Bachelor Thesis
Stockholm School of Economics
Spring 2012

What is the impact of community characteristics on conditional cash transfer programmes?

A case study on Oportunidades, Mexico

Authors

Amanda Olsson, 21865 Emmi Östlund, 21875

Abstract:

Conditional cash transfers are a poverty reducing tool that has gained popularity due to its success in increasing school attendance in developing countries. The Mexican programme Oportunidades is a role model for this kind of programmes and it is therefore of interest for policymakers to transplant this programme structure to other countries. To successfully transplant such a programme, it is of importance to understand which contextual forces are impacting a favourable outcome. This paper examines the impact of school quality and inequality on the outcomes of Oportunidades. For this, a fixed effects model is applied where school attendance is regressed on programme effects, the Gini-index, pupil/teachers ratio and the interaction of these. The results, while not being robust, suggest that although the programme would be positively affected by a simultaneous implementation of a school quality enhancing policy, school quality enhancing measures are valuable regardless of the community participating in a cash transfer programme or not. In terms of income inequality, the results indicate that the effects on the programme differ between older and younger children. It seems like cash transfers potentially are more important in unequal societies but that benefits have to be larger in more equal ones in order to compensate for the opportunity costs of unskilled work.

Key words: Education, Antipoverty, Development, and Developing Countries.
JEL-codes: I24, I25, I28 and O1.

Tutor: Kelly Ragan
Examiner: Yoichi Sugita
Presentation: Stockholm School of Economics, room 320, May 31 2012, 16.15-17.00

TABLE OF CONTENT

1 Introduction 1
1.1 Purpose and contribution 3
1.2 Research question and delimitation 4

2 Background 5
2.1 Conditional cash transfer programmes 5
2.2 Mechanism of conditional cash transfers 6
2.3 Oportunidades 9
2.4 Oportunidades – a literature review 10

3 Theoretical and Empirical Framework 12
3.1 Theoretical Framework 12
3.2 The household investment decision 12
3.3 Empirical Framework 15
3.3.1 Level 1 - Effects of parental education 15
3.3.2 Level 2 - Effects of household resources 16
3.3.3 Level 3 - Effects of community resources 16
3.4 Hypothesis 20

4 Method 21
4.1 The dataset from Oportunidades 21
4.2 Data on pupil/teacher ratio and the Gini index 22
4.3 Method 23
4.3.1 Regressing community characteristics on programme outcome 25

5 Results and analysis 27
5.1 Primary school children 6-12 years 27
5.2 Secondary school children 12-15 years 29
5.3 Gender differences 30

6 Discussion 31

7 Conclusions 33

8 References 35

Appendix I 38

Appendix II 40

Figures

Figure 1 Determinants of educational investments 2
Figure 2 Reasons for not investing in education 9

Tables

Table 1 Average yearly change in pupil/teacher ratio and Gini index 23
Table 2 Summary statistics by groups 24
Table 3 Regression results 28

DEFINITIONS

Community characteristics

Community characteristics are used to describe the common attributes of a community. This refers to different shaping of institutions within a community like policies, quality and pricing of health care and education and availability to school and health facilities.

Conditional cash transfer programme (CCT)

A conditional cash transfer programme is a social policy implemented by a country's government. Participating households are carefully selected against certain criteria. Participating households receive a monthly or bimonthly cash payment conditioned to certain performance measures. Usually the conditionality is attached to school attendance or regular health check-ups.

Human capital

Human capital is the knowledge, skills and other physical and mental characteristics contributing to the production capacity of people. These factors are acquired through investments in education, training and health care (Nationalencyklopedin – Humankapital, n.d.).

Regional differences

Regional differences in this thesis will be referring to the differences in conditional cash transfer programme outcomes between federal states in Mexico. The regional difference is the programme difference in outcome attributable to the programme operating in a certain federal state.

1 Introduction

An important focus of development economics is investments in human capital. The reason for this is the development of endogenous growth models [1] that imply that continuous economic growth is created through human capital accumulation and technology improvements. The fundamentals of the endogenous growth model are based on the model developed by Romer (1986) by assuming that technological development is not exogenous but dependent on the idea creation of humans. Lucas (1988) refined the model by increasing the importance of human capital accumulation. In Lucas' model, growth is made completely dependent on human capital investments. Moreover, both of them argued that investments in human capital have spill over effects on the economy as a whole and reduces the diminishing returns to capital accumulation. These kinds of economic models highlight the importance of human capital investments for creating continuous growth.

In developing countries, underinvestment in education is a frequent issue even though human capital accumulation is of even higher importance for these countries than for developed ones. First, because developing countries typically are starting from a lower overall level of human capital they have much more to gain from increasing human capital investments (Barro, 1991). Second, there is a more urgent need for growth since large proportions of their populations have very low living standards. Since investments in human capital in the endogenous growth theory are one of the fundaments for growth, these are believed to be a key to get people out of structural poverty.

Human capital investments could be seen as a household investment decision which means that a household will weigh benefits and costs of schooling in order to maximise the household utility. Previous research in this field provides a framework with three levels of determinants important for such investment decisions: the parental education level, the household resource level and the community resource level (Strauss and Thomas, 1995, pp. 1917-1918).

[1] In an endogenous growth model, growth becomes dependent on internal factors like human capital, which implies that these models, education is one of the driving factors behind growth. This is opposed to the exogenous growth models where the growth rate is assumed to be determined by the technological development.

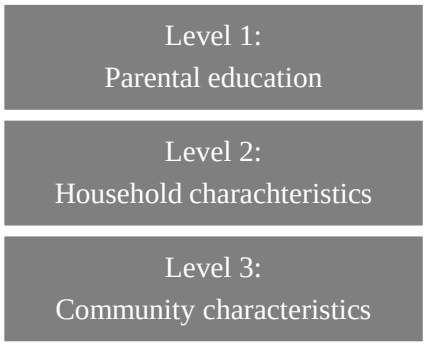

Figure 1 Determinants of educational investments (Source: Strauss and Thomas, 1995, pp. 1920-1941)

Due to this, these determinants are both directly and indirectly the fundaments of continuous growth according to endogenous growth models. Growth is created when many individual households choose to investment in human capital, but the fundamentals setting conditions for these are created both through household and community resources, as well as the educational level of the parents. Thus, it is a complex issue and the three dimensions are interlinked and correlated on many levels.

Many kinds of social policies have been developed in order to promote increments in human capital investments by poor households in developing countries. One sort of programme that has gained popularity during the past decades is conditional cash transfer programmes (CCT's). CCT's are partly World Bank financed social policy programmes that are implemented by local governments (The World Bank Group, n.d.). The programmes are poverty-reducing tools designed to work as a social security net by providing cash payments to poor households, conditioned to certain performance measures. Mexico has one of the most successful CCT programmes called Oportunidades. Because of its success, policymakers worldwide have shown interest in using it as a model for the implementation of CCT programme elsewhere.

In order to do so, there is a need to study potential complementarities to the programme. Prior research on CCT's appears to be thorough on the first two levels, hence, this paper will examine the impact of the third level determinant community characteristics. In practise, this would mean to investigate whether there are any differences in the successfulness of the programme on a regional level. However, previous research on regional differences in outcomes of Oportunidades has, to our knowledge, so far only been conducted by using the

Competitiveness index[2] as an explanatory variable (Dominguez Viera, 2011), rendering non-significant results. Therefore there is a need for further research in order to identify factors that explain these differences.

The focus of this paper is thus to expand the knowledge about the effect of community characteristics, in order to facilitate transplantation of the programme to other places. This would be of importance for policymakers when deciding whether a CCT programme would benefit from additional targeting interventions in combination with the CCT implementation. Also this might help in decisions about potential modifications to the benefit structure when transplanting the programme into a new intervention area.

In this paper, the regional effects in the outcomes of Oportunidades will be investigated by using school quality and income inequality as explanatory variables. These variables have been chosen since they have been found to have important impact on the human capital investment decision (Behrman, Parker & Todd, 2005; Ledbedinsky, 2009). Also, these variables can be proxied by rather simple measures, namely the pupil/teacher ratio and the Gini index, which are both indices that are transparent in terms of what they measure and easy to interpret. Additionally, the measures allow for comparability over different contexts, which is a benefit when looking to transplant the programme over different countries.

1.1 Purpose and contribution

The aim of this paper is to investigate if community characteristics are important for the success of a CCT programme. This research could provide information on how to modify a CCT programme according to the local context.

The CCT programme Oportunidades will be used to investigate if the differences in regional effectiveness of the programme, by federal state, could be explained by measures for community characteristics. The indices chosen are pupil/teacher ratio and the Gini index since they capture a measure of the community characteristics school quality and inequality. These will then be regressed onto the school attendance rates to find out if they have any explanatory power. Furthermore, policymakers would benefit from knowing what specific

[2] The Competitiveness index rank and analyse the ability of nations to create and maintain an environment in which enterprises can compete. The index comprises of 20 sub factors based on more than 300 different criteria that are weighted together (Research Methodology, n.d.).

characteristics are important to consider, and if the implementation of a CCT programme would require additional interventions to make the programme efficiency higher. The results may also give an indication on whether there are room for different benefit structures in different regional settings.

1.2 Research question and delimitation

By the set aim of this thesis, the following research questions will be investigated:

> *What implication do effects of community characteristics have for policymakers when considering transplanting a conditional cash transfer programme?*

The relationship being investigated is if and how community characteristics, in this paper income inequality and school quality, have an impact on the regional outcomes of the Oportunidades programme. The effect of community characteristics will also be investigated on what impact they have for the programme. In this thesis it will also be investigated whether there is a difference in the effects of the community characteristics between different groups such as age and gender.

The investigation will be limited to the Mexican CCT programme Oportunidades. The two main reasons for this limitation are, first, that it is difficult to obtain equivalent cross-country data and if comparing those, the risk of measurement errors increases. Secondly, by focusing on a programme operating in the same country it is possible to eliminate effects dependent on institutional differences across countries, such as culture and political systems, which may be difficult to identify and quantify. By looking at a programme operating in one country, a set of relatively homogenous regions (in terms of unobservable factors) are obtained, compared to when investigating differences across countries.

Investment in human capital is usually defined by, but not limited to, investments in health care and education. This thesis will, however, focus on education only due to two reasons. Firstly, due to the limited scope of time and space, there is only a possibility to address one of the dimensions since the CCT programme interventions are designed differently for each of the dimensions. Secondly, some of the measures for determining investments in health care are difficult to define and quantify. A commonly used measure of health is mortality but this

is only a gross measure providing little, if any, information about the state of health. Morbidity has gained more support as a measure of health, but it seems to include various biases. Research shows that a correlation between socio-economic status and the probability of reporting illnesses could be the source of the biases, implying that less educated people report morbidity with a lower probability (Strauss and Thomas, 1995, pp. 1918-1920). With these two factors in mind a choice was made to focus on CCT interventions for investments in education.

Furthermore, school attendance will be used as a predictor for investments in education when looking at the outcomes of Oportunidades. This measure is comparable to school enrolment, however, the weekly attendance measure provides more information about the actual success of the programme compared to only a yes or no answer to the question if a student is enrolled. However, enrolment and attendance are comparable since both are measures with the aim to gather evidence on whether the children are in school or not. Several economists have used enrolment as a proxy for human capital investments in education (Barro, 1991; Barro & Lee, 1993) but the method contains a drawback since a student's efficiency is not recognised in the enrolment measure. However, the advantage of enrolment is that it is easy to measure and it is also used as an indicator for measuring the Millennium Development Goal on education set by the United Nations (Millennium Development Goals Indicator, 2008). The choice of using attendance and not a more qualitative measure is because of the difficulty to access statistics and quantify for example educational quality and increased performance among students. Completed years of schooling can also not be used because participating students are still eligible for enrolment and therefore results of total completed years of schooling are not yet observable.

2 Background

2.1 Conditional cash transfer programmes

CCT's are anti-poverty programmes transferring money to poor households. It is a social policy adopted by local governments where the World Bank supplies financing for the implementation. CCT's are design as cash transfers conditioned to a certain performance measure, often related to school enrolment, regular school attendance and health check-ups.

By attaching conditionality, the CCT's seem to be able to fulfil their aims more successfully than their unconditional peers. Participating household are selected and carefully targeted for the CCT to reach the most marginalised households (Fiszbein & Schady, 2009).

2.2 Mechanism of conditional cash transfers

When applying an endogenous growth model it is possible to identify the importance of investments in education since lack of investments inhibit sustainable growth. Investments in education can be seen as an investment decision under a budget constraint (this theory will be developed further under *3.3* Empirical Framework*)* which means that the household faces a trade-off between costs and benefits of school attendance. Each household will only invest in their children's education as long as the marginal benefit of an extra hour of school attendance is higher than the marginal cost of it. It is important to note that the discount rates differ for the costs and the benefits since costs occur today but benefits are received tomorrow[3]. Human capital investments are for several reasons suboptimal in many poor households living in developing countries. This matter will be further discussed in *3.3.3.1* and *3.3.3.2.*

CCT programmes have gained popularity during the last few decades since they manage to directly address the problem of underinvestment in human capital. A CCT programme could be an efficient tool if one or both of the following conditions are true:

1. Private investments undertaken by households in their children's education, although rational from the households' point of view, are lower than the social optimum[4].
2. The households' investments decisions are limited by market failures, which lead to underinvestment due to sub-optimisation of the individual household investment decision.

If neither of these conditions are true, an alternative social policy or an unconditional cash transfer (UCT) could be a more efficient solution for addressing the problem since these do

[3] Temporal discounting is the human tendency to give greater value to rewards received in the near future relative a more distant future. This means that rewards received at different time horizons will be discounted with different discount rates.

[4] The household will make an underinvestment from a social point of view whenever the expected value of the private optimal investment is lower than the social optimum. Positive externalities are the source for this by making social expected return higher than the private expected return, which is thereby the cause of the underinvestment (Heckman & Klenow, 1997).

not require as much monitoring and thereby have lower implementation costs (Fiszbein & Schady, 2009).

The mechanism behind rational reasons for underinvestment is that the household is utility maximising by taking into account the costs and benefits of education, creating an optimal decision. However, there are positive externalities of education creating spill over effects in the society, possibly making the private optimal decision lower than the one for the society as a whole. This creates incentives for political intervention to redistribute resources since the household preferences of investment are not in line with the socially desirable ones. In particular, externalities generated from educational investment are increasing returns to skilled labour in production, which potentially increase expected returns of education (Fiszbein & Schady, 2009). Evidence has been found that education can have spill over effects both in a village and in a city (Fiszbein & Schady, 2009). CCT programmes address this issue by giving the parents money conditional on the school attendance of the children. This means that the maximisation problem will change since the parents now have more to gain from sending their children to school. If an UCT had been used, the parents would not have had any incentive to do this since the transfer would not have affected the benefits of education.

The second reason of underinvestment is due to market failures. This could thus be seen as "true" underinvestment since this occurs when individual households do not maximise their utility. A common failure is imperfect information causing parents to have the wrong beliefs of expected return to education. This is especially true among children of fathers with low educational level (Attanasio & Kaufmann 2008). Research on Oportunidades show that household expected returns to schooling are significantly lower than the actual returns, using Mincerian returns[5], conducted on educational research.

Becker stated the assumption that a household could borrow against their children's future income, making the human capital investment decision like any other investment decision (Ferreira & Walton, 2006). However, this is not realistic, since future returns to education cannot be used as a pledge for mortgages, which adds a liquidity constraint to the investment

[5] Mincerian returns, is founded on a study by Jacob Mincer, where the educational effect on wages is calculated. His research has become standard in the field, underlining the importance of human capital for the labour market (Nationalencyklopedin - Jacob Mincer, n.d.).

problem. This is because credit markets inherently are imperfect due to the fact that the payoff of an investment always includes some uncertainty which means that lenders do not only require interest payments but also often a pledge for the claim. Because education, unlike many other investment goods, cannot be used as a pledge for loans, this imperfection causes underinvestment.

Furthermore, it is riskier for a lender to give a loan to a poor household since they do not own many assets that could be used as collateral, which means that lenders are less likely to approve a loan for these households. For the same reason, interest rates are going to be higher for poor households. Thus, this imperfection does not only increase costs of borrowing for poor households relative to less poor ones, but more importantly applies a liquidity constraint limiting many households from making optimal investments by not being able to access credit markets.

CCT programmes address this by adding cash to the household income, which reduces the liquidity constraint. However, if the liquidity constraint had been the only market failure, an UCT would have served the same purpose since in this case, the underinvestment is involuntary. But since other market failures exist, such as imperfect information, CCT programmes offer more benefits. Imperfect information often leads to parents having wrong beliefs about expected returns to education, and when they then receive money for sending their children to school, they might comply just to receive the benefit. Also, there could be a signalling function of the CCT, that if the government is willing to pay for children obtaining education, parents will revise their view about the expected return to education.

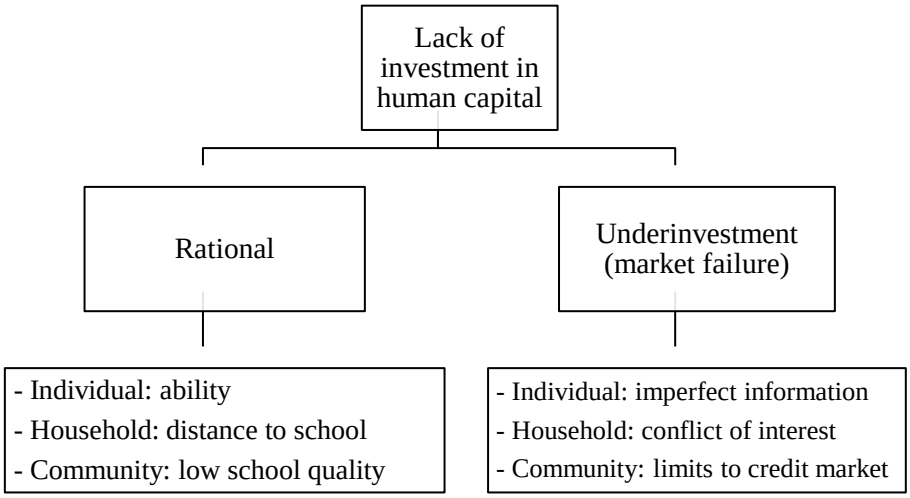

Figure 2 Reasons for not investing in education

The three levels of determinants of education can be found as underlying factors for each of the two reasons for non-investment. For market failures, the first level could for example be that the household decision maker has the wrong beliefs about the nature of the investment, most commonly too low estimation of the expected return, due to imperfect information. On the second level, there could be conflicting interests about the investment within the household. Conflict could either be between the parents (the ones who pay today) and the children (the ones who are benefitting tomorrow), or between the two parents. On the third level, an example could be the restrictions of the credit market as mentioned above (Ferreira & Walton, 2006, pp.94-95).

Rational reasons for lack of investment in education could, on the individual level, be cognitive ability. If the ability of the child is low, the benefits of going to school will be relatively lower. On the household level, a rational reason could be the distance to school. The farther the distance, the more unproductive travel time is required which will increase costs for attending school (Filmer, 2004). On the community level, low school quality could be one factor affecting the household decision. If school quality is poor, the benefits of going to school will be lower, which might lead to non-investment (Kabubo-Mariara & Mwabu, 2007).

2.3 Oportunidades

The Mexican CCT programme Oportunidades started in 1997 under the name Progresa to support rural households as one of the first implemented CCT programmes. During 2002 the programme expanded to include urban households as well, and changed names from Progresa to Oportunidades. Oportunidades serves as one of the main mechanisms of fundamental social policies in Mexico by providing inter-sectorial actions in order to stimulate well being among families living in poverty. The programme combines monthly or bimonthly cash transfer deliveries with conditions to performances related to health, nutrition and education with the aim to encourage regular school attendance and habitual doctor visits on the medium term (Irala Burgos, 2008).

Currently, approximately 25 % of Mexican households (5 million) receive cash transfers from the programme. The monthly payments are in the range between $10.5 and $66. The

programme targets households by using geographical targeting and proxy means test[6] and the transfer is normally given to the female head of family. Since there is a lower probability of girls attending school, the households receive relatively higher cash transfers for them attending school than boys (Fiszbein & Schady, 2009).

The national programme operates in about 100,000 locations of marginalisation and covers rural, urban and big cities providing a variety of support from scholarships for schooling, nutrition support to health support.

Since Oportunidades started there has been a clear evaluation objective and the government has specified that the programme should be thoroughly evaluated throughout the process of implementation. Huge amounts of data have therefore been collected officially, evaluating the effects and the recipients of the programme. This data is public and available on the programme website. The extensive follow-ups have enabled and laid ground for substantial research on Oportunidades, making it a well evaluated programme.

2.4 Oportunidades – a literature review

As mentioned, Oportunidades is one of the most evaluated and researched social benefits programmes globally. Prior research has been focused on perspectives such as change in the household investment decisions (Gertler, Martinez & Rubio-Codina, 2006), school participation (Behrman et al. 2010; Parker, Todd & Wolpin, 2006; Attanasio, Meghir & Santiago, 2012), migration (Azuara, 2009) and consumption (Angelucci & De Giorgi, 2009; Angelucci & Attanasio, 2009).

Rawlings and Rubio (2005) summarised the results regarding CCT programmes across Latin America, including Oportunidades. Their evaluation primarily focused on measuring changes in human capital on a short and medium term, in terms of education, school enrolment and attendance. The writers conclude that for education, the programmes have shown a positive effect on enrolment rates for both boys and girls. Estimates of Oportunidades' impact, controlling for household and community characteristics, range between 0.74 and 1.07 percentage points for boys and 0.96 to 1.45 percentage points for girls. However, they

[6] A targeting method based on the premise that a household's welfare can be relatively accurately estimated by only a few and measurable indicators. I.e. that household consumption/income level can be assessed by these characteristics (Holzmann, Robalino and Takayama, 2009).

conclude that many questions remain unanswered about the impact of the CCT programmes, including the efficiency of the programmes under different country contexts.

Attanasio, Meghir and Szelekly (2004) raised the importance of looking at regional effects when studying the potential of extrapolating results from Oportunidades in some states to other places. Their study did not focus on regional effects but they concluded that considering differences in regional contexts when implementing governmental interventions was important.

Dominguez Viera (2011) continued to investigate the impact of regional factors on the programme outcome. He argued that a more competitive environment would guarantee better infrastructure such as high quality schools, health clinics, skilled human capital, a well-developed and structured labour market and an efficient government, which would provide outstanding conditions for the programme to work efficiently. He therefore used the Competitiveness index as a variable to explain the regional differences. Even though the author found positive results of the Competitiveness index on school enrolment, they were not significant. This could be due to the Competitiveness index being a rather complex indicator composed of an average of weighed sub-indices, such as efficiency of market factors and trustworthiness of law enforcement (Research Methodology, n.d.). Within this index there might be opposing factors, which could be the reason for the ambiguous results. This paper therefore attempts to use simpler and more transparent indices to study the regional differences.

From the previous research, it can be concluded that Oportunidades does have positive effects on enrolment and other factors such as for example consumption. Some researchers however point to the fact that there is missing research on the regional differences found in the outcomes of the programme. They highlight that it is important to investigate the impact of regional differences to be able to use Oportunidades as a model to transplant to other places and the research conducted so far, have not yet found a significant explanatory variable.

This paper will contribute to the existing research conducted on Oportunidades by investigating the third level determinant, community characteristics. By exploring if community characteristics, defined by school quality and inequality, have an impact on the outcome of Oportunidades, additional knowledge will be gained about the mechanisms of the

programme. By understanding these mechanisms, transplantation would be facilitated. Current research shows that the programme has managed to achieve positive results for enrolment in particular. Therefore, it would be interesting to identify if and what contextual factors have contributed to the success. When wanting to transplant the structure, contextual factors are important for providing information on what additional factors need to be considered if implementing the programme in a new place. In this paper the impact of inequality level and the school quality on the programme's outcomes will be investigated.

3 Theoretical and Empirical Framework

3.1 Theoretical Framework

In order to assess what the regional effects might be stemming from, there is a need to understand the framework of analysis for the investment decision functions of the households.

The majority of research on household human capital investment decisions, such as investments in education, rest on the assumption that the household maximises a unique utility function under a set of constraints dictated by the household's available budget and technology. Treating the household as one decision-making unit, a "black box", is quite simplifying, since microeconomic theory of demand is established on the behaviour of individuals. Aggregating several individuals into households involves making some rather strict assumptions. Either an assumption has to be made that all members of the household have identical or common preferences or that there is one household member who determines all allocation and consumption decisions. Nevertheless, making these assumptions allows for considering the household as a fundamental decision making unit (Strauss & Thomas, 1995, pp. 1993-1995) and it is possible to elaborate on its investment decisions.

3.2 The household investment decision

Education could partly be seen as an investment good implying that the full benefits of acquiring it do not occur at the same time as the acquirement (Gertler and Glewwe, 1990). Households will only be willing to invest in their children's education if the marginal benefits of education exceed the marginal costs. The investment decision could therefore be stated as follows (Becker, 1962):

$$\sum_{t=0}^{n-1} \frac{B_t}{(1+r)^t} = \sum_{t=0}^{n-1} \frac{K_t}{(1+r)^t}$$

where

B = the benefits of an extra year of schooling

K = the costs of an extra year of schooling, including opportunity costs

r = the discount rate

t = the time period

n = the number of time periods

The implications are that a change in either costs or benefits (or discount rates) for the schooling will have an impact on the household investment decision.

Next, to understand the maximisation problem the households face, it is necessary to state the household utility functions. Since schooling today decreases consumption today, the household utility is a trade-off between consumption and schooling (consumption tomorrow). Following the model of demand for schooling developed by Gertler and Glewwe (1990) the household utility functions could be stated as follows:

Utility for a household with enrolled child:

$$U_1 = U(S_1, C_1) + \varepsilon_1$$

where S_1 is the increment to human capital by one year of extra education i.e. the return to education on future consumption, C_1 is the consumption possible after the costs of schooling are taken into account and ε_1 is a random taste shifter.

Utility for a household without enrolled child:

$$U_0 = U(C_0) + \varepsilon_0$$

where C_0 is the consumption possible when the child is not enrolled and ε_0 is a random taste shifter.

The household budget constraint could thereby be stated as follows:

$$C_1 + K = C_0 = Y$$

where *K* is the cost of schooling.

The maximisation problem each individual household face under the budget constraint Y is:

$$U^* = \max(U_0, U_1).$$

This implies that a household will continue to send their children to school if $U_1 - U_0 > 0$. Thus, the probability of enrolment equals the probability that the utility is higher when the child/children are enrolled than when they are not:

$$P(z = 1) = P(U_1 - U_0 > 0)$$

where z equals 1 if the child is enrolled and 0 otherwise.

The above theory considers enrolment which is not identical to school attendance. However, as stated earlier, the mechanisms of school enrolment and school attendance are similar. Therefore the utility functions can also be assumed similar. For households without enrolled children, the utility function will remain identical for the two measures. For households with enrolled children, when using school attendance instead of enrolment, the utility will vary by the amount of hours of school attendance.

This suggests that there are three ways of increasing the probability of school enrolment:

1. Increasing return to education which in practice would mean measures such as raising the quality of education or increase wages for higher educated people.
2. Increasing consumption possible after costs incurred by education for example by giving benefits to households with children attending school.
3. Reducing costs for obtaining education. This could involve lowering direct cost of schooling such as tuition fees and textbooks but also through stricter child labour laws, which would restrict opportunity cost of schooling.

This model implies that whenever a household has a higher benefit of sending their child to school than keeping them at home or sending them to work for wages, they will do so.

If this model was working perfectly, households would be investing in education at their private optimum, which in a perfect world would not be conflicting with the social optimum. Then, CCT's would be superfluous. However, as all models, the reality looks quite different. As explained in *2.2 Mechanism of conditional cash transfers*, households might not invest at their private optimum due to imperfections in the market and the social optimum does generally not equal the sum of the private optimums of the individual households. CCT programmes are addressing these issues by adding incentives for households to increase investments in education.

3.3 Empirical Framework

There has been vast research in the area of education, especially in poor countries, since human capital accumulation or ideas are non-rivalrous goods, which according to endogenous growth models, is the key for explaining continuous growth.

Previous research on investments in human capital has found three levels of determinants for investments in education. The three levels are parental education level, household level and community level, which will all be presented more in detail below.

3.3.1 Level 1 - Effects of parental education

Strauss and Thomas (1995) have summarised research on the effect of parental education on child schooling. They found substantial amounts of research supporting that parental education have a positive effect on child schooling. Education reflects, in part, household resources and so it is important to also control for income, assets, location and environmental conditions, such as water and sanitation quality. More education may also relate to the quantity and quality of public services available to the household. Strauss and Thomas found prior research where the impact of parental education on child schooling outcomes to fall once community infrastructure or community dummy variables are controlled for. However, there is strong evidence that child schooling outcomes, particularly years of school attainment and current school enrolment, are positively correlated with education of the parents and significant effects of parental education have been shown in several studies (Strauss &

Thomas, 1995, pp.1920-1930). This implies that parental education is robust to the inclusion of household and community resources.

3.3.2 Level 2 - Effects of household resources

The most significant variable of household resources is the household income. Nevertheless, since income could be hard to measure, researchers often use other variables portraying the household resources, such as food consumption, land owned, TV and access to facilities such as proper kitchen and drainage. These determine the living standard for the household and influence the household investment decision by affecting the benefits and opportunity cost of education.

Household resources could be influenced by community infrastructure; a household's access to good quality water and sanitation is likely to depend on the overall access to these resources by the community, but also by household taste. When defining community characteristics, it is therefore important to find a measure that is not strongly dependent on the individual household's taste since these factors are much harder to target by policies.

Neither parental education nor household resources are the main focus to investigate in this paper. However, since both levels have significant impact on schooling outcomes, it is important to be aware of these dimensions and their influence to be able to control for them and isolate the community resource effect.

3.3.3 Level 3 - Effects of community resources

Community resources as a determinant for educational investments could be defined by infrastructure (such as water, sanitation quality), price and quality measures of education (Strauss and Thomas, 1995, pp. 1933-1935) and household availability to credit market and reasonable interest rates.

A relevant distinction of infrastructure is what is available to the community and what is available to the households. Good quality of water, sanitation, local health facilities are likely to depend on household resources, including education, and will often be related to unobservable characteristics, such as tastes. Their use may therefore be endogenous in human

capital investment decisions and hence, these factors are not optimal too look at considering it is the isolated effect from community characteristics that is in focus.

Concerning prices, fees for educational facilities, schools and other infrastructure are often small or non-existing and could therefore be measured with the opportunity cost of time. This would imply measuring the travel time to the nearest facility alternatively the number of facilities for education or staff (Strauss and Thomas, 1995, pp.1933-1935). However, it is difficult to obtain accurate data on travel time and hence, this indicator will not be used.

By applying the cost/benefit model it is possible to detect which factors are increasing the benefits of education and which factors are increasing the consumption after taking into account cost incurred for education. Community characteristics increasing benefits of education could be defined by school quality or wages for skilled workers since both these factors would increase the expected return to education. Many other researchers have investigated the impact of education quality and there is a known effect of quality on increased school investment (Handa, 1999). However, since school quality has not been investigated on CCT's as an explanatory variable for regional variation, it can be considered to be interesting to find if it has the same impact on regional outcome differences from Oportunidades.

To be able to increase the possible consumption, the liquidity constraint of the investment function needs to be addressed. On a perfect market all households would be able to borrow against the future payoff of the educational investment, however, since markets are not perfect the liquidity constraint will be an important consideration to increase the household's possible consumption.

Research has shown that more unequal distribution of assets implies that, for any given per capita income, a greater number of people have a suboptimal liquidity constraint. Poor people are suggested to have limited access to credit market, which affects their liquidity constraint and limits their ability to invest in education (Deininger and Squire, 1998). Karlan and Morduch (2010, pp. 4712-4714) present results from Loury's model where he focuses on inequality transmissions. In this model, the parents' inability to borrow for investing in their human capital of their children means that inequality will transfer into the next generation.

The implications are that inequality, by limiting households from accessing credit markets, is tightening the liquidity constraint.

3.3.3.1 *Rational reasons for not investing in education - school quality*

Educational research suggests that dimensions of school quality improvements that are relatively simple and taken for granted in high income countries, may have a substantial payoff in some other income settings.

The logic behind the importance of school quality when applying an investment function is that if the quality of schooling increases, expected return to education (the benefit) will rise. Applying this in a household investment function, a decision to not invest in education due to low school quality could be perfectly rational since the expected return to education from a low quality school is lower. Therefore, children in areas with poor school quality should have relatively less school attendance than children in areas with schools of high quality, holding all other factors constant.

Pupil/Teacher ratio

According to the current state of research on investments in human capital, density measures can pick up a crude measure of school quality. One of the most widely used ratios for measuring school quality is the pupil/teacher ratio. This density measure provides a rough proxy for the quality of schooling. Persistent differences in pupil/teacher ratio have been shown to have significant impact on return to schooling and have also increased the completed years of education. Another important finding is that high pupil/teacher ratio affects students with lower cognitive ability more than students with high cognitive ability (Dearden, Ferri & Meghir, 2002). Since many of the children eligible for Oportunidades are of low cognitive ability, school quality should be of higher importance for these children. Importance also seems to be higher for girls (Case & Yogo, 1999).

Behrman, Parker and Todd (2005) performed a study on Oportunidades by investigating long-term effects on rural households and the relation between participating in the programme and school attendance. They included a quality dimension of schools using the pupil/teacher ratio and argued that different school quality levels will affect schooling decisions. Their results showed a significant positive impact of low pupil/teacher ratio on school grade attainment.

Another study from South Africa has shown that school quality measured by pupil/teacher ratio had a large and significant impact on return to schooling (Kabubo-Mariara & Mwabu 2007). This provides more indications about the importance of school quality and provides legitimacy for using the pupil/teacher ratio for measuring school quality.

3.3.3.2 *Market failures for not investing in education - Inequality*

In an investment model of schooling, income should have no effect on schooling if the interest rate faced by the household is independent of income (Becker and Tomes 1979), this being the case on a perfect market. However, measures of current income are often found to have positive effects on educational outcomes including current enrolment and years of completed schooling. Becker and Tomes (1979) apply a schooling model where parents invest in their children's education by comparing the expected marginal value of education with the resource cost of it. Measures of current income nevertheless are found to have positive effects on educational outcomes, like current enrolment and years of completed schooling, showing that income actually do matter for the schooling investment decision. This suggests that either household income affects access to credit market (or interest rates) or that schooling would have consumption returns. Strauss and Thomas conclude several studies where higher total household income is found to raise enrolment rates and years of completed schooling in both Malaysia and Brazil (Strauss & Thomas, 1995, p. 1932). This provides arguments for that markets are not perfect and that all households do not have the same access to credit market and thus, face a liquidity constraint dependent on their available income. From the argumentation above, inequality is found to be an indicator for unequal access to possibility of taking loans.

Research shows that inequality seems to serve as a factor decreasing the proportion of children enrolling in school. Empirical cross-country work has indicated that income inequality is negatively correlated with growth and there is strong evidence that it is also negatively correlated with secondary and tertiary enrolment (Ledbedinsky, 2009). However, for regional differences in inequality, a negative impact on primary school enrolment has also been found. It has also been shown that inequality decreases efficiency of health and education policies on a regional level (Lavado & Cabanda, 2009).

Theoretically, these findings are said to mostly depend on two inequality effects on a population. The first effect inequality has is decreasing the proportion of the population having access to credit markets. Since the return to investment for education only is obtained in the future, a household that does not have access to credit markets have to find some way of covering for the necessary consumption today. The second effect is that inequality normally means that the government takes less income redistribution measures, like subsidies of education. These theories have also been supported by empirics, for example by Goodman, who did a study in Massachusetts, showing that even when controlling for student ability, there is still an enrolment gap between poor and non-poor students, suggesting that credit constraint truly is a problem (Goodman, 2008).

The Gini Index

One of the most frequently used measures for income inequality is the Gini index (Charles Coll, 2011). The index measures income inequality where 0 corresponds to perfect equality, and where 1 corresponds to perfect inequality. One of the strengths of the Gini index is that it satisfies all the four principles that any inequality measure should fulfil.[7] In this paper the Gini index will be applied as an indicator of income inequality considering the wide acceptance the Gini index has as a measure for inequality.

Concluding the findings presented above, this thesis will use the pupil/teacher ratio as an indicator of school quality, aiming to measure a dimension of community characteristic influence on benefits in the investment decision, and the Gini index as a proxy of inequality, as a dimension of how community characteristics are affecting the liquidity constraint in the investment decision.

3.4 Hypothesis

We have formulated a working hypothesis founded on the previous research on Oportunidades and educational research together with the theoretical framework. The working hypothesis for this thesis is:

[7] The four principles are: *The transfer principle,* a transfer from a poor to a richer individual should result in an increase in the inequality measure, disregarding the size of the transfer, *The scale independence,* if the general income level increases by a fixed amount, the overall value of the inequality measure should stay unaffected, *The anonymity principle,* the identity of the income recipients does not matter for calculating the value, *The population independence,* the measure should not be affected by the size of the population (Charles Coll, 2011).

Inequality and school quality are important factors to consider when transplanting a CCT programme.

In practise this implies that regional differences in the treatment effects will be investigated on whether they could be explained by important community characteristics identified by previous research in the educational field; school quality, measured by the pupil/teacher ratio and the extent of liquidity constraint, using a proxy of income inequality.

To investigate if the variables have any explanatory power, pupil/teacher ratio and the Gini coefficients will be regressed on school attendance rates of households living in areas where Oportunidades is implemented.

4 Method

4.1 The dataset from Oportunidades

The dataset used is obtained from the official online Oportunidades evaluation platform (Cuevas Durán, 2008). It consists of both socio-economic data and programme evaluation data separated into two data sets, one for participants in urban areas and one for participants in rural areas. Only the urban area dataset, ENCELURB, which is available for years between 2002 and 2004 will be studied in this paper. There are several reasons for this. First of all, the evaluation questionnaires for the urban and rural programmes differ and the questions are posed rather differently. This could lead to biases in the answers because even though the questions have the same aim, posed differently they could generate different answers that might not be comparable. The urban dataset contains more quantitative or easily quantifiable data, making it more suitable for the purposes of this paper. Furthermore, there may be some differences between living in urban and rural areas that are hard to identify and control for, which is why not both the urban and rural participants will be considered.

However, the most important reason for choosing the urban dataset is that the targeting processes were different for the programmes making the urban targeting method more suitable for making comparisons. The eligible households in rural areas were directly targeted and informed about their eligibility for the programme, whereas the urban programmes had a

different approach. In the urban programme the poorest blocks of the areas were first selected and made intervention areas. Then, offices were put up where households considering themselves eligible could register.

The urban targeting method implies that many households that were eligible did not sign up for the programme whereas in the rural areas, most eligible households did sign up because of the direct targeting. This is important since it implies that the comparability between the households participating in the programme (the treatment group) and households not participating in the programme (the control group) should be higher in the urban survey than in its rural counterpart. It is however important to note that the targeting method does not ensure complete randomisation and that there might be a self-selection bias from the fact that some unobserved household characteristics might correlate with whether the households had the opportunity to, and made the decision to register at the registration offices. In this paper the assumption will be made that, even though it might not be entirely fulfilled in reality, the two groups are comparable due to their similar socio-demographic characteristics, this can be observed in Table 2 Summary statistics by groups.

4.2 Data on pupil/teacher ratio and the Gini index

The data on pupil/teacher ratio and Gini coefficients are obtained from official reports on education and income inequality and are separated by federal state. This means that every figure for the two indices is an average of the interstate variation and is therefore might not be completely representative for the intervention areas. This could cause potential biases on the results, however this issue will be addressed further in *6* Discussion.

Table 1 Average yearly change in pupil/teacher ratio and Gini index

	P/T –ratio primary school	**P/T-ratio secondary school**	**Gini-index**	
Federal State	Avg yearly change	Avg yearly change	Avg yearly change	10-year change
Campeche	0.1548	0.0238	0.0069	0.0835
Colima	0.3339	0.4043	0.0062	0.0484
Chiapas	0.0152	-0.0827	0.0181	0.0300
Guanajuato	0.0655	0.2006	0.0217	0.0651
Guerrero	0.4156	0.2042	0.0149	0.0513
Hidalgo	0.5258	0.2470	0.0111	0.0400
México	0.4214	-0.0802	0.0171	0.0783
Michoacán	0.4820	0.0837	0.0170	0.0557
Morelos	0.1371	-0.0127	0.0089	0.0580
Puebla	0.2995	-0.0966	0.0157	0.0653
Total	**0.2851**	**0.0891**	**0.0138**	**0.0575**

Sources: Gini Index - Instituto de Planeación del Estado de Guanajuato, 2009; Teacher/pupil ratio – Robles Vásquez & Felipe, 2006

The federal states in table 2 correspond to the federal states in the urban dataset from Oportunidades.

4.3 Method

The appropriate age group to study is concluded to be individuals of schooling age, 6 to 20 years old at the time of the data collection. After excluding observations outside this age group, a total of 14,000 individuals remain. Most individuals were observed during all three years (2002-2004), which implies that the initial dataset consists of approximately 40,000 individual observations.

After carefully examining the data, some problems were noticed with the data on school attendance regarding for 2004. The average weekly attendance suddenly drops to 3.9 in the control group from being 20.5 the previous year. The treatment group does not show the same effect. After several modifications, the issue cannot be fixed and therefore year 2004 is dropped from the dataset.

In order for the method to be valid, an assumption is needed to assure that the treatment and control groups are comparable. This is done by comparing summary statistics on socio-demographic factors The summary statistics looks encouraging; gender distribution is almost 50-50 and parental education of the two groups is almost identical. Also, the household living standard indicators such as ownership of TV and motorcycle seem to match well. The only mismatch seems to be age, where individuals in the treatment group seem to be somewhat older than the ones in the control group. However, the difference of the mean is only 0.36 years, which is approximately 4 months. This should imply that the control and treatment groups are comparable for evaluation of the programme effects.

Table 2 Summary statistics by groups

	Treatment	**Control**	**Difference**	
	Mean	*Mean*	*Treatment-Control*	
Age	12.19	11.83	0.36	
	(4.19)	(4.05)		
Gender	0.5	0.49	0.01	
	(0.5)	(0.5)		
Indigenous	0.07	0.055	0.015	(1is yes and 0 is no)
	(0.25)	(0.206)		
Parental educ (years)	3.61	3.62	-0.01	
	(1.91)	(1.83)		
Parental educ (grade attained)	2.48	2.42	0.06	
	(1.24)	(0.96)		
School attendance 2001	25.43	25.81	-0.38	(Hours/week)
	(5.65)	(5.04)		
TV	1.15	1.12	0.03	(1 is yes and 2 is no)
	(0.36)	(0.33)		
Motorcycle	1.99	1.98	0.01	(1 is yes and 2 is no)
	(0.99)	(0.13)		

This paper will conduct the test for community characteristics on regional differences in two steps. First by examining if there actually are differences in the outcome of Oportunidades

between different federal states, and secondly, by regressing the community characteristics on programme outcome.

4.3.1 Regressing community characteristics on programme outcome

Since prior research has not given much attention to the regional effects on the outcomes of Oportunidades, a first step was to confirm that these truly exist. Although not all of the regional effects were significant, most of them showed strong significance, and when tested for their joint significance, the results were significant at all relevant significance levels. This means that it indeed is reasonable to believe that there are regional differences in the successfulness of the programme and that it is interesting to investigating these. For further details about this estimation, refer to Appendix I.

With the regional effects confirmed, it is now possible to proceed to the main focus of this paper, which is to investigate whether the Gini coefficient and the pupil/teacher ratio have any explanatory power for school attendance. The models look as follows:

$$school\ attendance_{i,t} = \beta_1 treatment_i + \beta_2 GINI_t + \beta_3 GINI_t * treatment_i + a_i + u_{it} \quad (1)$$

$$school\ attendance_{i,t} = \beta_1 treatment_i + \beta_2\ ptratio_t + \beta_3\ ptratio_t * treatment_i + a_i + u_{it} \quad (2)$$

Where
i = is the individual i
t = time period t
a_i = individual unobserved effect
u_{it} = the error term

Treatment is a dummy variable that has the value 1 if the household is in the treatment group and 0 otherwise while *ptratio* and *GINI* are the respective values of the indices. The most interesting term for this thesis is the third term, which is the interaction term between the indices and the treatment dummy. This term shows the partial effect on school attendance of the treatment group dependent on the Gini and pupil/teacher ratio respectively.

From this model, it can be observed that individual unobserved effects a_i, are assumed to be constant. This is not an unreasonable assumption since many of these factors such as gender,

parental education and cognitive ability do not vary over time. Since we are using two-period panel data, implying that each individual is observed twice, there is a possibility to get rid of the effects in the programme due to a_i by using fixed effects estimation. The intuition behind this is that the fixed effect eliminates all effects dependant on the individual in order to isolate the effect of the variables of interest. This is done by time-demeaning the data, which in practise looks like this:

$$(y_{it} - \bar{y}_i) = \beta'(x_{i,t} - \bar{x}_i) + (a_i - a_i) + (u_{i,t} - \bar{u}_i) \qquad t = 1,2,\ldots T$$

Where

$y_{it} = school\ attendance$

$x_{it} = explanatory\ variables$

$u_{it} = error\ term$

$\bar{y}_i = T^{-1} \sum_{t=0}^{T} y_{it}$

$\bar{x}_i = T^{-1} \sum_{t=0}^{T} x_{it}$

$\bar{u}_i = T^{-1} \sum_{t=0}^{T} u_{it}$

Explanatory variables refer to the variables in our model (1) and (2); treatment groups, Gini, pupil/teachers ratio and the interaction terms. As can be seen above, a_i will cancel out when time-demeaning the equation because of the assumption that they are equal for all years. The fixed effects equation, in its simplest form, therefore could be expressed as follows:

$$(y_{it} - \bar{y}_i) = \beta'(x_{i,t} - \bar{x}_i) + (u_{i,t} - \bar{u}_i) \qquad t = 1,2,\ldots T$$

In practice, this implies running a regression that controls for individual unobserved effects and unobserved time effects by setting the years as the time variable. This regression thus only takes into consideration the within-effects i.e. the variation over time of each individual.

The dataset consists of two-period unbalanced panel data. When using unbalanced panel data, an important question to consider is whether there is a correlation between the reason of missing data and the error term. Finding a correlation would imply that the estimates are biased since this means that the sample no longer could be considered random. Although there could be such a correlation, the average number of observations per individual is 1.7 (of

2) for every variable, implying that 85 % of the individuals have been observed twice. This is concluded to be satisfying.

When testing for homoscedasticity, it is strongly rejected. Therefore a regression controlling for heteroskedasticity was made in order to obtain the correct standard errors. Important to remember when performing a fixed effects regression is that it is only possible to regress variables that have yearly variation, which means it is not possible to control for dummies that do not vary such as gender, parental education and household factors. These should be controlled for by the individual fixed effects.

5 Results and analysis

Many of the results obtained are not statistically significant, however, they do give some interesting insights to how these indicators affect the school attendance outcomes.

5.1 Primary school children 6-12 years

Statistical significance is obtained for both primary school pupil/teacher ratio and the Gini coefficient.

The influence from pupil/teacher ratios on the school attendance is strongly negative and there is a slight but significant effect on the interaction term, suggesting that a high pupil/teacher ratio lowers the effect of the programme. This corresponds well to the theoretical and empirical framework suggesting that when school quality is high, expected return to education will rise and therefore more households will invest in education due to the higher expected benefits. The primary pupil/teacher ratio has negative effect of 3.16 hours per week, whereas the interaction term for the programme has a negative effect of 0.34 hours per week. Comparing the two effects, the interaction term seems relatively small. However, put in context, an impact of 0.34 hours per week for a pupil/teacher ratio of 1, gives quite a large effect when considering a more likely pupil/teacher ratio of 30. This would imply a lower school attendance by approximately 10 hours per week. When looking at these results, it could also be noted that the constant term for this group is rather large, 107.7, but with consideration to the strong negative effects of the pupil/teacher ratio and that it is normally around 25-30, this is a reasonable number.

Table 3 Regression results

	P/T Primary[h]			P/T Secondary[i]			GINI		
	Treatment	P/T prim	Interaction	Treatment	P/T Sec	Interaction	Treatment	GINI	Interaction
All	8.8348**	0.0524	-0.3362**	4.145	-1.1255	-0.245	-1.1335	-3.1995	2.563
	(3.6119)	(0.315)	(0.1444)	(4.1895)	(0.8311)	(0.2207)	(4.1437)	(7.3131)	(6.7628)
	Cons 17.9270	Prob > F = 0.0623		Cons 40.6788	Prob > F = 0.0446		Cons 21.1056	Prob > F = 0.6430	
Girls	6.1135	-0.2170	-0.2260	5.2853	-1.4842	-0.2501	-1.7323	-9.019	3.5678
	(4.2830)	(0.4420)	(0.1734)	(5.4171)	(1.1715)	(0.2867)	(5.5913)	(10.1491)	(9.0907)
	Cons 24.9900	Prob > F =0.2258		Cons 47.45	Prob > F = 0.0735		Cons 24.3981	Prob > F = 0.5205	
Boys	11.6264*	0.337	-0.4481*	4.8745	-0.7869	-0.2337	-0.5772	3.0644	1.6385
	(5.9497)	(0.4500)	(0.2350)	(6.4954)	(1.1843)	(0.3392)	(6.0921)	(10.5556)	(9.9701)
	Cons 10.4466	Prob > F = 0.2651		Cons 34.3056	Prob > F = 0.5424		Cons 17.55826	Prob > F = 0.9090	
Age group 6-12	9.5699***	-3.1623**	-0.3376***	7.1153*	-1.4156	-0.2729	-0.73296	-77.9443***	2.2861
	(3.4457)	(0.3095)	(0.1363)	(4.1046)	(0.8879)	(0.2137)	(3.7020)	(7.5773)	(6.1067)
	Cons 107.7181	Prob > F = 0.0000		Cons 49.4698	Prob > F = 0.0000		Cons 68.0902	Prob > F = 0.0000	
Age group 12-15	24.2414**	3.151***	-0.9277**	-1.4307	-2.2743	0.0916	-9.0752	26.5813	16.3443
	(11.0347)	(0.9333)	(0.4475)	(9.7232)	(2.2489)	(0.5087)	(12.3779)	(21.3351)	(19.7988)
	Cons -61.3050	Prob > F = 0.0042		Cons 66.2501	Prob > F = 0.7232		Cons 7.2435	Prob > F = 0.1822	

Significance level: * 10 %, ** 5 %, * 1%**

[h]Refers to the pupil/teacher ratio for primary schools.
[i] Refers to the pupil/teacher ratio for secondary schools.

Although the interaction effect of pupil/teacher ratio and the CCT programme is significant, it is only a tenth of the effect of the pupil/teacher ratio alone. Hence, for a policymaker transplanting a CCT programme, this would indicate that the overall importance of school quality interventions is high and that there are positive but relatively small synergies with the CCT programme. It indicates that school quality is important and that school quality improving policies would have positive effects independent of whether it is in combination with a CCT programme or a school in an area that is not in the programme.

The results on the Gini coefficient have a negative sign, which also correspond well to the hypothesis suggesting that high inequality has a negative impact on school attendance. The interaction term is positive, implying that the programme is more effective in unequal societies. This also supports the theory, which could sound counterintuitive at first, but if inequality is considered as a constraint on credit markets access, it becomes clear that if households in unequal societies underinvest because of the liquidity constraint they should be more willing to invest once they have the money to do so. The positive coefficient for the Gini interaction term is 2.29, which means the impact is not very large considering that the Gini coefficients between the regions vary within the interval of 0.488 to 0.664. This would imply that overall weekly effect in these regions would be between 1.1 and 1.5 hours of decreased school attendance. When comparing the state with highest inequality and the state with the lowest, a weekly effect of 0.4 hours per week, corresponding to 24 minutes, is found. This implies that in a state with the highest inequality, the children would have a weekly attendance 24 minutes more than the ones in the least equal state. Overall, a decrease in the Gini index by 0.014 (average yearly change of the Gini index, refer to *Table 1 Average yearly change in pupil/teacher ratio and Gini index*) would correspond to approximately 8 minutes of increased schooling per month. Neither of these results sound very important but taken that this is weekly attendance it is not completely negligible.

5.2 Secondary school children 12-15 years

The results from the older age group of children 12 to 15 years, no significant results were obtained and hence no conclusions can be drawn from it. However, we note that the Gini index gives different results compared to the age group 6 to 12 years. For this group, the coefficient on the interaction term is still positive, but this applies also for the Gini index alone. This is somewhat puzzling since it contradicts both the results on primary school

children and the theory. From having a positive effect on school attendance by 26.58 hours per week for the Gini coefficient in the younger group, a negative effect can now be observed by more than the double, -77.94 hours per week. However, this result is not statistically significant and therefore we choose to only address the sign of the coefficients.

One explanation of this finding could perhaps be attributed to the skill premium. Children in this age group are more likely to be working on the market obtaining wages. Therefore, wages for unskilled work might have more impact on the opportunity costs of education than for the younger age group.

Inequality arises due to many different reasons but an important factor among them is the skill premium. A high skill premium implies that the increase in wages for being more highly skilled is not of negligible importance. This means that unskilled people receive relatively lower wages. Skill is comprised of a bundle of aspects that could be both observable and unobservable and one of the factors determining (and signalling) skill is education. Therefore returns to education will be higher in an unequal society than in a less unequal one due to the effects of the market premium of skill (Juhn, Murphy & Pierce 1993).

The above observations on the Gini index suggest that there are two opposing powers affecting the household investment decision in terms of inequality that could be the liquidity constraint and the opportunity costs. However, conclusions cannot be drawn from the results of children in this age group, since the results are not statistically significant.

5.3 Gender differences

When running separate regressions for girls and boys, statistically non-significant results are obtained. However, there is a tendency towards secondary school pupil/teacher ratio and the Gini index being more important for explaining attendance for girls than for boys, especially in the former case. The secondary pupil/teacher ratio interaction effect for girls is -0.25 whereas it is -0.23 for boys, implying that for a pupil/teacher ratio of 30, the weekly decrease in school attendance would have been 7.5 and 6.9 hours respectively. These results are consistent with theory suggesting that factors such as school quality and inequality matter more for school attendance of girls than for boys. However, it should be remembered that

these results are not statistically significant, which implies that no conclusions can be drawn from them.

Overall, it seems like the pupil/teacher ratio have a negative impact on school attendance and on the efficiency of the programme whereas the Gini coefficient seem to have negative impact on school attendance but a rather positive impact on programme efficiency. It is important to note that the results are not very robust and conclusions should be drawn cautiously. Nevertheless, the significant results found for primary school children suggest that these kinds of factors potentially could be important.

6 Discussion

This paper conducted research on the Mexican CCT programme Oportunidades. Therefore, there are some limits to the generalizability of the results. To be able to transplant these results to other countries, a necessary assumption would have to be that institutional factors specific for Mexico do not have a strong correlation with the results found or alternatively, that the other countries have very similar institutional settings to Mexico.

Furthermore, since this research focused on urban areas there is a constraint to the generalizability of the results to rural areas. Considering that conditions for urban and rural households are quite different, benefits and costs in the household investment decision will vary as well. What might differ are the surrounding factors affecting the investment decisions, such as opportunity cost of alternative occupation or the expected return to education. Nevertheless, the argumentation in the empirical framework for why school quality and inequality are important is not limited to only urban areas and hence, these two factors are likely to be of importance in rural areas too. Therefore, even if the results obtained for pupil/teacher ratio and Gini index might not be transferrable to rural areas, the general tendencies of the effect of the two factors might still be applicable.

When evaluating this kind of programme many problems and sources for bias arise. Inevitably there will be omitted variables that cause bias to the estimators. Ideally, more regional characteristics should be included into the analysis to reduce this bias. One improvement would be to collect data for more years since this would make the results more

reliable. Also, this would increase the heterogeneity of the indices, the Gini index and the pupil/teacher ratio, that vary significantly over the course of ten years, but do not vary as much over the two years studied. With more observations, it is likely that a more robust result could have been obtained since the standard errors now are rather large. It would also be of interest to collect more detailed data on the Gini index and pupil/teacher ratio since these are comprised of an average of each federal state included in the dataset. This implies that these are not randomised and that they also might not be representative of the areas the households are found in. This, considering federal state level is a relatively comprehensive area, and that there could be areas of different characteristics within that area. Further research should address this collecting data on municipality level rather than federal state level.

Furthermore, there could be a possible causality issue regarding the Gini index. Even though there is plenty of research suggesting that a low Gini index, implying low inequality, increases school attendance, there is also a possibility that the causality is reversed and that education causes inequality to decrease. However, the fundamental investment model is seems to be restricted by a liquidity constraint, a constraint that is relieved with a more liquidity. Hence, since inequality is suggested to have a substantial impact on poor households access to credit markets, the causality from inequality to education can be assumed to exist, even though the reversed causality cannot be ruled out.

Regarding the Gini index, an area within a state with very high income could cause a biased measure of inequality considering no GDP measure is controlled for. If the income gap is driven by very high incomes and not by most households being very poor, the assumption that high inequality leads to decreased access of credit markets does not hold. Nonetheless, previous research has suggested that income and inequality and its proxy, the Gini index, are valid indicators for the credit constraint, which is why we have chosen to work with this assumption.

Another question to be raised is the impact of the two measures chosen as indicators for community characteristics. The concern is that the effects of pupil/teacher ratio and the Gini index are correlated and affected by other factors than the ones aimed to be measured in this paper, school quality and inequality. Pupil/teacher ratio could be negatively correlated to school quality due to crowded classrooms but there is also a possibility that there are factors working in the opposite direction, namely schools with good teachers might have more

students per class because more people want to attend these schools (Jirjahn, Pfeifer & Tsertsvadze, 2009). However, since many other researches have used this measure as a proxy for school quality, the biases can be assumed to be negligible and the pupil/teacher ratio can be considered eligible for measuring school quality.

Overall, this discussion shows that it can be fairly assumed that even if the results are specific for Oportunidades, they are still valid as indications of potential effects when the programme is transplanted elsewhere.

7 Conclusions

This paper had the aim to investigate the impact of regional context for the successfulness of Oportunidades. The aim was to understand if these regional factors are important for policy considerations when considering transplanting a CCT programme.

The results obtained from this research give indications for policymakers considering what additional measures could be implemented in terms of school quality to increase the efficiency of a CCT programme. The results show that the effect of the pupil/teacher ratio on the programme is negative, implying that targeting policies for enhancement of school quality implemented together with a CCT programme could have synergy effects. However, the interaction effect is small compared to the level effect of just decreasing the pupil/teacher ratio. This indicates that implementing targeting policies for improving school quality is important, however it is not limited to schools with CCT programs but will have important impacts for schools no matter if they are in the program or not.

The results obtained on the Gini index suggest that there might be higher skill premiums in more unequal societies. This implies that opportunity costs of schooling will be lower when Gini is high which would explain why Gini has a positive impact on attendance rates for older children. From a policy perspective, this implies that benefits in unequal areas could be lower than in more equal areas, where opportunity costs are higher, since it would still be beneficial for households even with a lower cash transfer to have their children attend school. However, on younger children, the effect is the reverse and inequality seems to decrease

school attendance. This corresponds well to theory about liquidity constraint. This means that CCT's are more important in unequal areas than in equal ones when the children are young.

This paper sought to fill the gap in existing research on CCT's, by investigating whether community characteristics could explain the regional differences in programme outcomes. The results obtained are equivocal and far from all results show significance. However, the hypothesis cannot be rejected because of the indications provided by the results showing significant effect. A need for further research on the regional differences is identified to enable refinement to the structure of the CCT's in order to make them more efficient. The results indicate that community characteristics are worthwhile considering and the potential impact could be much larger than the indications in this paper due to the fact that cross-country variation in these factors are much higher. This is important since the impact of this kind of programme not only changes the opportunities of individuals but also is the key to economic growth.

8 References

Millennium Development Goals Indicators (2008/01/15), 2008-last update [Homepage of Development Indicators Unit, Statistics Division, United Nations], [Online]. Available: http://mdgs.un.org/unsd/mdg/Host.aspx?Content=Indicators/OfficialList.htm [2012-05-02].

Nationalencyklopedin - Humankapital, [Homepage of Nationalencyklopedin], [Online]. Available: http://www.ne.se/lang/humankapital [2012-05-11].

Nationalencyklopedin - Jacob Mincer, [Homepage of Nationalencyklopedin], [Online]. Available: http://www.ne.se/jacob-mincer [2012-05-13].

The World Bank Group, Safety Nets and Transfers - Conditional cash transfers [Homepage of The World Bank Group], [Online]. Available: http://go.worldbank.org/BWUC1CMXM0 [2012-05-13].

Research Methodology [Homepage of IMD - World Competitiveness Center], [Online]. Available: http://www.imd.org/research/centers/wcc/research_methodology.cfm [2012-05-11].

Angelucci, M. And Attanasio, O. (2009), Oportunidades: Program Effect on Consumption, Low Participation, and Methodological Issues. *Economic Development & Cultural Change,* **57**(3), pp. 479-506.

Angelucci, M. And De Giorgi, G. (2009), Indirect Effects of an Aid Program: How Do Cash Transfers Affect Ineligibles' Consumption? *American Economic Review,* **99**(1), pp. 486-508.

Attanasio, O.P., Meghir, C. And Santiago, A. (2012), Education Choices in Mexico: Using a Structural Model and a Randomized Experiment to Evaluate PROGRESA. *Review of Economic Studies,* **79**(1), pp. 37-66.

Attanasio, O.P., Meghir, C. And Szekely, M. (2004), Using Randomized Experiments and Structural Models for Scaling Up: Evidence from the PROGRESA Evaluation. In: F. Bourguignon And B. Pleskovic, eds, *Annual World Bank Conference on Development Economics, 2004: Accelerating development.* Washington, D.C.:; World Bank;; Oxford and New York:; Oxford University Press, pp. 315-339.

Attanasio, O. And Kaufmann, K. (2009), *Educational Choices, Subjective Expectations, and Credit Constraints.* National Bureau of Economic Research, Inc, NBER Working Papers: 15087.

Azuara, O. (2009), *Does Povery Alleviation Increase Migration? Evidence from Mexico.* No 17599. Munich Personal RePEc Archive.

Barro, R.J. (1991), Economic Growth in a Cross Section of Countries. *Quarterly Journal of Economics,* **106**(2), pp. 407-443.

Barro, R.J. and Lee, J. (1993), International Comparisons of Educational Attainment. *Journal of Monetary Economics,* **32**(3), pp. 363-394.

Becker, G.S. (1962), Investment in Human Capital: A Theoretical Analysis. *Journal of Political Economy,* **70**(5, Part 2: Investment in Human Beings), pp. pp. 9-49.

Becker, G.S. and Tomes, N. (1979), An Equilibrium Theory of the Distribution of Income and Intergenerational Mobility. *Journal of Political Economy,* **87**(6), pp. 1153-1189.

Behrman, J.R., Gallardo-Garcia, J., Parker, S.W., Todd, P.E. and Velez-Grajales, V. (2010), *How Conditional Cash Transfers Impact Schooling and Work for Children and Youth in Urban Mexico.*Working Paper edn. Philadelphia: University of Pennsylvania.

Behrman, J.R., Parker, S.W. and Todd, P.E., (2005), *Long-Term Impacts of the Oportunidades Conditional Cash Transfer Program on Rural Youth in Mexico.* Discussion Paper edn. Ibero America Institute for Economic Research (IAI).

Case, A. and Yogo, M. (1999), *Does school quality matter?: Returns to education and the characteristics of schools in South Africa.* Unpublished paper edn. Boston: National Bureau of Economic Research.

Charles Coll, J.A. (2011), Understanding income inequality: Concept, causes and measurement. *International Journal of Economic and Managerial Sciences,* **1**(3), pp. 17-28.

Cuevas Durán, M. (2010-01-15), last update 2010, Oportunidades External Evaluation [Homepage of Secretary of Social Development, Mexico], [Online]. Available: http://evaluacion.oportunidades.gob.mx:8010/en/bases_cuan_c.php [2012-03-15].

Dearden, L., Ferri, J. and Meghi, C. (2002), The Effect of School Quality on Educational Attainment and Wages. *Review of Economics and Statistics,* **84**(1), pp. 1-20.

Deininger, K. and Squire, L. (1998), New ways of looking at old issues: inequality and growth. *Journal of Development Economics,* **57**(2), pp. 259-287.

Dominguez Viera, M.E. (2011), Does the Impact of Oportunidades Program Increase in Highly Competitive Regions? *Ensayos: Revista de Economia,* **30**(2), pp. 79-111.

Ferreira, F.H.G. and Walton, M. (2006), *World Development Report 2006: Equity and Development.* New York: The World Bank/Oxford University Press.

Filmer, D. (2004), *If You Build It, Will They Come?School Availability and School Enrollment in 21 Poor Countries* Washington D.C.: The World Bank.

Fiszbein, A. and Schady, N. (2009), *Conditional Cash Transfers: Reducing present and future poverty.* Washington D.C.: The World Bank.

Gertler, P., Martinez, S. and Rubio-Codina, M. (2006), *Investing Cash Transfers to Raise Long Term Living Standards.* Working Paper edn. Washington D.C.: The World Bank.

Gertler, P. and Glewwe, P. (1990), The willingness to pay for education in developing countries: Evidence from rural Peru. *Journal of Public Economics,* **42**(3), pp. 251-275.

Goodman, J. (2008), *Skills, Schools, and Credit Constraints: Evidence from Massachusetts.* Columbia University, Department of Economics, Discussion Papers: 0809-03.

Handa, S. (1999), *Raising primary school enrolment in developing countries: the relative importance of supply and demand.* Discussion paper edn. Washington D.C.: International Food Policy Research Institute.

Heckman, J.J. and Klenow, P.J. (1997), *Human Capital Policy.* Chicago: University of Chicago.

Holzmann, R., Robalino, D.A. and Takayama, N. (2009), *Closing the Coverage Gap.* Washington D.C.: The World Bank.

Instituto de Planeación del Estado de Guanajuato (Iplaneg), last update 2009, Indice de Gini [Homepage of Instituto de Planeación del Estado de Guanajuato (IPLANEG)], [Online]. Available: http://seip.guanajuato.gob.mx/indicadores/index.php?option=com_content&view=article&id=416:indice-de-gini&catid=73:medicion-multidimensional-de-la-pobreza&Itemid=67 [2012-04-12].

Irala Burgos, F. (2008-12-11), last update 2008, Oportunidades, a Human Development Program [Homepage of President of the Republic, Mexico], [Online]. Available: http://www.oportunidades.gob.mx/Portal/wb/Web/oportunidades_a_human_development_program [2012-04-04].

Jirjahn, U., Pfeifer, C. and Tsertsvadze, G. (2009), Class Size, Student Performance and Tiebout Bias. *Applied Economics Letters*, **16**(10-12), pp. 1049-1052.

Juhn, C., Murphy, K.M. and Pierce, B. (2003), Wage Inequality and the Rise in Returns to Skill. In: E.A. Hanushek, ed, *The economics of schooling and school quality. Volume 1. Labor markets, distribution and growth.* Elgar Reference Collection. International Library of Critical Writings in Economics, vol. 159; Cheltenham, U.K. and Northampton, Mass.: Elgar; distributed by American International Distribution Corporation, Williston, Vt, pp. 229-261.

Kabubo-Mariara, J. and Mwabu, D.K. (2007) Determinants of school enrolment and education attainment: Empirical evidence from Kenya. *South African Journal of Economics*, **75**(3), pp. 572-593.

Karlan, D. and Morduch, J. (2010), Chapter 71 - Access to Finance. *Handbook of Development Economics, volume 5.* Elsevier, pp. 4703-4784.

Lavado, R.F. and Cabanda, E.C. (2009), The Efficiency of Health and Education Expenditures in the Philippines. *Central European Journal of Operations Research*, **17**(3), pp. 275-291.

Lebedinsky, A.G. (2009), Does Income Inequality Affect School Enrollment? *Journal of Applied Economics & Policy*, **28**(1), pp. 69-100.

Lucas Jr., R.E. (1988), On the Mechanics of Economic Development. *Journal of Monetary Economics*, **22**(1), pp. 3-42.

Rawlings, L.B. and Rubio, G.M. (2005), Evaluating the Impact of Conditional Cash Transfer Programs. *World Bank Research Observer*, **20**(1), pp. 29-55.

Robles Vásquez, H.V. and Felipe, M.R. (2006), *Panorama Educativo de México 2006, Indicadores del Sistema Educativo Nacional.* Mexico: Instituto Nacional para la Evaluación de la Educación.

Romer, P.M. (1986), Increasing Returns and Long-run Growth. *Journal of Political Economy*, **94**(5), pp. 1002-1037.

Strauss, J. and Thomas, D. (1995), Chapter 34 Human resources: Empirical modeling of household and family decisions. In: J. BEHRMAN and T.N. Srinivasan, eds, *Handbook of Development Economics.* Elsevier, pp. 1883-2023.

Appendix I

Difference in difference estimation of regional effects

To confirm that there truly are regional differences in the outcome of Oportunidades, a difference in difference estimation is used. This method compares the difference in school attendance of the treatment group before and after the event with the school attendance of the control group during the same period in order to identify an average treatment effect (ATE).

$$ATE = \{Treatment(T1) - Treatment(T0)\} - \{Control(T1) - Control(T0)\}$$

Where T1 is after the event and T0 before the event. The event is defined as the start of receiving benefits from the Oportunidades. If the programme has no effect, there would not be any significant difference between the relative changes in attendance rates between the control and treatment groups i.e. the average treatment effect would not be statistically different from zero.

The difference in difference regression in its simplest form thus looks as follows:

$$Y_{i,t} = \alpha + \beta_1 treatment_i + \beta_2 post_t + \beta_3 post_t * treatment_i + \varepsilon_{i,t}$$

The interpretation of the variables is tabulated below.

	Pre-Treatment T0	*Post-Treatment T1*	*Difference T1-T0*
Treatment group	$\alpha + \beta_1$	$\alpha + \beta_1 + \beta_2 + \beta_3$	$\beta_2 + \beta_3$
Control group	α	$\alpha + \beta_2$	β_2
Difference-in-Differences			$\boldsymbol{\beta_3}$

Necessary assumptions when performing a difference in difference estimation are that the two groups are comparable in terms of their subjectivity to overall trends that are not direct effects from the programme. Due to the possible self-selection bias in the selection process mentioned in the main text, this assumption could potentially be violated. However, socio-

demographical comparability would imply that the two groups are exposed to the same trends and as showed in the table 2, the control and treatment groups are comparable which means that it is reasonable to assume that the two groups are exposed to the same trends.

The critical question for this paper is whether we can confirm that there are regional differences in the average treatment effect. This will be investigated by including regional dummies and interaction terms between the regional dummies and treatment effect. This will show the combined effect of being in the treatment group and living in a specific region.

In previous research variables affecting the successfulness of the programme have been identified to be factors such as gender, parental education, access to television at home and age, which is why individual and household socio-demographic characteristics will be controlled for. Age is an important control variable because of its strong negative effect on school attendance. Gender is also of interest since it is common in many developing countries to value the education of girls less due to cultural traditions.

$$Change\ in\ school\ attendance$$
$$= \alpha + \beta_1 post + \beta_2 treatment + \beta_3 treatment * post + \beta_4 regional\ dummies$$
$$+ \beta_5 treatment * regional\ dummies + \beta_6 controls + \varepsilon$$

where ε equals $\varepsilon_{t1} - \varepsilon_{t0}$.

β_5 is the coefficient that we are interested in since this is the combined impact of living in a specific region and being in the treatment group, which means that this coefficient signifies how the treatment effect is affected by the recipients federal state of residence. The results confirm that there are significant regional effects on the treatment effects of the programme.

Appendix II

All

Primary school pupil/teacher ratio

Total attendance	Coefficient	t	P>|t|
Pupil/teacher ratio primary school	0.0524 (0.3150)	0.17	0.868
Treatment primary school	-0.3362 (0.1444)	-2.33	0.020
Treatment	8.8348 (3.6119)	2.45	0.014
Constant	17.9270 (8.4423)	2.12	0.034

Number of observations: 28,588
Number of groups: 17,197
F(3, 11388) 2.44
Prob > F 0.0623

Secondary school pupil/teacher ratio

Total attendance	Coefficient	t	P>|t|
Pupil/teacher ratio secondary school	-1.1255 (0.8311)	-1.35	0.176
Treatment secondary school	-0.2450 (0.2207)	-1.11	0.267
Treatment	4.1450 (4.1895)	1.23	0.219
Constant	40.6788 (15.9065)	2.56	0.011

Number of observations: 28,588
Number of groups: 17,197
F (3, 11388) 2.69
Prob > F 0.0446

Gini index

Total attendance	Coefficient	t	P>|t|
Gini	-3.1995 (7.3131)	-0.44	0.662
Treatment Gini	2.5630 (6.7628)	0.38	0.705
Treatment	-1.1335 (4.1437)	-0.27	0.784
Constant	21.1056 (4.3079)	4.90	0.000

Number of observations: 28,588
Number of groups: 17,197
F (3,11388) 0.56
Prob > F 0.6430

Girls only

Primary school pupil/teacher ratio

Total attendance	Coefficient	t	P>|t|
Pupil/teacher ratio primary school	-0.2170 (0.4420)	-0.49	0.623
Treatment primary school	-0.2260 (0.1734)	-1.30	0.193
Treatment	6.1135 (4.2830)	1.43	0.154
Constant	24.9900 (11.8466)	2.11	0.035

Number of observations: 14,270
Number of groups: 8,662
F(3, 5605) 1.54
Prob > F 0.2258

Secondary school pupil/teacher ratio

Total attendance	Coefficient	t	P>|t|
Pupil/teacher ratio secondary school	-1.4842 (1.1715)	-1.27	0.205
Treatment secondary school	-0.2501 (0.2867)	-0.87	0.383
Treatment	5.2853 (5.4172)	0.98	0.329
Constant	47.4510 (22.4386)	2.11	0.034

Number of observations: 14,270
Number of groups: 8,662
F (3, 5605) 2.32
Prob > F 0.0735

Gini Index

Total attendance	Coefficient	t	P>|t|
Gini	-9.0190 (10.1491)	-0.89	0.374
Treatment Gini	3.5678 (9.0907)	0.39	0.695
Treatment	-1.7323 (5.5913)	-0.31	0.757
Constant	24.3981 (5.9874)	4.07	0.000

Number of observations: 14,270
Number of groups: 8,662
F (3, 11388) 0.75
Prob > F 0.5205

Boys only

Primary school pupil/teacher ratio

Total attendance	**Coefficient**	**t**	P>|t|
Pupil/teacher ratio primary school	0.3369 (0.4500)	0.75	0.454
Treatment primary school	-0.4481 (0.2350)	-1.91	0.057
Treatment	11.6264 (5.9497)	1.95	0.051
Constant	10.4466 (12.0648)	0.87	0.387

Number of observations: 14,318
Number of groups: 8,556
F(3, 5759) 1.32
Prob > F 0.2651

Secondary school pupil/teacher ratio

Total attendance	**Coefficient**	**t**	P>|t|
Pupil/teacher ratio secondary school	-0.7869 (1.1843)	-0.66	0.506
Treatment secondary school	-0.2337 (0.3392)	-0.69	0.491
Treatment	4.8742 (6.4953)	0.75	0.453
Constant	34.3056 (22.6520)	1.51	0.130

Number of observations: 14,318
Number of groups: 8,556
F (3, 5759) 0.72
Prob > F 0.5424

Gini index

Total attendance	**Coefficient**	**t**	P>|t|
Gini	3.0644 (10.5556)	0.29	0.772
Treatment Gini	1.6385 (9.9701)	0.16	0.869
Treatment	-0.5772 (6.0921)	-0.09	0.925
Constant	17.5583 (6.2100)	2.83	0.005

Number of observations: 14,318
Number of groups: 8,556
F (3, 5759) 0.18
Prob > F 0.9090

Primary school children (6-12 years)

Primary school pupil/teacher ratio

Total attendance	Coefficient	t	P>|t|
Pupil/teacher ratio primary school	-3.1623 (0.3095)	-10.22	0.000
Treatment primary school	-0.3376 (0.1363)	-2.48	0.013
Treatment	9.5699 (3.4457)	2.78	0.005
Constant	107.7181 (8.3195)	12.95	0.000

Number of observations: 18,047
Number of groups: 11,120
F(3, 6924) 54.37
Prob > F 0.0000

Secondary school pupil/teacher ratio

Total attendance	Coefficient	t	P>|t|
Pupil/teacher ratio secondary school	-1.4156 (0.8879)	-1.59	0.111
Treatment secondary school	-0.2729 (0.2137)	-1.28	0.202
Treatment	7.1153 (4.1046)	1.73	0.083
Constant	49.4698 (16.9787)	2.91	0.004

Number of observations: 16,045
Number of groups: 10,027
F (3, 6015) 12.13
Prob > F 0.0000

Gini index

Total attendance	Coefficient	t	P>|t|
Gini	-77.9443 (7.5773)	-10.29	0.000
Treatment Gini	2.2861 (6.1067)	0.37	0.708
Treatment	-0.7330 (3.7020)	-0.20	0.843
Constant	68.0902 (4.4324)	15.36	0.000

Number of observations: 16,045
Number of groups: 10,027
F (3, 6015) 50.12
Prob > F 0.0000

Secondary school aged children (12-15 years)

Primary school pupil/teacher ratio

Total attendance	Coefficient	t	P>|t|
Pupil/teacher ratio primary school	24.2415 (11.0347)	3.38	0.001
Treatment primary school	-0.9277 (0.4474)	-2.07	0.038
Treatment	24.2415 (11.0347)	2.20	0.028
Constant	-61.3050 (24.9331)	-2.46	0.014

Number of observations: 7,780
Number of groups: 5,237
F (3, 2540) 4.41
Prob > F 0.0042

Secondary school pupil/teacher ratio

Total attendance	Coefficient	t	P>|t|
Pupil/teacher ratio secondary school	-2.2743 (2.2489)	-0.15	0.883
Treatment secondary school	0.0916 (0.5088)	-1.01	0.312
Treatment	-1.4307 (9.7232)	0.18	0.857
Constant	66.2501 (43.0405)	1.54	0.124

Number of observations: 7,780
Number of groups: 5,237
F (3, 2540) 0.44
Prob > F 0.7232

Gini index

Total attendance	Coefficient	t	P>|t|
Gini	26.5813 (21.3351)	1.25	0.213
Treatment Gini	16.3443 (19.7988)	0.83	0.409
Treatment	-9.0752 (12.3779)	-0.73	0.464
Constant	7.2435 (12.6476)	0.57	0.567

Number of observations: 16,045
Number of groups: 5,237
F (3, 2540) 1.62
Prob > F 0.1822