Some Notes on How Land Title Affects Child Labor

Mauricio Jose Serpa Barros de Moura
World Bank Group, Washington DC, USA

Rodrigo De Losso da Silveira Bueno
Universidade de São Paulo (USP), Brasil

Abstract

Secure property rights are considered a key determinant of economic development. However, evaluation of the causal effects of land titling is a difficult task. Since 2004, a program called "Papel Passado" has issued titles to more than over 85,000 families and has the goal to reach 750,000. This paper examines the direct impact of securing a property title on child labor force participation. This study uses a comparison between two close and similar communities in the City of Osasco case. The key point of this case is that some units participate in the program and others do not. Estimates, generated using difference-in-difference econometric technique suggest that titling results in a substantial decrease in child labor force participation for the families that received the title compared with the others. This findings are relevant for future policy tools for dealing with informality and how it affects economic growth.

Keywords: Property Rights, Land Titling, Child Labor Force

JEL Classification: P14, Q15, J22, O18, O54

Resumo

A obtenção dos direitos de propriedade é considerada um determinante para o desenvolvimento econômico. Entretanto, a avaliação dos efeitos do título de propriedade é uma tarefa difícil. Desde 2004, o programa intitulado "Papel Passado" vem concedendo escrituras para mais de 85.000 famílias e ainda objetiva alcançar a marca de 750.000 famílias beneficiadas. Este artigo examina o impacto direto da obtenção do título de propriedade sobre a participação de crianças no mercado de trabalho. O estudo utiliza uma comparação entre duas comunidades vizinhas na cidade de Osasco. As estimações, geradas a partir da técnica econométrica *Difference-in-Difference*, sugerem uma diminuição substancial na participação do trabalho infantil para as famílias que obtiveram a escritura em comparação com as outras. Tais observações são relevantes para políticas públicas futuras com respeito a informalidade e como esta afeta o crescimento econômico.

Mauricio Jose Serpa Barros de Moura and Rodrigo De Losso da Silveira Bueno

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 and Thomas (1973). The fragility of property rights is considered a crucial obstacle for the economic development (North 1990). The main argument is that individuals underinvested 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 a context, strengthening economic institutions is widely argued to foster investment in physical and human capital, bolster growth performance, reduce macroeconomic volatility and encourage an equitable and efficient distribution of economic opportunity (Acemoglu et al. 2002). In current developing world scenario, a pervasive sign of feeble poverty rights are the 930 million people living in urban dwellings without possessing formal titles of 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 to use land as collateral to access the 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. By contrast property title could allow the poor to collateralize the land. Field and 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). Figure 1 sketches the mechanisms that property titling causes economic growth.

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 March 15th 2007 edition. The same edition brings in 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 such 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 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 title in Brazil and promote*

Fig. 1. Land registration
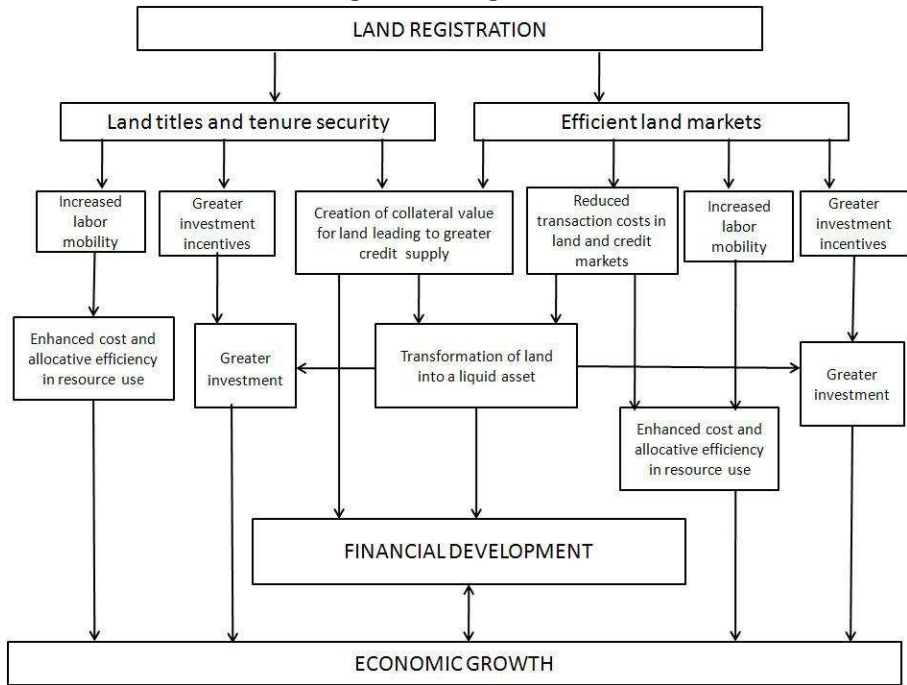
Source: World Bank, 2008.

an increase in 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).

Furthermore, child labor is a major issue faced by the global economy. In Brazil, about 5.4 million children and teenagers between 5 and 17 years old do work in the streets as PNAD (an annual research on random households in Brazil done by IBGE, 2007) shows.

This paper investigates the impact of property rights on labor markets by analyzing household response regarding child labor force participation to an exogenous change in formal ownership status in Brazil. In particular, the paper assesses the value to a squatter household of increases in tenure security associated with obtaining a property title in terms of hours of child labor supply.

Effects of land titling have been documented by several studies. A partial listing includes Jimenez (1985), Alston et al. (1996) and Lanjouw and Levy (2002) on real estate values. Besley (1995), Jacoby et al. (2002), Brasselle et al. (2002) and Do and Iyer (2003) on agricultural investment. Place and Migot-Adholla (1998), Carter and Olinto (2003) and Field and Torero (2002) on credit access, housing investment and income.

In urban settings, the value of property titles has been measured far less often and empirical work has focused on real estates prices. A major contribution is from the of paper by Jimenez (1984), involving an equilibrium model of urban squatting in which it is shown that the difference in unit housing prices between 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 Philippines finds equilibrium prices 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 and Torero (2002), in Peru, exploits 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 finds positive effects, particularly in the credit access 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 property 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 and 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, by comparing two neighborhoods in the City of Osasco (a town with 650,000 people located in the São Paulo – Brazil metropolitan area) which are very similar between each other in many aspects. Osasco is part of the *Papel Passado* program and has 6,000 families living under urban property informality. One of them,*Jardim Canaã*, was fortunate to receive the titles in 2007, the other, *Jardim DR*, only will be part of the program schedule in 2012, and for that reason became the control group. Such approach enables a comparison of households in a neighborhood reached by the program with households in a neighborhood not yet reached.

The present research is based on a panel data from a random sample from *Jardim Canaã* and *Jardim DR*, and it is 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 was collected in August 2008, almost one year and half after the titles were awarded. As a matter of fact, that is the main methodological difference from other studies and therefore may potentially generate more robust and trutful results. As Ravallion et al. (2005) argues that the best *ex-post* evaluations are designed and implemented *ex-ante* –

often side-by-side with the program itself.

Based on the first survey, 95.0% of the 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). In the second stage of the survey, most of households that received the land title felt that such event was relevant for their lifes – see Figure 2 below even not previously expecting the land title.

Fig. 2. How land title affected household's life?
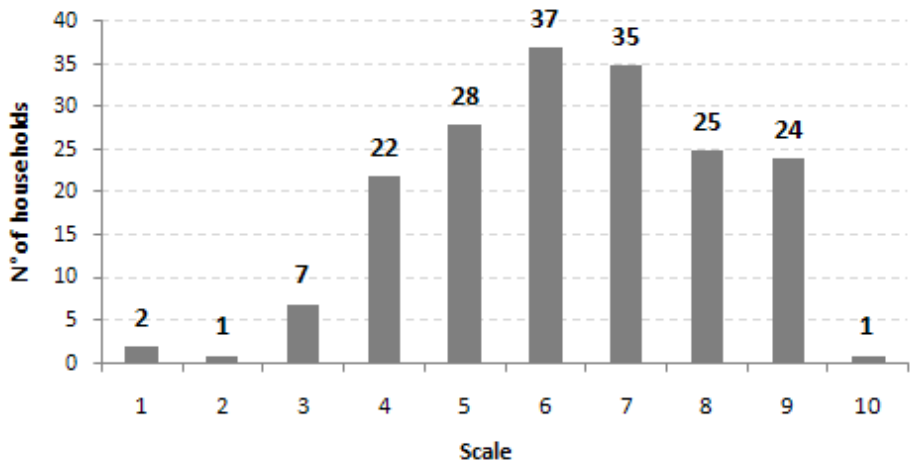
Source: Research from the Osasco Land Title Survey – 2008.

Hence, given the specific focus on non-agricultural households the first contribution of this paper is to shed some light on 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. Field and Torero (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 – and particularly the impoverished population – is increasingly urban.

Second, this research provides a unique panel data by means of a quasi-natural experiment that helps minimize the endogeneity aspect related to most of the studies on such subject as property rights.

Third, many aspects have applied to try to explain the reasons of the child labor. The most common are income, poverty, parent's level of education, parent's previous child labor experience, credit constraints and others. This paper intends to provide an additional aspect that can be used as part of the child labor causes.

Finally this paper provides an initial impact 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 regarding child labor force participation. Certainly, reducing child labor force participation is one of the main goals of the Federal and Local Governments. 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. Understanding the potential positive effects of land titling and property rights in such subject could be valuable to make any effort related to child labor participation stronger and more effective.

2. Child Labor Force Participation: The Economic Context

Investing and focusing on human capital development is a critical factor to increase economic growth, as stated by Becker and Lewis (1973). Given such key assumption, the United Nations Millennium goals include eliminating child labor as 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 them work for their own family activities. Asia, Africa and Latin America are the continents that host most the child labor in the world. Asia has the highest number of children in terms of volume but Africa is the leader relatively to the total size of work force.

In Brazil, data from PNAD (IBGE, 2007) have shown that out of a 44.7 million population between 5 and 17 years old, 10.8% (4.8 million) are directly involved in labor child. Northeast is the worst region of Brazil regarding this subject, with 13.4% of 5-17 year population working. By contrast, Southeast holds the lowest average (7.9%). Such statistics represents a positive evolution over the last 4 years as Figure 3 shows.

However, child labor is still a major issue for Brazilian policy makers as PNAD (IBGE, 2007) suggests. 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% *of the teenagers* work at least 40 hours per week.

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

Fig. 3. Occupation level among the 5-17 year-old population (Percentual of total 5-17 population)
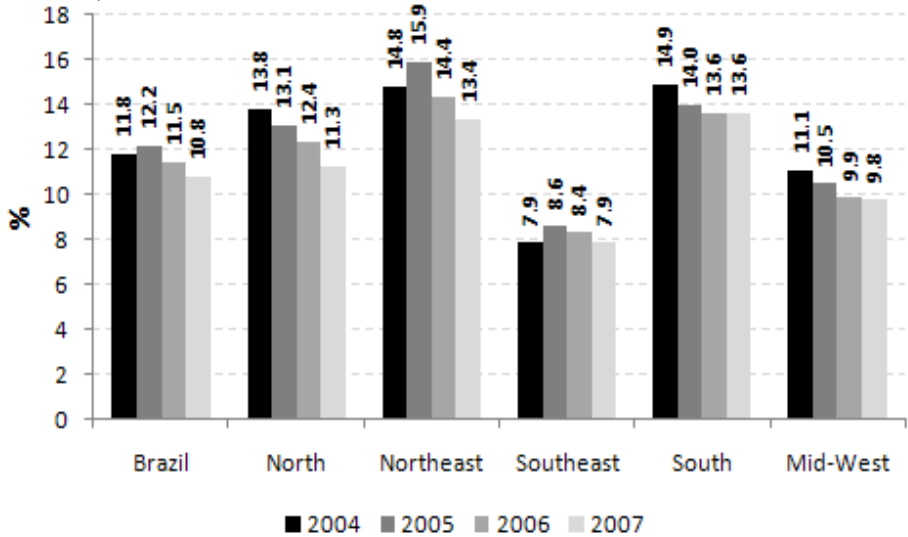
Source: IBGE, PNDA 2007.

Basu and Van (1998) have built a model using one basic assumption: luxury. They consider that poverty is the main factor that makes parents to send children to work. Hence, children's time that is not allocated between to generate income is luxury as school and leisure. However such goods can not be afford by low income parents. Ray (1999) has created a theory for emerging economies: child labor occurs mainly because of poverty and credit markets imperfections. He has shown that if poor families had access to credit, in the presence of high returns for education, they would be 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) have demonstrated that an increase in the household's income reduces the probability of child labor and increases the school attendance. Another element that affects child labor probability is the parent's education degree. Bhalotra and Heady (2003) found a negative effect given the mother's level of education and the child labor participation in Ghana. The effect the mother's education profile is higher comparing with the father. Kassouf (2002), in Brazil, has obtained the same negative effect. Family composition is another relevant factor for the particular analysis, Patrinos and Psacharopoulos (1994) for Paraguay and Bhalotra and Heady (2003) for Pakistan, concluded that more people in the family, higher the chances of having child labor.

Wahba (2002), using data from Egypt, showed a phenomenum denominated "dynastic poverty traps" which means that the probability of children to be sent

to work increases 10% when their parents worked during their childhood. Emerson and Souza (2003) reached the same conclusion and explain such event as "social norms": parents that worked during their childhood years face child labor more naturally. As mentioned earlier, this paper aims to providing 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.

3. Microeconomic Framework: Basics

"*I go to work with my children but my wife has to stay to look after the house*" says Mr. Rosivaldo Reis, who sells popcorn and soft drinks in downtown Osasco, São Paulo, Brazil. Mr. Reis worries that people could size his house when he is away.

Cockburn (1998) pointed 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 and Zegarra (2000), World Bank (2000) and Field (2007) have noted that, in many settings, informal institutions arise to compensate for the absence of formal property protection. In such a context, there is one important mechanism by which it is assumed that tenure security removes individuals from the labor force and incremental income. Households untitled 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 increases 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.

$$I\,(income) = f(w; H^m)$$

where
    w is market wage
    H^m is work in the outside market
    We assume that:
(i) 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 is some risk involved in employing non-members to guard property – especially in those poor communities in Brazil);

(ii) Leisure and home production hours are assumed to be perfect substitutes for the hours individual spend on property protection;

(iii) All households face a common wage w;

(iv) Household is assumed to maximize *per capita* leisure and not leisure of individual members;

(v) Household talent, Φ, and endowment, E, are assumed to be fixed.

Now, let the time spent at home be Z such that

$$Z = H^h + L$$

where

H^h is work at home

L is the household leisure

The value of work at home is given by a production function $q(H^h)$, which is increasing and concave. If n is the number of members at a determined househod i, then l is leisure per capita and x is consumption per capita. Household utility is concave and an increasing function of *per capita* leisure, *per capita* consumption, and home security tenure, S, also concave. The parameter Ω is exogenous and designs household formal property rights. Therefore:

$$U\left(x, l, S; \Phi, E\right),$$

where $S = S(Z, \Omega)$.

In this problem the endogenous variables are H^h, H^m, x, l, and S. Also there are two restricthing to deal with. The first is the budget constraing given by:

$$pX = wH^m + q\left(H^h\right),$$

where

p is the goods price

X is the household consumption.

The second restriction is the time constraint, T, given by:

$$T = \left(L + H^h\right) + H^m = Z + H^m$$

The security function depends on the time spend in home security and the property right:

$$S = S\left(H^h + L, \Omega\right)$$

By assumption the variables L, H^h, H^m, and x are non negative. Consequently,, normalizing prices to one, the household's optimization problem is

$$\max_{(H^h, H^m)} U\left(\frac{X}{n}, \frac{L}{n}, S\right) = U\left(\frac{wH^m + q\left(H^h\right)}{n}, \frac{T - H^m - H^h}{n}, S\left(H^h + L, \Omega\right)\right)$$

The first order condition, assuming that $H^m > 0; H^h > 0$, and $H^m + H^h < T$) are:

$$[H^m] : w\frac{U_x}{n} = \frac{U_l}{n} + U_S S_Z. \tag{1}$$

$$[H^h] : q'\frac{U_x}{n} = U_l. \tag{2}$$

The first equation establishes that, at the optimum, households equate the marginal value of an additional hour of outside labor with the marginal utility of leisure. The second equation states that they also equate the marginal utility of leisure with the marginal value of an additional hour of work at home.

Given such a context, demand functions of work hours in the outside market and in home production depend on Ω and w:

$$H^h = H^h (\Omega, w) , H^m = H^m (\Omega, w)$$

Spending time on security, decreases consumption and leisure, so it is reasonable to assume that $U_{xS} \geq 0$ and $U_{lS} \geq 0$. By spending time on leisure, then the consumption must decrease, such as $U_{xl} \geq 0$. Thus, household's 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. Therefore, it can be proved that:

$$\frac{\partial H^h}{\partial \Omega} < 0 \text{ and } \frac{\partial H^m}{\partial \Omega} > 0$$

For households involved in both type 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 by strengthening formal property rights decreases work hours inside the house and increases time spent outside, reflecting the fact that an exogenous increase in the formal property protection lowers the opportunity cost of outside labor and makes stronger the probability to increase current income of those households as presented on $I (income) = f (w; H^m)$.

In the empirical analysis, data limitations prevent us from separating employment hours inside and outside home. Given that, and with the respect to the net effect of a property title on total labor hours, the model predicts that households with zero home production hours *ex-ante* $(H^h = 0)$ will increase total household work hours by some positive amount in response to land title and property rights and decreases child labor hours.

3.1. *Labor supply of children*

An extension of the model, and 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, $n = n_a + n_c$, where n_a and n_c are the number of adult and children in household, respectively. The variables l_a and l_c are *per capita* adult and child leisure, so L_a and L_c are total adult and child leisure. Finally T_a and T_c are total adult and children time endowments. In this setting, the household maximization problem is:

$$\max_{l_a,l_c,x} U\left(x,l_a,l_c,S\left(L_a,\Omega\right)\right)$$

such that

$$w_a(T_a - L_a) + w_c(T_c - L_c) = X,$$

where w_i is the wage of $i = a,c$.

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

$$\left[l_a = \frac{L_a}{n_a}\right] : w_a \frac{U_x}{n} = \frac{U_{l_a}}{n_a} + U_S S_{L_a}.$$

$$\left[l_c = \frac{L_c}{n_c}\right] : w_c \frac{U_x}{n} = \frac{U_{l_c}}{n_c}.$$

From these conditions it can be shown that, for all interior optima, $\frac{\partial l_c}{\partial \Omega} > 0$, and $\frac{\partial l_a}{\partial \Omega} < 0$. 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 the child labor would follow from the luxury and axioms of the Basu and Van (1998) model of labor supply, in which children can substitute for adults in the labor market and a family will send children to the labor markets only if the family's income from non-child labor sources falls below some threshold amount.

4. The Data

The empirical analysis of household labor supply and income responses to changes in formal property rights relies on a data survey developed especially and

exclusively for this paper 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 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, representing almost 4.5% of its total population. The program timetable for Osasco establishes that all the communities under illegal situation will be part of the "*Papel Passado*" during the period between 2007 and 2014 (the main reason because all communities are not receiving the land title at the same time relies on the fact that fiscal resources are limited in time). Officially, according to the Osasco City Hall, there is no priority, and the choice on the community to be benefited follows a random criteria. Unofficial sources from local communities in Osasco express the feelings that a "political" agenda might be present in the decision.

Anyway, the first community to receive the land title was *Jardim Canaã*, in 2007, a place with 500 families. The closest neighborhood 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 2011. Hence, the data of this paper consist in 326 households distributed randomly across *Jardim Canaã* and *DR* (185 from *Jardim Canaã* and 141 from *DR*).

4.1. *Minimizing endogeneity bias concerns*

Given the particular nature of the research conducted in the city of Osasco, some steps were taken to minimize the bias related with the data collected. First of all, a technique to sample randomly 326 households follows the methodology by Bolfarine and Bussab (2005). The approach basically chooses 150 households (from the *Canaã* and *DR*) that have the closest birth dates (day and month). Each one of the three field researcher then got 50 names initially as first base [1]. After reaching each of those households, they could go and pick the third and the fifth neighbor on the right hand side.

Second, Heckman and Hotz (1989) state that constructing counterfactuals is the central problem in the literature about 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. So, an important step to minimize such issue is to use a comparison between two neighborhoods (*Jardim Canaã* and *DR*) with very similar characteristics. *Canaã* and *DR* are not only official neighbors but there is no physical "borderline" between them, since both are geographically united (if someone walks there, it is hard to identify the boundaries – even for the local households).

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[1] The field researchers are not from Osasco.

One of them, *Jardim Canaã*, fortunate to receive the titles in 2007, is qualified for the paper proposal as the main sample. The other, *DR*, part of the program schedule in 2011, is the control group. Such approach enables a comparison of households in a neighborhood reached by the program with households in a neighborhood not yet reached and gives the possibility to produce a panel data.

Another aspect to be mentioned about the data collected is that produced a unique match within same geographic area which helped to assure that comparison units come from the same economic environment. Rubin and 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.

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

The survey was based on a 39 questions questionnaire applied to the 326 families randomly sampled as described earlier. The survey instrument, in many questions and methodologies, closely mirrors the IBGE Living Standards Measurement Survey (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 the range of economic, social and personal benefits associated with property formalization.[2]

The first stage of the survey was conducted in March 2007, before titles had been issued to *Jardim Canaã*. The second was collected in August 2008, almost one year and half after the first title had been issued. There were 98.0% of recall – or 2.0% missing, which means that almost all households interviewed in the first survey were found and interviewed during the second stage. The reason regarding such time gap gave the opportunity to all 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 and Hotz (1989) add that it is not necessary to sample the same person in different periods – just persons from the same population. Therefore this paper has clearly the advantage that the same households were tracked over time to form a panel data 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.

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[2] The questionnaries are available under request.

Furthermore, we emphasize again another aspect that helps minimize the selection bias. Based on the first survey, 95.0% of the participants (from *Canaã* and *DR*) did not expect to receive any land title, i.e., they were not aware about "*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 whether the land title effect stands. From the original sample, 8% of the households that received the land title have moved away from *Canaã* by selling their property. The local authorities in Osasco believe that 8% is lower than they expected, but it seems to be high when compared to the control group where only 1 household (out of 140) has moved away during the same period.

5. Basic Findings – Child Labor Force

This study has used basically four questions to address the issue of child along the survey. The first question was: "*Do you have any children?*". Combined sample and control group, about 75.0% of the households declared to have children (about 73.0% sample and 76.0% control group).

After the initial question mentioned above, the survey included the following:
a) "*Are there any children helping in the familiar income? How many? (under* 18 *years old)*",
b) "*How many hours they work daily?*" and
c) "*How many days per week minors work?*".

On top of that, from those households that have children, 25.5% responded that have minors helping the familiar income.
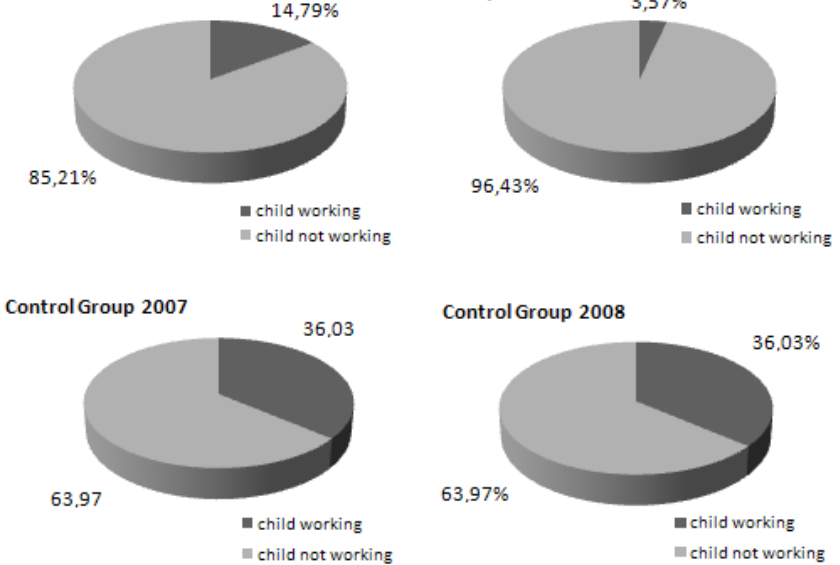
Additionally, the diagram below summarizes the household's answers (2007 and 2008) about weekly hours of child labor. The main issue that arises is related to the fact that for the sample is visible that children are working lower hours (and even households that have children working in 2007 changed path in the survey's second round) and for the control group the scenario gets worst over time.

6. Econometric Model

### 6.1. *Difference-in-difference estimator*

The econometric method is the differences-in-difference estimator, also known as DD. As Bertrand et al. (2004) define, Diff-in-Diff consists of identifying the effects of a specific intervention or *treatment* (often a passage of a law). The idea is to compare the outcome before and after the treatment between a treated and non-treated (control) group.

Fig. 4. Are there any child/teenager helping in family income? How many?

Sample 2007
14,79%
85,21%
■ child working
■ child not working

Sample 2008
3,57%
96,43%
■ child working
■ child not working

Control Group 2007
36,03
63,97
■ child working
■ child not working

Control Group 2008
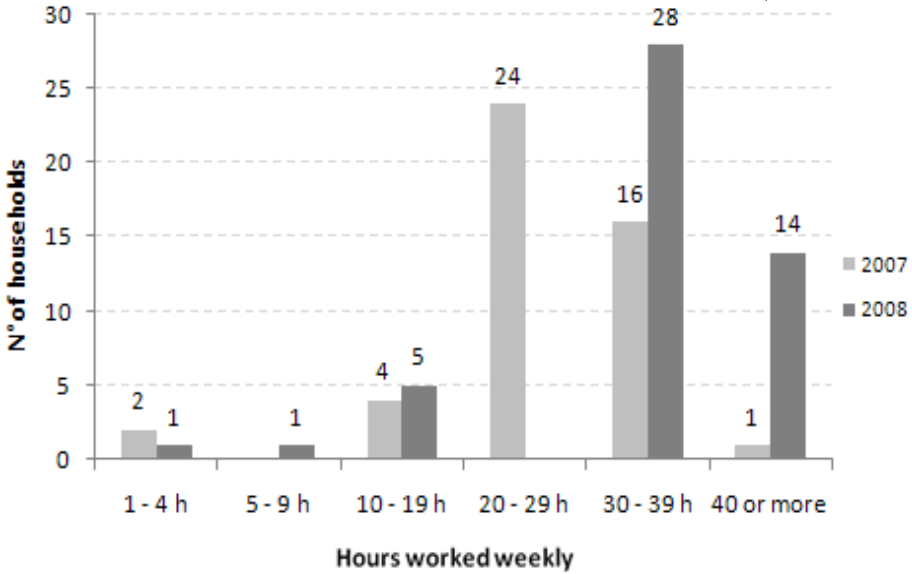36,03%
63,97%
■ child working
■ child not working

Source: Research from the Osasco Land Title Survey – 2008.

Fig. 5. Child labor force hours worked weekly × Number of households (Sample)
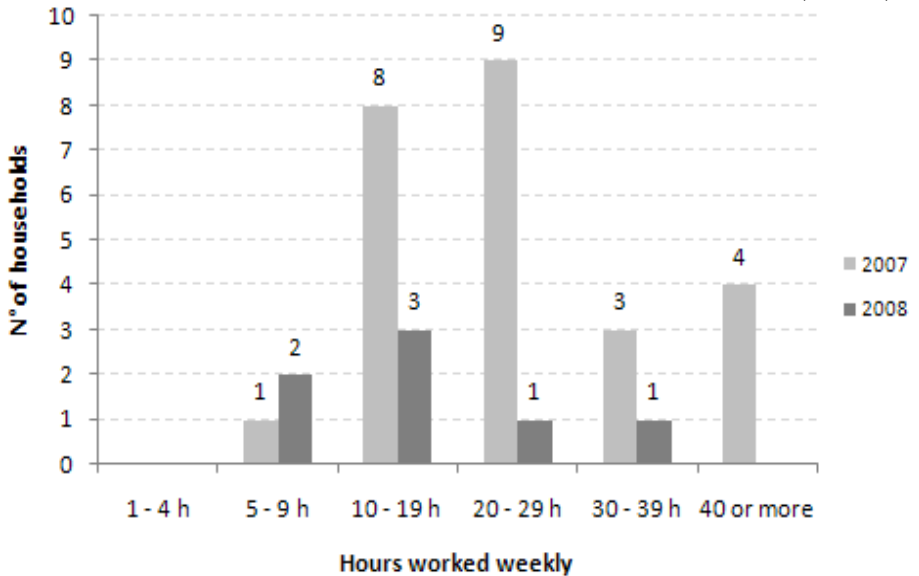
Source: Research from the Osasco Land Title Survey – 2008.

Fig. 6. Child labor force hours worked weekly × Number of households (Control group)

Source: Research from the Osasco Land Title Survey – 2008.

Heckman and Hotz (1989) state that 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 a non-treated situation to a treated one. To see that, let y_{gt} be the outcome at t from group g, where the participant group is indexed by $g = 1$, and the non participant group is indexed by $g = 0$:

$$E\left(y_{1t} - y_{0t}|X\right). \tag{3}$$

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

$$E\left(y_{1t} - y_{0t}|X, d = 1\right) \equiv E\left(y_{1t} - y_{0t}\right)_1, \tag{4}$$

where
  $d = 1$ is the treated group;
  $d = 0$ is the control group.
  In what follows, we omit the dependence on X.
  Given the data characteristics, this particular study aims, as previously mentioned, to provide a comparison between treated and untreated to estimate impact of treatment on the treated with a counterfactual. Heckman and Hotz (1989) pointed 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.

We can decompose the former expression into two groups, treated and control, if there are at least two time periods. That is the case of our data, so let $t > t'$. Then the DD estimator is given by:

$$E\left(y_{1t} - y_{0t}\right)_1 = E\left(y_{1t} - y_{0t'}\right)_1 - E\left(y_{0t} - y_{0t'}\right)_1 +$$
$$+ E\left(y_{0t} - y_{0t'}\right)_0 - E\left(y_{0t} - y_{0t'}\right)_0.$$

We must assume that:

$$E\left(y_{0t} - y_{0t'}\right)_1 = E\left(y_{0t} - y_{0t'}\right)_0,$$

which means that the time variation in the averages of the two groups, treated and control, although non-participant are the same.

Hence:

$$E\left(y_{1t} - y_{0t}\right)_1 = E\left(y_{1t} - y_{0t'}\right)_1 - E\left(y_{0t} - y_{0t'}\right)_0.$$

The expression may be simplified, if one notice that the control and treated groups at t' are exactly the same, because nothing happened by then. So rewrite $(y_{0t'}|d=1) \equiv y_{t'}^1$ and $(y_{0t'}|d=0) \equiv y_{t'}^0$. Consequently:

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

where
$\Delta y_1 \equiv \left(y_t^1 - y_{t'}^1\right)$;
$\Delta y_0 \equiv \left(y_t^0 - y_{t'}^0\right)$.
Therefore, one can write the estimator as a switching regression:

$$\Delta y = d\Delta y_1 + (1 - d)\Delta y_0 = \Delta y_0 + d\left(\Delta y_1 - \Delta y_0\right),$$

where $d = 1$ for the treated group, and 0 for the control group.

If $\Delta y_g = \Delta x_g \beta_g + u_g$, we have:

$$\Delta y = \Delta x_0 \beta_0 + d\left(\Delta x_1 \beta_1 - \Delta x_0 \beta_0\right) + \varepsilon,$$

where $\varepsilon = u_0 + d\left(u_1 - u_0\right)$

When $\beta_1 - \beta_0 = 0$, but the constant, α, we have:

$$\Delta y = \Delta x_0 \beta_0 + d\alpha + \varepsilon,$$

where α is the parameter of interest.

6.2. *The regression equation*

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. Meyer (1995) argues that 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:

$$\Delta y_i = \Delta x_{0i}\beta_0 + d_i\alpha + \varepsilon_i, \tag{5}$$

where i indexes the household sampled.

The estimated impact of the intervention is the OLS estimate $\widehat{\alpha}$. Standard errors used to form confidence interval for $\widehat{\alpha}$ are usually OLS standard errors sometimes corrected to account correlation of shocks within each year. Considering the data characteristics mentioned earlier, this study will assume that the estimated coefficient of intervention is variable (given x_i) but does not help to determine program participation (land title 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 econometric technique. The basic assumption is that changes in outcome variable over time would have been exactly the same in both treatment and control group in the absence of intervention.

6.3. *Land title specification*

The dependent variable is weekly hours of work of child labor force y_{it} (the outcome of interest for household i at time t). The dependent variable would be posted as the difference among weekly hours of child labor in 2008 and 2007. Then the basic regression is:

$$\Delta y_i = \beta_0 + d_i\alpha + \beta_1\Delta H_{ai}^m + \beta_2\Delta Y_i + \beta_3\Delta n_i + \beta'\Delta x_i + \varepsilon_i$$

where

H_{ai}^m is the hours worked outside the market by adults in household i

Y_i is the income of household i;

n_i is the number of people in household i;

x_i are other controls.

The coefficient α is the estimated of program effect, which provides a measure of conditional average difference in time worked by child households in 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 to include fixed effects, according to Becker and Lewis (1973) suggestion, are level of income – measured in terms of minimum wage. Furthermore, weekly hours of adult work is an essential variable to understand child labor according to Rosenzweig (1981).

Patrinos and Psacharopoulos (1994) for Paraguay, Grootaert (1998) for Gana and Heady (2003) for Pakistan, all of them concluded that the more people in the family, the higher the chances of having child labor. Given such framework, 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.

As a robustness check, 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 whether the land title still has positive effect even considering those who are not living in the original community.

Of course, we are willing to test the following hypothesis:

$$H_0 : \alpha = 0 \times H_1 : \alpha < 0,$$

that is, whether the land titling decreased the hours worked by children.

7. Results

The basic statistics results are presented in Table 1 (Sample Means). Consistent with the study basic findings, one main aspects demands special attention. The average weekly hours of child labor force has decreased from the program households and increased for the non-program. Additionally, for land title owners, weekly hours worked of adults increase more. Such could provide a potential signal that child labor is being substituted by adult work.

Regarding the time of work of children, one can see a decrease in the hour of the participant group (about 3 hours) and an increase in the hours of the non-participant group (about 2.8) hours. A possible explanation for that effect is there to be a substitution for children from non program participants. Taking that for granted, then one must conclude at least the following: first, the program indeed removes children from the treated group from work, and makes them better off. Second, children from the non participant group substitute for the others and may increase their household income. That is not desirable, but it is likely to make them better off. This hypothesis is not tested, though. Our questionnaire does not reach the level of details to conclude whether there was that kind of substitution.

On the other hand, 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 1. This study 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 α coefficient is −6.08, with a robust standard error of 0.93.

Table 1
Sample means – With all households that have children

	Pre-program t'			Post-program t		
	Ia	Ib($d=0$)	Ic	IIa	IIb	IIc
	$d=1$	$d=0$		$d=1$	$d=0$	
	(program)	(non-program)	$|t\triangle|$	(program)	(non-program)	$|t\triangle|$
Mean age	42.0	45.0	-3.0	42.8	45.9	-3.1
Time in residency (#months)	146.2	158.4	-12.1	157.8	175.0	-17.1
Households number (#member)	3.8	4.0	-0.2	3.9	4.1	-0.2
Number of rooms	3.3	3.7	-0.4	3.3	3.7	-0.3
Income (#MW)	2.0	3.0	-1.0	2.0	3.0	-1.0
Years of education	9.0	5.0	4.0	9.0	5.0	4.0
Hours worked weekly	9.8	9.2	0.5	19.5	10.0	9.5
Child labor hour weekly	3.5	9.1	-5.6	0.5	11.9	-11.4
N		251			251	

Source: Author's Estimates.

Furthermore, as expected from a DD regression, other coefficients such as sex, ethinicity, years of education, household member and hours worked weekly presented not significant results. Such outcome also helps to support the child labor variable result.

This outcome is highly consistent with our hypothesis, that property rights (Land Title) decreased 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 minimize the number of weekly hours worked by children in the case of Osasco.

Table 2
T test for the difference of means for covariates in 2007

Variables	Non-program	Program	Difference
			(p-value)
Mean age	45.0	42.0	0.05
Mean age squared	2047.1	1757.8	0.05
Sex	0.3	0.3	0.4
Marital status	0.2	0.2	0.7
Ethinicity	0.3	0.4	0.4
Years of Education	9.0	5.0	0.05
Households number (# members)	4.0	3.8	0.5
Sex*Marital status	0.5	0.5	0.9
Ethinicity*Marital status	0.9	1.0	0.4
Weekly hours worked of adult work	9.2	9.8	0.7
Income (BRL)	1,520.0	807.5	0.05
Child labor hours weekly	9.1	3.5	0.15

Source: Research from the Osasco Land Title Survey.

(Currency 12/31/2008, 1 USD=1.75 BRL. Source: Central Bank of Brazil)

Table 3
Child labor and land title

Independent variables	Dependent variables	
	Child labor	
	(hours worked weekly)	Robustness check
		(with household that moved)
Constant	4.68	4.28
	(1.88)	(1.33)
Sex	-0.21	-0.20
	(0.87)	(0.87)
Single	-1.67*	-1.68*
	(0.96)	(0.96)
African Brazilian	-0.90*	-0.91*
	(0.84)	(0.84)
Years of education	0.17	0.16
	(0.10)	(0.10)
Households number	-0.45	-0.45
(# member)	(0.25)	(0.25)
Hours worked	0.01	0.01
weekly	(0.03)	(0.03)
Moved from	-0.48	-
Canaã	(1.63)	-
Land title	-6.08*	-6.04*
	(0.93)	(1.22)
R^2/Pseudo R^2	0.13	0.13
N	251	251

(*) Standard error – significant at 5%.

8. Conclusion

This paper 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 and child labor force participation, the study has provided additional empirical support for the evidence that property title appear to reduce the household demand for child labor in the majority of the households.

Although existing studies indicate significant effect on access to credit, income, home investment and fertility as Field (2007) and Andrade (2006), this particular study aims at helping to fill an important gap in the literature on property rights and child labor force participation. 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 labor force, government property titling programs appear to have a different effect – removes child labor from the labor force.

It will certainly be interesting to apply the same survey in different locations and compare outcome results. Ravallion et al. (2005) 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. Furthermore, it will also add value keeping tracking the same households with other surveys to check consistency and robustness of the results overtime.

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 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. Hence, land title could be applied as an asset to improve public policy actions that directly impact economic growth.

It is possible that the reduction of child labor has been caused by other factor not embranced by the theory which supports this study. However, that is to appear.

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