / Are you retired / Are you housewife only / Are you unemployed?
(IF UNEMPLOYED) Are you looking for a job or not?
NON PEA (Non-Active Economic Population)
11 Only housewife
12 Only retired
13 Only student
14 Other sources of income
15 Other (TAKE NOTE) _______________________
16 Unemployment (not seeking for a job) - NON PEA
17 Unemployed (seeking for a job) - PEA

P9. Do you have any children? (STIMULATED ONCE)
1. Yes ....................... 2. No

P10. How many people, including yourself, live in your place? (TAKE NOTE)
.....................................................................................................................
P11. Are there any children/teenager helping in the familiar income? How many? (= UNDER 18 years old)

............................. 99 There are no children working (GO TO P.13)

P12. How many hours do they work daily? (if there are more than one working, please check the worked average hours among them all (per day)
(DON’T PROVIDE THE SUM)

............................. TAKE NOTE - QUANTITY OF WORKED HOURS

P13. How many days per week do minors work?
(SPONTANEOUS AND UNIQUE) (HIGHEST AVERAGE FREQUENCY)
1 day  2 days  3 days  4 days  5 days  6 days  7 days (everyday)

P14. The number of hours is greater, equal to or less than one year ago?
(STIMULATED AND ONLY)
1. Greater  2. Equal to  3. Lower

P15. Do you have some other source of income? ....
(READ UNTIL THE QUESTION MARK)
1 Alimony       2 Pension       3 Retirement
4 Unemployment insurance   5 Any rent   6 Donations
7 Occasional job            8 Social programs
98 Other. Which? _____ 99 NO ONE
P16. Are you (or someone in your home) benefited by any Government social program?
1. Yes 2. No (GO TO P18)

P17. Which social program benefits you (or someone at your home)?
1 Bolsa Família 2 Bolsa Escola 3 Student Pass
4 Unemployment pass 5 LOAS/BPC 6 Basket good
7 Housing Program 8 Medicines 9 Donations
10 PRONAF 11 PROGER 98 Other. Which? ___________

P18. What’s your marital status? (SPONTANEOUS)

P19. About the house where you live, you consider you as…
(READ UNTIL THE QUESTION MARK)
(STIMULATED AND ONLY)
1. Housewife / Head of family / mother / wife (ONLY FOR WOMEN)
2. Head of family / husband / father (ONLY FOR MEN)
3. Son / daughter (older than 18 years old) OR
4. Other adults (18 or older)

P20. "Taken all together, how would you say things are these days -
Would you say that you are …
(READ UNTIL THE QUESTION MARK)

90
LET’S TALK ABOUT YOUR HOME

P21. How long have you and your family lived here? (TAKE NOTE)
Year ............................................. months ..........................................

P22. What’s the size of your property?
1 Until 20m²  2 More than 20 m² - 40m²  3 More than 40m² - 60m²
4 More than 60m²  5 Don’t know

P23. How many rooms have your place? (TAKE NOTE)

P24. Do you use your place only as residency?
1. Yes (GO TO P26)  2. No (CONTINUE)

P25. What kind of trade/service has been applied in your home?
1. Bar
2. Mini-market
3. Beauty and cosmetics
4. Homemade food and candies
5. Mechanics and auto-service
6. Deposit of recycle material
7. Church
8. Other. Which one? ___________________

91
P26. How long are you doing that in your home?
1. Less than 1 year
2. 1 to 3 years
3. More than 3 to 5 years
4. More than 5 to 10 years
5. More than 10 to 15 years
6. More than 15 years
7. Don’t know

P27. How did you acquire this residence? (SHOW THE CARD AND READ IT)
1. Bought the property from the Householders Association
2. Bought the property from the other household and built the house
3. Bought and already build house
4. Occupied the property and built the house
5. The property was conceded DEFINITELY by the former owner
6. The property was inherited by a relative that passed away
7. Rent the house
8. The property was TEMPORARILY borrowed by the current owner
9. WAS OFFICIALLY TRANSFERRED BY THE LOCAL GOVERNMENT / HAS RECEIVED THE LANDTITLE FROM THE LOCAL OFFICIALS
10. Other. Which one? (TAKE NOTE) ____________________________
96. Don’t know / Don’t remember

P27a. (TO P26 = 1,2,3) Could you tell me how much did you pay for this property?
(TAKE NOTE) R$ _________________________
P27b. (TOP27# 7 and 8) Have you ever have rented this property to another household?
1. Yes. How much? R$ ................................. (TAKE NOTE)  2. No

P27c. Do you know what is the market value the property today?
(TAKE NOTE) .................................

P28. Could you tell me if during the last year have you purchased something by credit?
(SPONTANEOUS AND ONLY)
1. Yes 2. No (GO TO P30)

P29. What was the payment method chosen to make this purchase?
(READ THE ALTERNATIVES) (STIMULATED AND MULTIPLE)
1. Credit card  2. Debit card  3. Postdated check
7. Financing  8. Other (TAKE NOTE)

P30. Last year did you take any personal loan? (SPONTANEOUS)
1. Yes 1. Bank/financing company/insurance  2 Family/Friends
3 Credit card  4 Other ..........................
96. No

P31. Have you delayed any payment of personal loan or purchase on credit?
(TO P.28=1 or P30 =1)
1. Yes  2. No (GO TO P33)
P32. (For those who delayed payments last year) How past due was/is the delay? (TO P.27=1 or P29 =1)  
(READ THE ALTERNATIVES) (STIMULATED AND MULTIPLE)  
1. Less than 30 days  2. Between 31 to 60 days  3. Between 61 to 90 days  
4. More than 90 days  5. More than 180 days  

P33. Thinking about the payment methods which you use regularly,  
I would like to know which of them you use more frequently: (READ EACH ITEM)  

P34. FOR EACH PAYMENT METHOD THAT YOU REGULARLY USE,  
I would like to know the level/degree that you use between 1 and 5.  
(1 is the lowest and 5 the highest) (STIMULATED)  

<table>
<thead>
<tr>
<th>Method</th>
<th>Yes</th>
<th>No</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Check</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>B) Postdated check</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>C) Debit card</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<td>D) Credit Card</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>E) Store card</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>F) Installment payment slip</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>G) Cash</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>H) Others? (TAKE NOTE)</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

P35. On the whole, about the life that you lead, are you...  
(READ UNTIL THE QUESTION MARK)  
1 Not at all satisfied   2 Fairly Satisfied OR  3 Very satisfied?
P36 Now, I will ask some questions about your home. Such information is required only for socioeconomic classification.

Do you have in your house ............... (Ask to each item below)? How many?

<table>
<thead>
<tr>
<th>Items</th>
<th>There’s no</th>
<th>THERE IS (QUANTITY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color TV</td>
<td></td>
<td>0 1 2 3 4</td>
</tr>
<tr>
<td>Videocassette / DVD</td>
<td>0</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Radios</td>
<td>0</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>Baths</td>
<td>0</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Vehicles</td>
<td>0</td>
<td>4 5 6 7</td>
</tr>
<tr>
<td>Maid</td>
<td>0</td>
<td>4 7 9 9</td>
</tr>
<tr>
<td>Washing machines</td>
<td>0</td>
<td>3 4 4 4</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>0</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>Freezer (*)</td>
<td>0</td>
<td>2 2 2 2</td>
</tr>
</tbody>
</table>

P37. Which level of education have the head of the family reached?

<table>
<thead>
<tr>
<th>English</th>
<th>Points Fill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate / Elementary school incomplete</td>
<td>0</td>
</tr>
<tr>
<td>Elementary school completed / middle school incomplete</td>
<td>1</td>
</tr>
<tr>
<td>Middle school completed / High school incomplete</td>
<td>2</td>
</tr>
<tr>
<td>High school completed / College incomplete</td>
<td>4</td>
</tr>
<tr>
<td>College complete</td>
<td>8</td>
</tr>
</tbody>
</table>
P38. (SHOW THE “INCOME CARD”)

Now, I will read some income groups and I would like you tell me what group is your monthly familiar income included. I mean, the sum of income of all people living in your home, including you. Your monthly familiar income (last month) was?

(READ THE INCOME GROUPS) (STIMULATED AND ONLY)

<table>
<thead>
<tr>
<th></th>
<th>Until R$ 380,00</th>
<th>Until 1 SM</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>R$ 381,00 to R$ 760,00</td>
<td>More than 1 to 2 SM</td>
</tr>
<tr>
<td>3</td>
<td>R$ 761,00 to R$ 1140,00</td>
<td>More than 2 to 3 SM</td>
</tr>
<tr>
<td>4</td>
<td>R$ 1141,00 to R$ 1.520,00</td>
<td>More than 3 to 4 SM</td>
</tr>
<tr>
<td>5</td>
<td>R$ 1.521,00 to R$ 2.660,00</td>
<td>More than 4 to 7 SM</td>
</tr>
<tr>
<td>6</td>
<td>R$ 2.660,00 to R$ 4.560,00</td>
<td>More than 7 to 12 SM</td>
</tr>
<tr>
<td>7</td>
<td>R$ 4.560,00 to R$ 8.740,00</td>
<td>More than 12 to 23SM</td>
</tr>
<tr>
<td>8</td>
<td>More than R$ 8.741,00</td>
<td>More than 23 SM</td>
</tr>
</tbody>
</table>

(SM = Minimum wage)
ONLY IF P27 = 9 - TO FINISH, you told me you got, last year, the land title from the local officials. I would like you tell me how such event has changed your life. In a scale of 1 to 10, considering 1 as no effect at all, and 10 if your life is really better because of the land title.

1 2 3 4 5 6 7 8 9 10 96 Don’t know

Thank you for the cooperation.
Appendix B: Microeconomic Framework

9.1 Microeconomic Framework - The Basics

Cockburn (1998) point out that one of the principal gains of strong property institutions is to shift the burden of property protection and enforcement away from individual households and informal communities to the state.

There is little microeconomic evidence documenting the cost of informality to individual households. Carter & Zegarra (2000), World Bank (2000) and Field (2007) note that, in many settings, informal institutions arise to compensate for the absence of formal property protection. In such context, there is one important mechanism by which it is assumed that tenure security removes individuals from the labor force and incremental income. Untitled households are constrained by the need to provide informal policing, both to deter prospective invaders from invading private properties and to actively participate in community enforcement efforts to protect neighborhood boundaries.

Hence, an important outcome of titling efforts that effectively increase household tenure security should allow households and communities to reallocate time, resources and human talent away from this role.

The acquisition of a property title has a direct value in terms of freeing up hours of work (and income generation) previously devoted to maintaining tenure security through informal means.

\[ I(\text{Income}) = f(w; H^m) \]

\( w \) = market wage
\( H^m \) = work in the outside market

Assumptions:
a) There is no outside labor market for provision of home/tenure security. Assuming
a missing labor market for the provision of home security is reasonably justified by incomplete contracts (there some risk involved in employing non-members to guard property - especially in those poor communities in Brazil).

b) Leisure and home production hours are assumed to be perfect substitutes for the hours individual spend on property protection.

c) All households face a common wage $w_i$.

d) The household is assumed to maximize per capita leisure ($l_i$) and not the leisure of individual members.

e) Househould talent ($\Phi$) and endowment ($E$) are assumed to be fixed.

Assuming, $Z =$ time spent at home = $H^h + L$ $H^h =$ work at home and $L =$ leisure $N$ is the number of household members, $l_i$ is leisure, $x_i$ consumption, $H^h$ work hours in home production, and $H^m$ outside market work hours of household member $i$, and $x_i = X/N, l_i = L/N$.

The value of work at home is given by production function $q(H^h)$ and $w$ is the value of work outside or the market wage.

Household utility is an increasing function of per capita leisure ($l_i$); per capita consumption ($x_i$), and home security tenure ($S$) ($S =$ home tenure security function) and also concave.

The tenure security function implies that the production of home security is only determined by exogenous variable $\Omega$ ($\Omega =$ exogenous parameter, household formal property rights) and the amount of time spent in the home.

The parameter $\Omega$ can be thought as a binary indicator of legally registered property title.

Given the set of talent $\Phi$ and endowment $E$: $U(x_i, l_i, S : \Phi, E)$ where $S = S(Z, \Omega)$

Maximizing the utility function: $U(x_i, l_i, S : \Phi, E)$ where $S = S(Z, \Omega)$, where the
endogenous variables are $H^h$, $H^m$, $x_i$, $l_i$, and $S$.

Budget ($pX$) and time ($T$) constraints to the maximization problem:

\[ S = S(H^h + L, \Omega) \]  
\[ pX = \omega H^m + q(H^h) \]  
\[ T = L + H^h + H^m = Z + Hh \]

Assumption: $L, H^h, H^m, x_i \geq 0$

Where $q(.)$ satisfies the decreasing marginal productivity ($q' > 0, q'' < 0$). Then, normalizing prices to one, the household’s optimization problem is:

\[ \text{Max}_{(H^h, H^m)} U(\frac{1}{N}(\omega \ast H^m + q(H^h)), \frac{1}{N}(T - H^m - H^h), S(T - H^m, \Omega)) \]  

This equation requires the following first-order conditions for an interior solution ($H^m > 0; H^h > 0; H^m + H^h < T$):

\[ \frac{\omega}{N} \ast U_{xi} = \frac{1}{N} \ast U_{l_i} + U_s \ast SH^m \]  
\[ qH^h \ast U_{x_i} = U_{l_i} \]

Equation 1 establishes that, at the optimum, households equate the marginal value of an additional hour of outside labor with the marginal utility of leisure. Equation 2 states that they also equate the marginal utility of leisure with the marginal value of an additional hour of work at home.

Given such context, the demand functions of work hours in the outside market and in
home production which depends on $\Omega$ and $\omega$ are:

$$H^h = H^h(\Omega, \omega), H^m = H^m(\Omega, \omega)$$ \hspace{1cm} (19)

Assume that $U_{x,i} \geq 0, U_{x,i} \geq 0, U_{i,h} \leq 0$

In that case, households ability to increase security by staying close to home implies that optimal allocation of work hours across home and market will depend on the formal tenure rights. In particular, maximizing the above utility function subject to the basic budget and time constraints mentioned above generates the following inequalities:

$$\frac{\partial H^h}{\partial \Omega} < 0 \text{ and } \frac{\partial H^m}{\partial \Omega} > 0$$ \hspace{1cm} (20)

For households involved in both types of labor, an increase in formal tenure security decreases work hours at home and increases work hours in the outside market.

The conditions imply that, in aggregate, strengthening formal property rights decreases work hours inside the house and increases time spent outside, reflecting the fact that an exogenous increase in formal property protection, lowering the opportunity cost of outside labor and making stronger the probability to increase the current income of those households as represented by $I(Income) = f(w; H^m)$.

In the empirical analysis, data limitations prevent the separation of employment hours inside and outside the home. Given that, and with respect to the net effect of a property title on total labor hours, the model predicts that households with zero home production hours \textit{ex-ante} ($H^h = 0$) will increase total household work hours by some positive amount in response to a land title and property rights. Hence, income will increase as consequence.
9.2 Microeconomic Framework - Labor Supply of Children

An extension of the model, and a significant part of the present study approach, incorporates differences in the household supply of adult and child labor when only adults contribute to home security provision. This extension formalizes the intuitive idea that, if adults have comparative advantage in the provision of home security, in the absence of property rights, children will substitute for adults in the labor market. In this case, while total household labor hours rise with an increase in formal rights – as demonstrated above, child labor hours will actually fall. Here, $N_a$ and $N_c$ are the number of adult and child household members, respectively, $l_a$ and $l_c$ are *per capita* adult and child leisure, $L_a$ and $L_c$ are total adult and child leisure and $T_a$ and $T_c$ are total adult and child time endowments. In this setting, the household maximization problem is:

$$\max_{l_a, l_c, x} U(x, l_a, l_c, s(L, \Omega)) \text{ such that } W_a(T_a - L_a) + W_c(T_c - L_c) = X$$

The first order conditions corresponding to each employed adult member $i$ and child $j$ are:

$$U_{lai} = (-\frac{W_a}{N}) * Ux + (\frac{1}{Na}) * Ul_a + Us * sl_a = 0 \text{ adult}$$

$$U_{lci} = (-\frac{W_c}{N}) + Ux + (\frac{1}{Nc}) * Ul_c = 0 \text{ child}$$

From these conditions it can be shown that, for all interior optima, $\frac{\partial l_c}{\partial T} > 0$, and $\frac{\partial l_a}{\partial T} < 0$.

In households in which children are labor force participants, child labor hours will fall and adult labor hours will rise with an increase in tenure security. For all other households, adult labor hours will rise and child labor hours will remain at zero. Thus, given a positive amount of ex-ante child labor, the aggregate number of child labor hours will unambiguously fall, while the number of adult hours rises with an increase.
in property rights.

Although this model focuses on optimal labor allocation, the income effect that follows from relaxing the household time constraint provides a plausible alternative explanation for a decrease in child labor with an increase in formal rights, and one that has been proposed by other authors. In particular, a decrease in child labor would follow from the luxury and axioms of the Basu & Van (1998) model of labor supply, in which children can substitute for adults in the labor market and the family will send children to the labor market only if the family’s income from non-child labor sources falls below some threshold amount.
Figure 14: Comparing distributions of "weekly hours of adult work" for treated and control on the average income distribution in 2007

Source: Author’s estimates
Figure 15: Comparing distributions of "weekly hours of adult work" for treated and control on the upper quartile of income distribution in 2007

Source: Author's estimates
Figure 16: Comparing distributions of "weekly hours of adult work" for treated and control on the lower quartile of income distribution in 2007

Source: Author’s estimates
Figure 17: Comparing distributions of "weekly hours of adult work" for treated and control on the average income distribution in 2008

Source: Author’s estimates
Figure 18: Comparing distributions of "weekly hours of adult work" for treated and control on the lower quartile of income distribution in 2008

Source: Author's estimates
Figure 19: Comparing distributions of "weekly hours of adult work" for treated and control on the upper quartile of income distribution in 2008

Source: Author's estimates
Figure 20: Hours Worked Weekly x Number of Households: Households that not moved - Sample

Source: Research from the Osasco Land Title survey - 2008
Figure 21: Number of Minimum Wage x Number of Households: Households that not moved - Sample

Source: Research from the Osasco Land Title survey - 2008
## Appendix D:

<table>
<thead>
<tr>
<th></th>
<th>Pre-Program (N=326)</th>
<th>Post-Program (N=310)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ia (program)</td>
<td>Ib (non-prog)</td>
</tr>
<tr>
<td>Mean age</td>
<td>39.0</td>
<td>42.4</td>
</tr>
<tr>
<td>Time in residency (# months)</td>
<td>143.4</td>
<td>154.4</td>
</tr>
<tr>
<td>Households number (# members)</td>
<td>3.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Number of rooms</td>
<td>3.3</td>
<td>3.6</td>
</tr>
<tr>
<td>Income (# MW)</td>
<td>1.8</td>
<td>3.1</td>
</tr>
<tr>
<td>Years of education</td>
<td>3.4</td>
<td>1.6</td>
</tr>
<tr>
<td>Hours Worked Weekly</td>
<td>10.6</td>
<td>10.1</td>
</tr>
</tbody>
</table>

Table 13: Sample means - with all households that have not moved

Source: Author's Estimates
Table 14: Sample Means - Households that not moved

<table>
<thead>
<tr>
<th></th>
<th>Pre-Program (N=310)</th>
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<tbody>
<tr>
<td></td>
<td>Ia (program)</td>
<td>Ib (non-prog)</td>
</tr>
<tr>
<td>Mean age</td>
<td>39.4</td>
<td>42.5</td>
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<tr>
<td>Time in residency (# months)</td>
<td>152.3</td>
<td>155.4</td>
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<tr>
<td>Household number (# members)</td>
<td>3.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Number of rooms</td>
<td>3.3</td>
<td>3.6</td>
</tr>
<tr>
<td>Income (number of MW)</td>
<td>1.7</td>
<td>3.1</td>
</tr>
<tr>
<td>Years of education</td>
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<tr>
<td>Hours Worked Weekly</td>
<td>10.4</td>
<td>10.1</td>
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Source: Research from the Osasco Land Title survey - 2008.

(MW = minimum wage)
Table 15: Sample Means - Households that moved

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<td>Ia (N=15)</td>
<td>Ib (N=1)</td>
<td>Ic</td>
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<tr>
<td></td>
<td>(program)</td>
<td>(non-prog)</td>
<td></td>
</tr>
<tr>
<td>Mean age</td>
<td>34.3</td>
<td>31.0</td>
<td>3.3</td>
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<tr>
<td>Time in residency (# months)</td>
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<td>20.0</td>
<td>16.4</td>
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<td>Household number (# members)</td>
<td>3.5</td>
<td>3.0</td>
<td>0.5</td>
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<tr>
<td>Number of rooms</td>
<td>3.1</td>
<td>4.0</td>
<td>-0.9</td>
</tr>
<tr>
<td>Income (number of MW)</td>
<td>3.2</td>
<td>5.0</td>
<td>-1.8</td>
</tr>
<tr>
<td>Years of education</td>
<td>2.9</td>
<td>4.0</td>
<td>-1.1</td>
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<tr>
<td>Hours Worked Weekly</td>
<td>12.6</td>
<td>30.0</td>
<td>-17.4</td>
</tr>
</tbody>
</table>

Source: Research from the Osasco Land Title survey - 2008.

Only households that moved.

(MW = minimum wage)
### Pre-Program

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<thead>
<tr>
<th></th>
<th>Ia (program)</th>
<th>Ib (non-prog)</th>
<th>(p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>39.4</td>
<td>42.7</td>
<td>0.1*</td>
</tr>
<tr>
<td>Sex</td>
<td>0.4</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>Marital status</td>
<td>2.0</td>
<td>2.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>2.7</td>
<td>2.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Households number (# members)</td>
<td>3.8</td>
<td>4.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Income (number of MW)</td>
<td>7.1</td>
<td>6.7</td>
<td>0.0***</td>
</tr>
<tr>
<td>Child</td>
<td>0.4</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>Hours Worked Weekly</td>
<td>0.4</td>
<td>0.3</td>
<td>0.0**</td>
</tr>
<tr>
<td>Child Labor Hours Weekly</td>
<td>3.3</td>
<td>8.2</td>
<td>0.0***</td>
</tr>
</tbody>
</table>

Table 16: Tests of means for covariates in 2007

Note: (*),(**),(***) denotes statistical significance at 10%, 5% and 1%, respectively.

H0: Ia = Ib.
Figure 22: Osasco’s Map

Source: Prefeitura Municipal de Osasco - City Hall Osasco
13 Appendix F: Google Earth’s Pictures

Figure 23: Jardim Canaã

Source: Google Earth
Figure 24: Jardim DR I

Source: Google Earth
Appendix G: Pictures from DR

Figure 25: Jardim DR II

Source: Pictures taken by the Author
Figure 26: Jardim DR III

Source: Pictures taken by the Author
Figure 27: Selected Variables by Land Title: Age

Source: Author’s Estimates
Figure 28: Selected Variables by Land Title: Years of Education

Source: Author’s Estimates
Figure 29: Selected Variables by Land Title: Employed

Source: Author’s Estimates
Figure 30: Selected Variables by Land Title: Hours Worked Weekly

Source: Author’s Estimates
Figure 31: Selected Variables by Land Title: Increase in Hours Worked

Source: Author’s Estimates
Figure 32: Selected Variables by Land Title: Income

Source: Author’s Estimates
Figure 33: Selected Variables by Land Title: Increase in Income

Source: Author’s Estimates
Figure 34: Selected Variables by Land Title: Increase in Income by Gender

Source: Author’s Estimates
Figure 35: Selected Variables by Land Title: Increase in Income by Race

Source: Author’s Estimates
Figure 36: Selected Variables by Land Title: Time in Residency

Source: Author’s Estimates
16 Appendix I: Child Labor x Land Title Diagrams

Figure 37: Selected Variables by Land Title

Source: Author’s Estimates
Figure 38: Histogram Works Worked Weekly by Adults

Source: Author’s Estimates
Figure 39: Histogram of Income Level of Households

Source: Author’s Estimates
Appendix J: Intercept in Ordered Probit Models

The intercept is implicit in the cut points in ordered probit models. To see that more clearly take a three-outcome ordered probit model, the response probabilities are

\[ P(y_{it} = 1|x_{it}) = P(x_{it}\beta + \varepsilon_{it} \leq \mu_1|x_{it}) \]
\[ P(y_{it} = 2|x_{it}) = P(\mu_1 < x_{it}\beta + \varepsilon_{it} \leq \mu_2|x_{it}) \]
\[ P(y_{it} = 3|x_{it}) = P(x_{it}\beta + \varepsilon_{it} > \mu_2|x_{it}) \]

If we add an intercept (alternatively, if we consider that the intercept already was in \( x_{it} \) and we now write it explicitly)

\[ P(y_{it} = 1|x_{it}) = P(x_{it}\beta + \alpha_0 + \varepsilon_{it} \leq \mu_1|x_{it}) \]
\[ P(y_{it} = 2|x_{it}) = P(\mu_1 < x_{it}\beta + \alpha_0 + \varepsilon_{it} \leq \mu_2|x_{it}) \]
\[ P(y_{it} = 3|x_{it}) = P(x_{it}\beta + \alpha_0 + \varepsilon_{it} > \mu_2|x_{it}) \]

Which is the same of

\[ P(y_{it} = 1|x_{it}) = P(x_{it}\beta + \varepsilon_{it} \leq \mu_1 - \alpha_0|x_{it}) \]
\[ P(y_{it} = 2|x_{it}) = P(\mu_1 < x_{it}\beta + \varepsilon_{it} \leq \mu_2 - \alpha_0|x_{it}) \]
\[ P(y_{it} = 3|x_{it}) = P(x_{it}\beta + \varepsilon_{it} \leq \mu_2 - \alpha_0|x_{it}) \]
Thus, $\mu_1, \mu_2$ and $\alpha_0$ are collinear, the only difference is in the estimation of the threshold parameters, and therefore there is no use for an intercept. Actually, the cut points are analogue to intercepts. Consider a two outcome probit model

\begin{align*}
P(y_{it} = 1|x_{it}) &= P(x_{it}\beta + \varepsilon_{it} \leq \mu_1 | x_{it}) \\
P(y_{it} = 2|x_{it}) &= P(x_{it}\beta + \varepsilon_{it} > \mu_1 | x_{it})
\end{align*}

This can be re-written as

\begin{align*}
P(y_{it} = 1|x_{it}) &= 1 - P(y_{it} = 2|x_{it}) \\
P(y_{it} = 2|x_{it}) &= P(\mu_1 < x_{it}\beta + \varepsilon_{it} | x_{it}) = P(0 < x_{it}\beta - \mu_1 + \varepsilon_{it} | x_{it}) = \\
&= P(x_{it}\beta - \mu_1 + \varepsilon_{it} > 0 | x_{it})
\end{align*}

In this case $\mu_1$ is the intercept. Therefore, although the intercept may not be explicitly considered in the model, they are implicitly added in the estimation of the cut points.