LUND UNIVERSITY
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Conditional Cash Transfer Programs and Inequality of Opportunity

A case study: Juntos in Peru

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Abstract:
Inequality of Opportunity has recently emerged in the development agenda. The unequal access to opportunities can reinforce poverty and inequality traps. Conditional Cash Transfer (CCT) programs have consolidated as an important policy tool to fight against poverty. In addition, they have a great potential to equalize opportunities. The relationship between CCT programs and inequality of opportunity is examined in this thesis, introducing an innovative methodology for assessing inequality based on the Non-satisfied Basic Needs (NBI) approach. The NBI is the most extended direct method to estimate non-monetary poverty in Latin America. A quantitative analysis is performed in the context of the CCT program *Juntos* in Peru. The results suggest that *Juntos* had a positive impact on the reduction of inequality of opportunity (in the long run), measured by the new NBI Inequality of Opportunity Index introduced in this research.

Key words: Inequality of opportunity, NBI, conditional cash transfers, *Juntos*, Peru.

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Glossary of Abbreviations

CCT- Conditional Cash Transfer

CEPAL - Economic Commission for Latin America and the Caribbean (*Comisión para America Latina y el Caribe*)

CPV – Census of Population and Housing (*Censo de Condiciones de Vida y Pobreza*)

DiD - Difference-in-differences

DNI – National Identification Document (*Documento Nacional de Identidad*)

ENAHO – Principal Household Survey in Peru. "National Survey of Life and Poverty Conditions" (*Encuesta Nacional de Condiciones de Vida y Pobreza*)

GDP – Gross Domestic Product

GEI – Generalized Entropy Indexes

ID – Identification Document

INEI – National Institute of Statistics and Informatics (*Instituto Nacional de Estadística e Informática*)

MDG – Millennium Development Goal

MIMIC – Multiple Indicators and Multiple Causes

NBI – Non-satisfied Basic Needs (*Necesidades Básicas Insatisfechas*)

NGO – Non-Governmental Organization

OLS – Ordinary Least Squares

PCM - Presidency of the Council of Ministers (*Presidencia del Consejo de Ministros*)

SDG – Sustainable Development Goal

SISFOH – System for Household Targeting (*Sistema de Focalización de Hogares*)

SWF – Social Welfare Function

UNDP – United Nations Development Programme

UNSD- United Nations Statistics Division

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1   Introduction

Inequality is one of the core phenomena of research in development economics. There is a lively interest in the understanding of the evolution and patterns of inequality not only in academia but also within the public opinion and political spheres. The first question that arises is: inequality of what? Economic studies of inequality typically focus on the distribution of economic resources with income as the preferred measure. However, since inequality is a multidimensional concept and has multiple components inequality measured by a single monetary variable represents only a narrow view. Recently, inequality research has been shifting towards the concept of inequality of opportunity.

Inequality of opportunity is the one related to the "circumstances" of the individual[1]. The unequal access to social services is one of the appearances in which it can materialize. These inequalities might reinforce poverty and inequality traps. The lack of access to health services in the early childhood, for instance, can have an adverse effect on the future development of children[2] so the unequal access to those services can reinforce the differences in all health, economic and social future outcomes. Equality of opportunity, or "equity", is gaining importance also due to the consensus of fairness behind this concept. Since this type of inequality is caused by events or "circumstances" beyond the individual's control it is intrinsically unfair. Moreover, according to de Barros et al. (2008) "the unequal opportunity to benefit from social services is probably the more suitable aspect for direct public policy intervention".

Latin America is one of the most unequal regions in the world in terms of income but also in other multiple political and social aspects. These inequalities could be preventing inclusive growth in spite of the great efforts of the respective governments and international organizations in reducing extreme poverty. Since the 1990s Conditional Cash Transfer (CCT) programs have spread out around the world. They have become a very popular development policy tool, especially in Latin America. These programs consist on direct monetary transfers conditional on the commitment of the beneficiaries to a series of

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[1] See Roemer (2002).

[2] See Shonkoff et al. (2012).

conditions. They are specifically targeted to reduce poverty, nevertheless they might also have externalities affecting other outcomes such as child health (Fernald et al., 2008), schooling (Janvry et al., 2006), nutrition (Bassett, 2008) or social inclusion (Rawlings, 2006). Since in many cases the transfers are directly given to mothers, the possible impact of CCT programs on female empowerment and gender equality have been largely discussed (Arif et al., 2011; Martínez-Restrepo et al., 2015; Martinez Franzoni and Voorend, 2012). This thesis focuses on the relationship between CCT policies and inequality of opportunity.

1.1   Research Problem

CCT programs might affect inequality of opportunity through several mechanisms. First, through the transfers of money by directly redistributing income to the poor. Moreover, they may have an indirect effect through the conditions stipulated in their design. Normally these conditions are related to health, education and nutrition. By improving the access to health and educational facilities for the poorest households in the society CCT programs can improve equality of opportunity. This thesis leads with the following research question:

Can CCT programs help to reduce inequality of opportunity?

With the aim of addressing this issue, a quantitative analysis is performed using data for the case of Peru, one of the most unequal countries in Latin America. Despite of the decrease in income and wealth disparities during the last decade in Peru[3], inequality remains a central problem in the country as well as in the whole region.

Peru launched the CCT program *Juntos*[4] in 2005 and ten years later it has become the most significant tool for fighting against poverty in the country. The program consists on the monetary transfer of 100 *nuevos soles*[5] a month during a period of four years to households in a situation of extreme poverty, conditional on the participation of the beneficiary families in governmental services. It is specifically targeted to those families with "the lowest levels of human development in the country and to the ones with the

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[3] According to the estimations of the World Bank, the Gini Index has decreased from 51.20% in 2004 to 44.14% in 2014.

[4] "Together" in English

[5] This amount is equivalent to the 20% of the income of a household in extreme poverty in Peru (Lizarzaburu, 2008).

lower possibilities to benefit from economic growth" (Lizarzaburu, 2008; pp. 3). This makes *Juntos* a unique paradigm in Peru.

Inequality of opportunity is going to be measured using an index developed during my first year master's thesis. This index is based on the Non-satisfied Basic Needs (NBI[6]) methodology developed by the Economic Commission for Latin America and the Caribbean (CEPAL[7]). The NBI is a direct method to estimate poverty. It identifies households which lack the access to certain basic goods and services considered indispensable to reach a minimum level of welfare. The index is applied with the intention to capture the disparities in the opportunity of access to basic services, approximating this way inequality of opportunity.

In 2005 four departments of Peru were selected to receive the CCT program *Juntos*. During the following years it was gradually implemented in other regions of the country as well, reaching 18 departments in 2015. Taking advantage of this rolling out of *Juntos*, treatment and control groups will be selected and the impact of the CCT program on inequality of opportunity will be estimated using a *difference-in-differences* strategy.

1.2   Aim and Scope

The aim of this research is to study the relationship between a very popular policy tool, the CCT programs, and inequality of opportunity which is a concept that is increasingly gaining importance among researchers, scholars and policymakers.

The main hypothesis of this thesis is that *Juntos* in particular and CCT programs in general have a positive effect on the reduction of inequality of opportunity measured by NBI.

This work contributes to the literature of CCT programs in the context of developing countries with a quantitative analysis of the case of *Juntos* in Peru which is socially and politically considered a success but has not been yet deeply evaluated, at least in quantitative terms. Moreover, this paper contributes to the literature on inequality since the analysis is carried out introducing an original method for computing inequality which has not been used as a measurement of inequality of opportunity yet. The NBI method allows to approximate inequality from a multidimensional perspective of well-being

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[6] For its acronym in Spanish: *Necesidades Básicas Insatisfechas*.

[7] For its acronym in Spanish: *Comisión Económica para América Latina y el Caribe*.

different from the traditional monetary approaches and also to understand the channels or mechanisms through which CCTs may affect inequality.

The empirical results show a reduction in inequality of opportunity between 0.05 and 0.06 points due to the CCT program *Juntos*. The impact of the program is only statistically significant in the long term.

The case of Peru is only one among many. In these types of studies it is very difficult to generalize any results or conclusions. The quantitative analysis is accomplished for one particular case in a specific context. However, the goal of this thesis is to shed some light on the potential of CCT policies in improving equality of opportunity in developing countries as well as on new methods for assessing inequality.

1.3 Outline of the Thesis

This thesis is organized as follows. Section 2 establishes the theoretical framework for the relation between CCTs and inequality of opportunity, reviewing the existing literature related to the topic and explaining how the NBI methodology can be employed to approximate inequality of opportunity. In addition, the case of *Juntos* in Peru is introduced with an overview of the program and the context of the country. Section 3 summarizes relevant previous research. Section 4 describes the data used in the quantitative analysis and discusses its limitations. Section 5 presents the estimation strategy. The results are reported and discussed in Section 6. Finally, Section 7 concludes summarizing the main findings and highlighting the principal practical implications.

2　　Theory and Background

2.1　　Inequality

Inequality is a broad concept and a major issue in development economics. One can find political, social or economic inequalities between individuals, households, neighborhoods, regions or countries. These inequalities occur when rights, privileges or resources are distributed unevenly among the different agents. Economic inequality is usually studied through the distribution of income, consumption or wealth of a given society.

After a decade of neglect (in the 1980s) economic inequality resurfaced as a part of the development agenda due largely to the emergence of welfare economics. The relation between the concepts of inequality, poverty and economic growth has placed inequality at the core of academic and political interests; large efforts have been made to understand and measure patterns of inequality. Both economic growth and income equality are in the same way relevant to poverty reduction (Bourguignon, 2004). At the same time economic growth can change the distribution of income while initial inequalities can affect economic growth performance. In fact, different types of inequality could have different effects (positive or negative) on economic growth (Ros, 1998). The debate about this triangle is one of the largest within the discipline.

Besides, inequality is relevant in its own right.

> *"With imperfect markets, inequalities in power and wealth translate into unequal opportunities, leading to wasted productive potential and to an inefficient allocation of resources"* (World Bank, 2006; pp 7.)

In addition, income inequality is related to multiple social and economic outcomes. Individuals in more unequal societies have lower life expectancy, higher probability to suffer from mental illness, worse educational and academic results, consume higher quantities of drugs and experience more violence than those who live in more equal societies (Wilkinson and Pickett, 2010). Moreover, economic and political inequalities are

related to the weakening of institutional development (Glaeser et al., 2003). Inequality is also a matter of human rights and, since most people show preferences towards fairness (Güth and Tietz, 1990; Fehr and Schmidt, 1999), disparities that violate the sense of social justice are at the center of any political debate.

2.1.1   Measures of Inequality

Inequality measurements attempt to capture the dispersion of individual or social well-being. Measuring inequality is not an easy duty; first because the definition of well-being is quite complex, and also because different measurements of inequality typically lead to different results (Sala i Martin, 2002). According to Dalton, despite the fact that inequality "might be defined in terms of economic welfare, it should be measure in terms of income" (Dalton 1990; pp. 349). However, besides the distribution of income, inequality can be studied in multiple dimensions: market assets, land, education, opportunities, etc. In spite of which component one chooses, the simplest way of describing a distribution is through the *frequency distribution*. The frequency distribution shows how many individuals (or households) own different amounts of resources. Since these kinds of distributions are difficult to compare across countries and can present complex shapes, it is normal to display a *size distribution* instead (Perkins et al., 2012; pp 169). The size distribution shows the share of total resources received by different groups of individuals ranked according to the level of resources they possess, usually grouped in quintiles from the poorest 20% to the richest 20%.

The simplest statistical measure of inequality is the *variance* which measures the average square of the deviations of the variable from its mean value. The mean independence principle does not hold in this case: if the income for all the individuals is doubled, inequality should not change, but if measured using the variance inequality would quadruple since it depends on the mean income. One possible solution to this problem is to use the *variance of logarithms* however this alternative measure violates the principle of Pigou-Dalton: transfers from the poor to the rich should increase inequality but the variance of the logarithms will no show that change. Another statistical measurement is the *coefficient of variation,* which is just the standard deviation divided by the mean. Its

main limitation is that the weight of the transfers does not vary with the relative position in the distribution[8].

Some authors have discussed the necessity of incorporating normative properties to those "objective" statistical measures of inequality that might be hiding value judgments and welfare attributes (Ruiz-Castillo, 1986; Aigner and Heins, 1967). The literature on individual preferences aggregated in utility functions and the concept of risk aversion has influenced the welfare analysis of distributional comparisons (Cowell, 2000). The works of Atkinson (1970) and Kolm (1968; 1976) constitute the axiomatic foundations of inequality measurements through aggregated indices. Some indices of income inequality were proposed as derivations from Social Welfare Functions (SWF) so ethical principles together with distributional axioms determine the ordering of the distributions. Assuming a preference *ceteris paribus* for a more equal distribution, these indices compare the actual distribution with the ideal "equally distributed" case given a SWF and a degree of inequality aversion. Any SWF has an arbitrary cardinalisation. Inequality aversion is also arbitrarily determined supposedly based on personal preferences and social values.

For instance the Atkinson Index relates the actual mean income to the level of income that each individual should receive if income were equally distributed in order to reach the same level of welfare. The Atkinson Index[9] depends on the social degree of inequality aversion and needs a defined SWF. As the parameter of inequality aversion (ε) increases, the weight given to transfers at the top of the distribution decreases while the weight given to transfers at the lower end increases. According to Atkinson any inequality measure contains judgments regarding social welfare.

Another popular set of axiomatic inequality indices are the Generalized Entropy Indexes (GEI(θ)). Theil (1967) introduced a new measure of inequality based on information theory[10]. The Theil Index captures inequality by subtracting the actual entropy (or "degree of disorder") of the income distribution from the maximum possible value of entropy that occurs when each individual receives an even share of the total income. A generalization of

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[8] For more details on these measures see Mancero (2000).

[9] $I^{\varepsilon} = 1 - \frac{1}{\mu(F)} [\int x^{1-\varepsilon} \, dF(x)]^{\frac{1}{1-\varepsilon}}$

[10] Information theory is a branch of the mathematical theory of probability and statistics. See Kullback (1997).

this index led to the GEI[11] which instead of the level of income, use income shares to capture the disparities in the distribution. The sensitivity of a particular GEI is given by the constant parameter θ: the larger (and positive) the parameter, the more sensitive the index is to the changes on the upper tail of the distribution; a negative θ indicates the sensitivity of the index towards changes in the lower tail. In the particular case of the Theil Index the parameter θ takes the value 1. The main attraction to these indices is their *decomposability*; they can be decomposed into *within* and *across* subgroup inequality.

Nevertheless, the most popular measurement of inequality is the Gini Index. The Lorenz curve plots the cumulative percentage of total income against the cumulative proportion of individuals in ascending order according to the level of income. The Gini Index compares this income distribution with the hypothetical line of perfect equality (when 10% of the population receives 10% of total income, 30% of the population receives 30% of total income and so on); it is the area between the two curves[12]. Therefore, this index takes values between zero and one hundred. The value 100 represents perfect inequality while the value 0 implies a perfectly equal distribution of income[13]. The Gini is more sensitive to changes in the middle part of the distribution and it is not decomposable. In addition, it presents a problem of comparability between two distributions when their Lorenz curves cross. However, its easy interpretation and its capacity of presenting graphically an image of the distribution makes the application of the Gini index very useful (Mancero, 2000).

Economic inequality has been frequently considered just as income inequality. However, inequality involves many aspects related to the quality of life and, perhaps, income (or consumption) is not the best outcome to measure it. Anand and Sen (1997) discuss the adequacy of measuring poverty through income-based poverty measures since poverty is a multidimensional concept which involves the deprivation of material well-being as well as the "opportunities of living a tolerable life". As such, measuring poverty through one single variable leads to an important loss of information. The same can be argued regarding inequality. Therefore, economic inequality research must consider factors beyond the traditional dimensions of income and community holdings (Sen, 1999).

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[11] $GEI(\theta)_t = \frac{1}{\theta^2 - \theta} \left[\frac{1}{N_t} \sum_{i=1}^{m} \sum_{j=1}^{N_{tt}} \left(\frac{y_{ijt}}{\bar{y}_t} \right)^{\theta} - 1 \right]$

[12] $Gini = \frac{1}{2n^2 \bar{y}} \sum_{i=1}^{n} \sum_{j=i}^{m} |y_i - y_j|$

[13] As such, the Gini coefficient lies between zero and one, being 1 perfect inequality and 0 perfect equality.

2.1.2   Inequality of Opportunity

Inequality has been the heart of a large number of studies and debates among both scholars and policymakers over the years. Since the pioneer studies, most of the research in the field of economic inequality has focused on the differences in welfare outcomes, usually measured by income or consumption. Nevertheless, inequality has multiple components and the center of the debate seems to be changing. According to Roemer (2009), a distinction should be made between two different types of factors that affect an individual's advantage. On the one hand, we find those factors or "efforts" which are the result of the choices made by the individual. On the other hand, there are the "circumstances" on which the individual cannot make any change (such as gender or family background). Inequality of opportunity is the one which comes from the "circumstances" and not the "choices".

Many voices argue that economic inequality is not necessarily bad for society. This might have important policy implications. However, it is difficult to argue against policy interventions targeted to eliminate those inequalities that come from the "circumstances" of the individuals that are completely beyond their control. That is one of the reasons why inequality of opportunity (or equity) is gaining importance for researchers, economist and policymakers. The concept of equality of opportunity may influence individuals' opinions about social justice and attitudes towards redistribution (Ferreira and Ginoux, 2011; Alesina and Angeletos, 2002). As such, it might bring new chances for researchers to display results that otherwise would have been ignored by policy makers. In addition, some authors claim that inequality of opportunity could be more relevant for understanding whether and why more equal societies perform better in economic terms (World Bank, 2006), and it is a significant measure of economic development (Zhang, and Eriksson, 2010).

Nevertheless, Kanbur and Wagstaff (2014) warn of the risk of applying the concept of inequality of opportunity in detriment of inequality of outcomes in a way in which policy makers would mistreat a situation of inequality arguing that the source of those disparities in outcomes are "legitimate". The authors illustrate this idea with an example of an extreme case: "(…) imagine yourself serving on a soup line of the indigent. Consider then the idea that we would condition the doling out of soup on an assessment of whether it was circumstance or effort which led to the outcome of the individual in front of us to be in the soup line" (pp. 5). That would be morally unacceptable. Following a similar

argument, Bourguignon et al., (2007) incorporate in their definition of the concept of equity the "avoidance of extreme deprivation in outcomes" together with the equal opportunities.

There is no intention in this thesis to neglect the importance of the evaluation of inequality of outcomes in favor to inequality of opportunity but rather to approach a concept increasingly significant in the development agenda, both in research and in policymaking. A concept that allows going beneath the surface of inequality to understand some of the forces behind the overall inequality and possibly find new spaces for policy intervention.

2.1.3   Measuring Inequality of Opportunity: NBI Method

The first attempts to measure inequality of opportunity have been made only very recently. The "Gini" of Opportunity, developed by LeFranc et al. (2008), compares income distributions conditional on "circumstances". In their analysis they include circumstances related to the individual´s socioeconomic background such as social origin measured by parental education and occupation. On the other hand, de Barros et al. (2009) measure inequality of opportunity among children through the Human Opportunity Index. This is a dissimilarity index which combines in one compound indicator the quantity of opportunities available in the access to basic services and how (in)equitably these opportunities are distributed among the population. The "opportunities" used to create this index are related to child education and housing conditions (completion of sixth grade on time, school attendance at ages 10-14, access to clean water, sanitation and electricity).

In this thesis I am going to approximate inequality of opportunity in Peru through the Unsatisfied Basic Needs (NBI) methodology. This method was designed and developed by the CEPAL during the 1980s with the aim of taking advantage of the scope of the large geographic disaggregation of the census information to estimate poverty. Since then, it has become one of the most popular direct methods in Latin America for measuring poverty with non-monetary indicators (see Boltvinik and Laos, 1999), further used to create poverty maps which can be extremely valuable in the design and implementation of social policies (Kaztman, 1995).

Poverty can be defined as the situation when the individuals of a given society cannot reach a minimum level of material well-being according to the standards of that society (Ravallion 1992). There are two different perspectives when attempting to identify the poor: indirect and direct. First, one can measure the resources available for an individual

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(or household) and estimate if those resources are sufficient to reach an adequate standard of living. The second alternative consists on assessing whether the individuals (or households) have the capacity to satisfy their basic necessities directly measuring the access and availability of certain goods and services considered indispensable to reach that minimum level of well-being. The NBI is a direct method to estimate the lack of access to several basic needs that permits a multidimensional approach when measuring poverty and, as it will be discussed in this thesis, also when measuring inequality.

The NBI indicators are dummy variables that allow identifying certain deprivations in the households. These indicators can be defined in multiple ways. The classical definitions include four different categories: dwelling conditions, sanitary conditions, educational conditions and economic capacity. The National Institute of Statistics and Informatics (INEI[14]) of Peru considers two NBI indicators related to dwelling conditions: inadequate housing and overcrowding; one NBI indicator related to sanitary conditions: type of toilet facilities; one NBI indicator related to schooling and one NBI indicator related to economic capacity. These five NBI indicators are summarized in Figure 1; they are dummy variables taking the value 1 when the household has the deprivation.

According to this, any household would have zero, one, two, three, four or five non-covered basic needs (NBI). A household is usually considered poor when it has one or more NBI indicators with the value 1 and extremely poor when two or more of these indicators take the value 1 (Alarcón, 2001).

The NBI methodology takes advantage of census data which reach large geographic disaggregation. The method permits a multidimensional approximation to poverty, taking into consideration aspects that are not necessarily reflected in household income. Nevertheless, this method has some drawbacks. First, the identification of NBI indicators is limited by the availability of information. There is a problem of *repesentativity*: the number of "poor" depends on the amount of indicators used (Feres and Mancero, 2001). In addition, it typically does not take into account indicators related to nutrition and health since this kind of information is not usually collected in the censuses. Moreover, there could be a *measurability* problem since not all the characteristics employed in the definition of the NBI indicators are presented in every household (Álvarez et al., 1997).

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[14] For its acronym in Spanish: *Instituto Nacional de Estadística e Informática.*

For instance, a household without the presence of children does not have the possibility to be identified as poor using the NBI type 4. Besides, the nature of the NBI variables, the fact that they are dummies, makes *aggregation* one of the most relevant weaknesses and most criticized factors regarding this method (Beccaría et al., 1997; Feres and Mancero 2001).
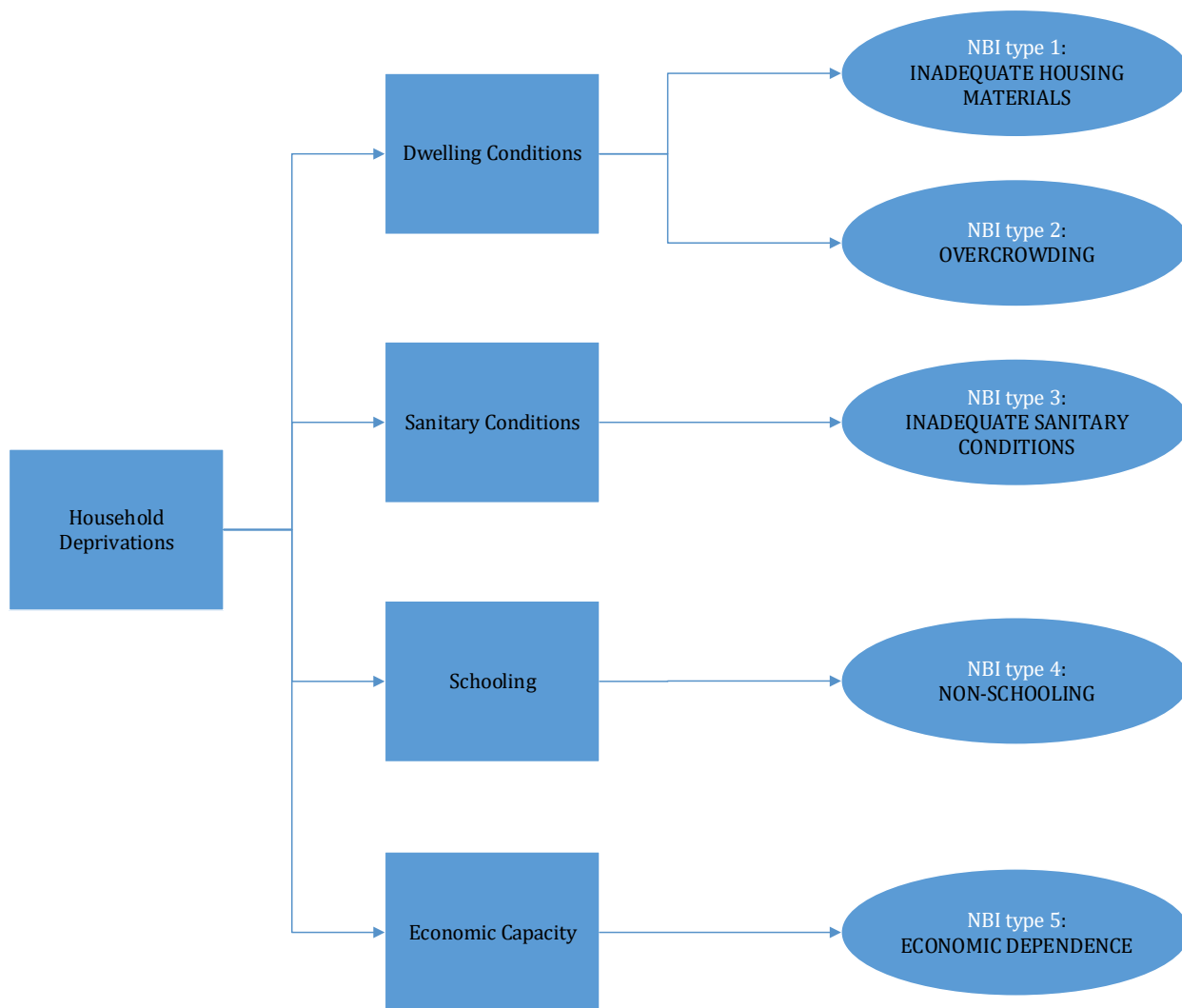
Figure 1. "Classic" NBI Indicators.
Source: Self-elaboration with information from the INEI.

The approach to create the NBI Index combines both the direct and the indirect methods, weighting the different NBI indicators according to the coefficients of their calculated relationship with household expenditure (which is a variable easier to aggregate). This methodology for measuring inequality has also limitations. When comparing it with other

methods, for instance the classical Gini Index, it tends to underestimate the absolute level of inequality since it does not capture the whole variability among the households in the right tail of the distribution (those households which have all their basic necessities covered; the non-poor households). However, the index is entirely able to capture the relative measures and consequently, as I demonstrated in my first year master's thesis, the NBI method is completely valid to make comparisons between different regions and periods of time in terms of inequality[15].

The NBI index was developed with the particular aim of approximating wealth inequality with a historical perspective, since it would allow estimating inequality in periods for which there is no data on income or consumption available. Information on income or consumption is usually collected in household surveys, built only since very recently. The first household surveys for most countries in Latin America are dated in the 1990s; in 1995 in the case of Peru. On the other hand, in some countries like Argentina there is Census information available since the 19th century with high level of detail. These censuses contain variables related to household characteristics but do not have reliable information on income. In this context, the NBI inequality index could be very useful.

Here, the attempt is to approximate inequality of opportunity with this same index since what the NBI Index is measuring is the unequal access to basic services and this is one of the most relevant components in which inequality of opportunity can appear. These services can be accessed with private resources or can be provided by the public state. Among them one can find the access to a proper dwelling with adequate sanitary conditions, the access to school for children, or the access to medical care. Consequently, this method can be used to measure inequality of opportunity taking the NBI indicators as "opportunities".

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[15] In Festa Secanella (2016) I developed an index, using NBI indicators, able to create a distribution vector that allows measuring inequality among households. The idea is similar to the method of "social tables" developed by Milanovic et al. (2011). In a first stage, using data from the ENAHO 2007 I established the relationship between the NBI indicators and household expenditure with a simple OLS regression. The coefficients from the estimation of that model constitute the different weights for the different NBIs in the index. Once the index is created the use of monetary variables is no longer needed. The index is used to create a distribution vector assigning a "fictitious" level of expenditure to each household based on the types and number of NBIs that it has. The Gini index was computed on this "NBI distribution" and then compared with the Gini obtained from the real household expenditure distribution in Peru. Both the "real" and "NBI" Ginis were calculated for the years 2005, 2006, 2008 and 2012 using data from the ENAHO. The results showed a high correlation between the two types of Ginis, validating the NBI method to estimate inequality as an alternative from the traditional monetary measurements.

The five NBI indicators summarized in Figure 1 were employed to construct the index based on NBIs in Festa Secanella (2016). In addition to these five "classic" NBI variables, one more NBI indicator is included to construct the NBI Inequality of Opportunity Index in this research, taking advantage of survey data, to incorporate a measure for the lack of access to health care (NBI type 6).

Therefore, inequality of opportunity is going to be measured on the distribution of a continuous variable (expenditure) conditional on a set of "circumstances" or "opportunities" following a similar approach to the Gini of Opportunity Index exposed above. However, the variables used as "opportunities" are the NBI indicators. In this sense the method is closer to the approach of the Human Opportunity Index which employs indicators related to education and housing conditions to measure the disparities of opportunities. This is the first time that the NBI method is going to be used for measuring the impact of a program on the reduction of inequality and particularly on the reduction of inequality of opportunity.

2.2   CCT Programs and Inequality of Opportunity

The first Millennium Development Goal (MDG)[16], and the first priority for any development economist, is to eradicate extreme poverty and hunger. In order to reach this high objective it is not only necessary to fight poverty today but also for the future generations. Following this vision the first national Conditional Cash Transfer (CCT) Program was developed in Mexico in 1997 (Levy, 2007). This innovative social policy was based on a simple idea: transfer money directly to the poor in return for their commitment to invest in the human capital of their children. Since then, and encouraged by international institutions as the World Bank, CCT programs have become a popular tool to fight poverty around the world, especially in Latin America (Sugiyama, 2011).

CCT programs do not have a standardized design so they can be very different depending on the context in which they are implemented and on the policies that need to be addressed. Today, one can find CCTs led by national and local governments, NGOs or private actors in almost thirty countries around the world (Fiszbein and Schady, 2009). These programs are targeted to diverse objectives, from those large-scale programs designed to eradicate poverty like *Bolsa Familia* in Brazil (Soares et al., 2009) or the

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16 Since 2015, Sustainable Development Goals (SDG).

already mention *Progresa-Oportunidades* in Mexico, to more local ones aiming for instance to improve prevention of HIV/AIDS in rural Malawi (Kohler and Thornton, 2011) or to reduce the gender gap in education in Bangladesh (Mahmud, 2003).

These programs have a latent capability to reduce inequality, and particularly inequality of opportunity. In spite of the differences in the design of the programs, all the CCTs are demand-side interventions searching to improve well-being and life conditions of the beneficiaries. Since they are targeted to the most disadvantaged individuals in the society, they have a great equalizing potential. If the circumstances faced by the individuals divide the population into two groups: the advantaged and the disadvantaged; and the CCTs are directed to benefit the disadvantaged more than the advantaged, then these policies could lead to a more egalitarian distribution of opportunities.

Most CCT programs in general and *Juntos* in particular, are aimed to break the intergenerational transfer of poverty. Direct cash transfers can be effective in reducing poverty and inequality in the short run since they increase income for the poorest. Their effect on the long-run, however, is uncertain. This is one of the reasons why CCT programs incorporate in their design several conditions that the beneficiaries need to compromise with in order to receive the monetary transfers. The commitment of families to periodical visits to health centers and to assure that their children attend school are normally the central conditions of these types of programs[17]. This long-term perspective of the CCTs is what might help to reduce inequality of opportunity.

Measuring inequality through the NBI method, CCTs can contribute to improve equality of opportunity through several mechanisms. First, the most evident short-term mechanism is the redistribution of income to the poor through the direct monetary transfers, which will *ceteris paribus* reduce income inequality. Moreover, in the long-term the cash transfers could for instance improve the chances of a poor family to move to a proper dwelling with the floor and exterior walls built with appropriate materials or to build up their actual dwelling (affecting NBI type 1) and with the adequate sanitary conditions (affecting NBI type 3). In addition, the conditions stipulated in these programs aimed to improve the future human capital should help to promote the use of health and education facilities, especially for children, reducing the opportunity gap in the access to schooling and health care centers.

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[17] This is the case for instance in *Progresa/Oportunidades* (Mexico), *Bolsa Familia* (Brazil), *Chile Solidario* (Chile), *Familias en Acción* (Colombia) or *Juntos* (Perú).

Consequently, CCTs programs have an implicit potential to reduce inequality of opportunity. These interventions can therefore, by improving equality of opportunity, be effective not only in poverty and inequality reduction today but also in breaking inequality traps. Inequality traps are understood as "persistent differences in social, political and economic power and status between advantaged and disadvantaged socioeconomic groups sustained over time by political and socioeconomic institutions" (Bourguignon et al., 2007; pp. 236). The CCT program *Juntos* developed in Peru since 2005 presents a great chance to analyze the possible effects of these increasingly popular policy interventions on inequality of opportunity which is an essential component of overall inequality and an important indicator for development.

This thesis evaluates the potential of CCT programs of reducing inequality of opportunity through the accomplishment of the conditions intrinsic to its design, together with other collateral effects, in a context of a developing country which is unequal in multiple aspects of economic development. In addition, it has the intention to highlight the major importance of the reduction of inequality of opportunity in breaking the cycles of poverty and inequality for the next generations so they can escape from current inequality and poverty traps; and the relevance that this has for development.

2.3 Context

2.3.1 Country overview: Peru

The research of this thesis is assessed in the context of Peru; a developing country situated in the west coast of South America with a total population of around 31 million people of which 23% live in rural environments (UNSD, 2015). Peru became independent from the Spanish empire in 1821 giving rise to a sovereign state which had suffered changes in government from oligarchic to democratic systems. After the military regime imposed in 1968 the democratic government was reestablished in 1980 giving rise to a period of political instability and economic crisis. At the beginning of the new century, though, the country experienced a notable economic growth and reduction in poverty. Although, income per capita levels were below both the world and Latin American averages and the country was still bearing with high levels of inequality.

Peru is administratively organized in 24 departments plus one constitutional province; these departments are divided into 196 provinces which are at the same time divided into 1854 districts. Poverty and inequality generally have a geographic component; both outcomes tend to concentrate in rural areas. In the case of Peru the access to services and opportunities depends strongly on the place of birth and residence. For instance, the number of years of schooling in adults in the department of Huancavelica is half that in Lima (5.5 versus 11 years)[18] and the probability to be poor for a rural household is triple the likelihood than for an urban household (Mendoza, 2015).

It is important to understand the context and situation of Peru regarding poverty, inequality and development. Although Peru is considered a country with high human development by the United Nations, some disturbing statistics deserve attention. In 2015, the population undernourished was estimated in 2.3 million, 22.7% of the population was below the poverty line[19] and child labor was estimated to be 34%, being slightly higher for girls than for boys[20]. The last figure is highly worrying due to the evident adverse effects of child work on children's development, specially taking into account that child work is intrinsically related with poverty status (See Streuli, 2012).

Latin America remains one of the most unequal regions in the world despite of the encouraging figures of growth of the last decades. The World Bank (2015) estimates a Gini Index of 44.4% for Peru. In spite of being one of the countries in Latin America which most reduced inequality since 2000, the figure is still high. To put it in context, Latin America as a region presented a Gini Index of 48.3% in 2008, the highest value of all the regions in the world (Ortiz and Cummins, 2012).

Nevertheless, inequality of income is not the only concern. Many Peruvians are underprivileged because of their origin, socioeconomic or gender conditions. According to Trivelli (2012), 33.7% of the Peruvian households are indigenous. Indigenous peoples in Latin America have poorer access to infrastructure and assets such as roads, land, clean water or education (Patrinos and Skoufias, 2007). This is the case of Peru, where the majority of indigenous households are located within the rural Andes. Educational

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[18] Huancavelica, situated within the central highlands (*sierra)*, is mostly rural and one of the poorest regions in Peru. On the other hand, Lima is the largest urban city of the country.

[19] According to the national poverty line calculated by the INEI. This calculus is based on the prices of representative food and non-food basic baskets. In 2015 the value of the national poverty line was 1,260 *nuevos soles*.See more in INEI (2016).

[20] Data from: UN Millenium Development Goals Database (2015), INEI (2015) and UNICEF Data (available at http://www.devinfo.org/childinfo)

outcomes are lower for indigenous speakers, compared to their Spanish counterparts (Cueto et al., 2012) and the probability to be poor is 11% higher for indigenous households than for non-indigenous (Trivelli, 2012)[21]. Women in Peru suffer from sexual violence and are discriminated in the access to credit, land, education and the labor market (Molyneux and Thomson, 2011). The highest proportions of women who suffer from physical violence live in the jungle and have indigenous ancestry (Díaz and Miranda, 2010).

The access to public services and adequate housings is also unequal in Peru. De Barros et al. (2008) estimate inequality of opportunity for 19 countries in Latin America in three different dimensions: clean water, electricity and education. Peru is the third most unequal country of the sample in the access to electricity. In the ranking of the most unequal countries in the access to clean water, Peru is in the eighth position. In the three dimensions, Peru presents higher values of inequality than the averages for the whole Latin American region[22].

Access to education and health are also important components of inequality of opportunity and its measurement. School enrollment is almost universal in both primary and secondary school in Peru, but there are important differences in school attendance depending on economic situation and poverty status. According to de Barros et al. (2008) Peru ranks the fifth most unequal country in educational opportunity (in primary education) of the 19 Latin American countries in their sample[23]. There are also disparities in the access to health care facilities. Figure 2 illustrates the difference in secondary school attendance and in the delivery care during childbirth between the poorest 20% and the richest 20% of the population in Peru.

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[21] Spanish is the official language of Peru, spoken by around 85% of the households as their mother tongue. In addition, there are more than 40 indigenous languages in Peru. Quechua and Aymara are the most common, mostly spoken in the Andean region. The other minority languages are spoken by small groups of people mostly living in the Amazon jungle (Cueto et al., 2012).

[22] These inequalities are calculated with a dissimilarity index for the year 2005. The inequality of opportunity index in clean water and sanitary conditions for Peru is 31%, only surpassed by Nicaragua, Guatemala, Jamaica, Bolivia, El Salvador, Honduras and Panamá. The most unequal countries in the access to electricity in the sample are Bolivia and Nicaragua; Peru is the third with a value of 23%. The averages values for the Latin American region are 25% in clean water and sanitation and 8% in electricity.

[23] Peru presents a value of educational inequality of opportunity of 17%. The countries that are above Peru in this ranking are Guatemala, Nicaragua, El Salvaldor and Brazil. The average value for Latin America is 12%.

18
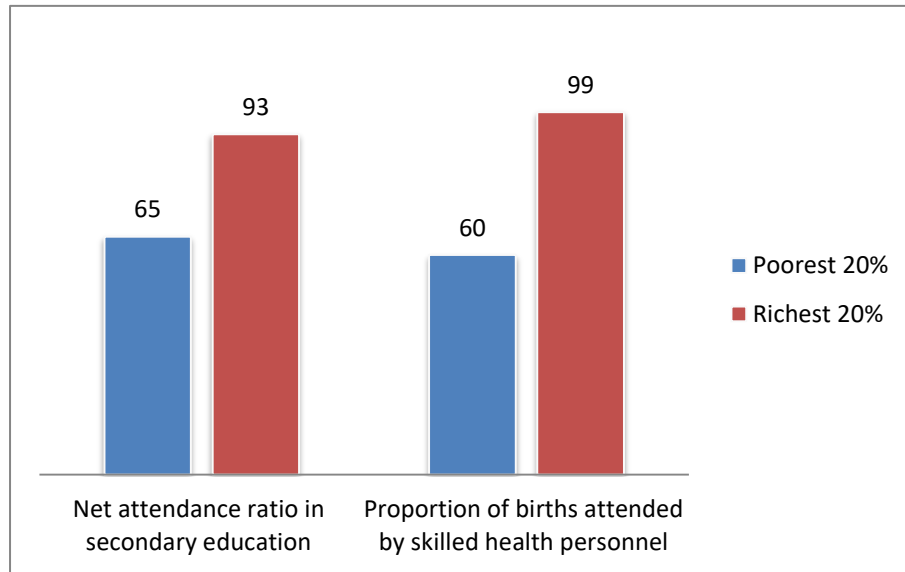
Figure 2. Access to health and education facilities between the richest and the poorest quintiles: Peru 2008-2012.

Source: Self-elaboration with data from UNICEF Data

The net attendance ratio for the richest 20% of the population is very high (93%), while among the poorest 20% of the population only 65% of children attend school. Similarly, almost the totality of births among the "rich" is attended by skilled health personnel when only 60% of the births among the more disadvantaged received skilled health personnel's attention.

Inequality of opportunity can perpetuate intergenerational transfer of poverty. The unequal opportunities in the access to education due, for instance, to child work can reinforce the differences in all economic and social future outcomes between the rich and the poor creating poverty and inequality traps.

Given the high levels of inequality in Peru in all of the development dimensions presented in this chapter, it is relevant to evaluate whether CCT programs like *Juntos* could help to reduce such inequalities and to break its persistence over the life course.

2.3.2 JUNTOS

The political and social instability, subsequent to the economic crisis of 1998-1999, led to a new democratic government in Peru in 2000 and to a continuous process of economic recovery during the following years (2001-2005). Peru was still far away to move towards the achievement of the MDGs. According to the INEI (2006) the economy grew 14% during that period; however, this growth did not translate into an equal decrease in poverty. Within this framework, the Presidency of the Council of Ministers (PCM[24]) of Peru together with the UNDP[25] established a series of agreements with the purpose of putting in operation the new National Program of Direct Support to the Poorest-*Juntos* (Lizarzaburu, 2008).

Having two of the most popular CCT programs in Latin America as a paradigm (*Progresa/Oportunidades* in Mexico and *Bolsa Familia* in Brazil), *Juntos* was finally launched in Peru in 2005. The program was designed with the aim of contributing to human development and breaking the intergenerational transfer of poverty through economic incentives that promote and support the access of households to basic social services.

Therefore, it is specifically targeted towards families with the presence of children under 14 years old in a situation of extreme poverty, living in districts with poverty rates equal or above 40%. The selected families receive a monthly direct transfer of 100 *nuevos soles* for a period of four years. In return, they commit to accomplish a set of requirements. The first condition is the attendance for children to at least the 85% of the activities in school. Second, they commit to periodical visits to health centers for a set of health and nutrition controls (for both children and mothers) as well as for educational talks. In addition, they must participate in the program *Mi Nombre*[26] which provides identity documents for those who do not have any[27]. All the requirements are described in Table 1. If the families fail to fulfill these commitments, they are removed from the program.

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[24] *Presidencia de Consejo de Ministros* in Spanish.

[25] United Nations Development Programme.

[26] "My Name" in English.

[27] In 2007 more than a half million Peruvians did still not have a national ID (INEI, 2007).

Table 1. Conditions of the Program Juntos

	Commitments
Education	Children between 6 and 14 years old who did not complete primary school: assistance to the 85% of activities in the education center.
Health	Complete vaccination, deworming and vitamin supplements up to 5 years, pre and post natal controls and educational talks for pregnant mothers.
Nutrition	Growth and development controls for children up to 5 years and participation in the Program of Food Supplementation[28] for groups in greater risk.
Identity	Participation in the program *Mi Nombre* for every family with children without birth certificate and/or adults (older than 18) without DNI[29].

Source: Self-elaboration following Huber et al. (2009).

The selection process of the program has three different stages: geographic targeting, household targeting and communal validation. First, based on poverty and extreme poverty rates, child chronic malnutrition and high incidence of political violence the districts of intervention are selected. In the second stage the program is assigned to the beneficiary households. The household targeting is executed by the SISFOH[30] through an algorithm developed by the INEI which is based on the Socioeconomic Classification (CSE) based on the level of income of the household and household monthly electricity and water invoices. Finally, the record of the selected beneficiaries is presented to the local population in an assembly where they have the chance of removing from the list those families who, in their opinion, do not fulfill the criteria to participate in the program based on the families' economic situation.

Following this process the program was gradually implemented across the different regions of the country, prioritizing those districts with the highest extreme poverty rates and grades of political violence (Perova and Vakis, 2009). *Juntos* was initiated in 2005 in the departments of Apurimac, Ayacucho, Huancavelica and Huanuco, reaching 22,550 households. This represents 0.37% of the total number of households of the country. The program has expanded its coverage continuously during the following decade, reaching 814,533 households in 18 different departments of Peru in 2015.

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[28] In Spanish*: Programa de Complementación Alimentaria.*(*PACFO)*
[29] National ID. In Spanish: *Documento Nacional de Identidad (DNI)*
[30] System for Household Targeting (*Sistema de Focalización de Hogares* in Spanish). It is an institution belonging to the Ministry of Development and Social Inclusion of Peru, created to provide socio-economic information to identify the beneficiaries of social programs.

Panel A of Figure 3 shows the number of households in each of the four departments where *Juntos* was first implemented. Panel B of Figure 3 plots the evolution of the number of households attended by the program in the whole country over the last ten years.

Panel A. Households with Juntos: Peru 2005.

	Apurimac	Ayacucho	Huancavelica	Huanuco
■ HH in Juntos 2005	3030	9258	7809	2453
■ Poor Households	47946	50313	72903	90081
■ Total HH	102013	150969	102680	158037
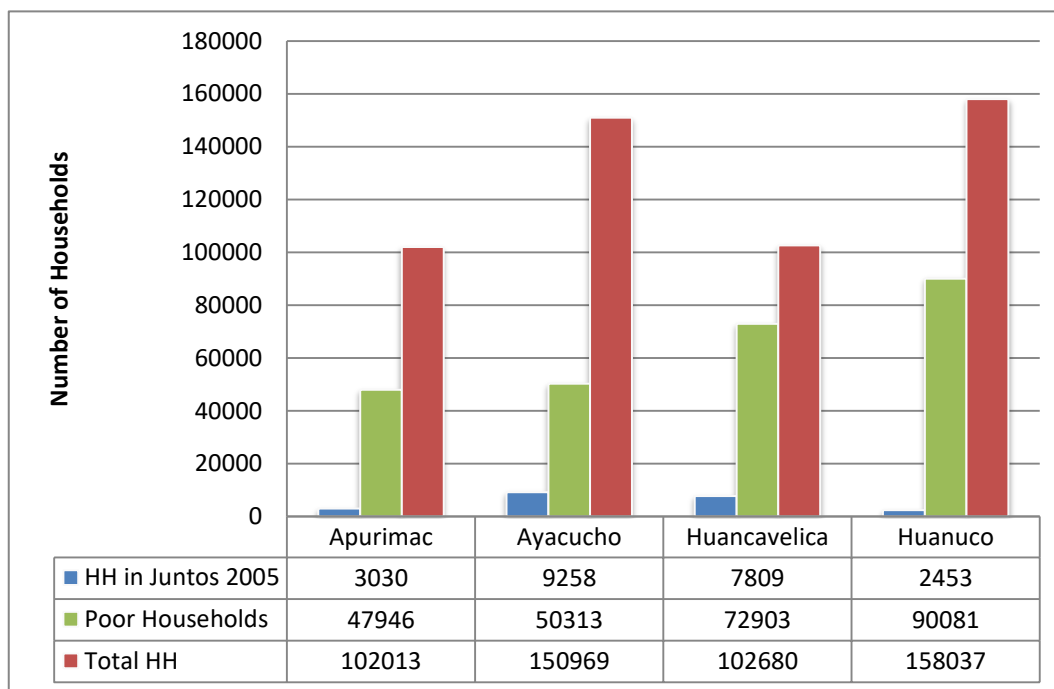
Panel B. Evolution of the number of Households in Juntos: Peru 2005-2015.
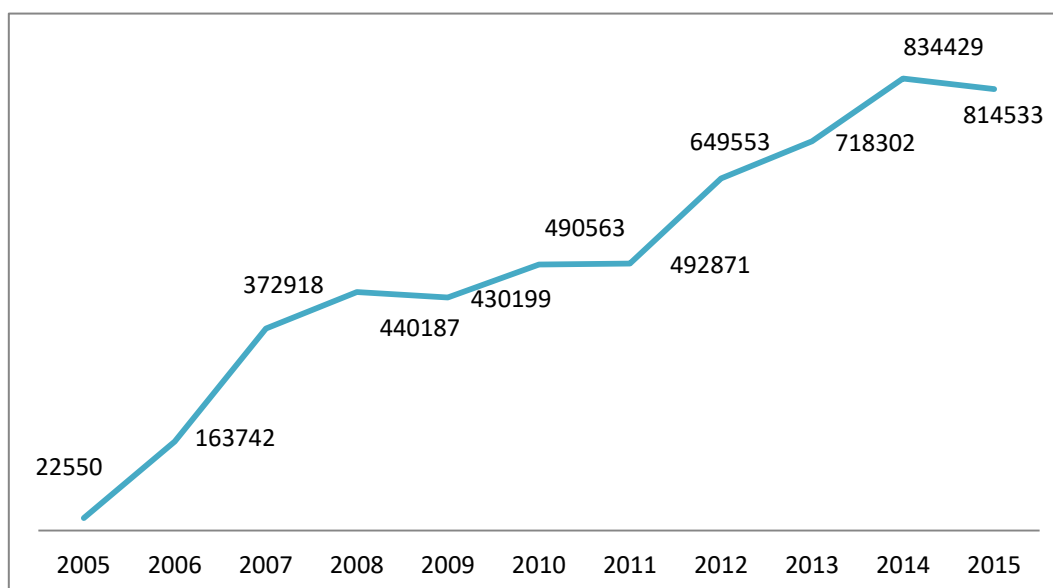
Figure 3. Beneficiary Households of JUNTOS.
Source: Self-elaboration with data from the ENAHO and Bustamante et al. (2016)

Few households were attended by *Juntos* in 2005 since it was a pilot program. Only one year later the number of households receiving the program increased in over 140 thousands. Its political and social success led to the increasing rolling out of the program across the Peruvian regions and to its continuity over time[31]. Figure 4 shows the provinces where the program was implemented by year of implementation. A decade after its commencement, *Juntos* has become the most important policy tool to fight against poverty in Peru.
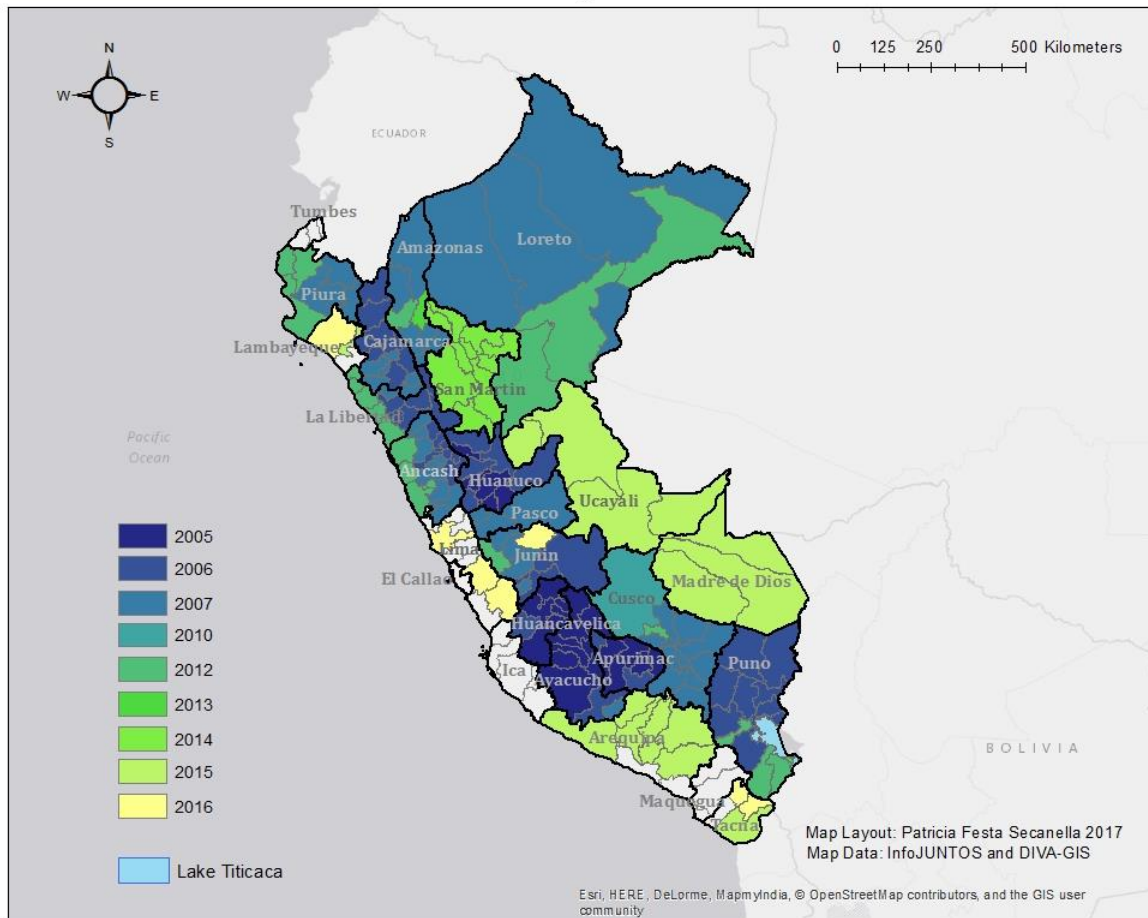
Figure 4. Peru: provinces by year of entry into the program *Juntos*

Source: Self-elaboration with data from InfoJUNTOS

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[31] *Juntos* is still working in Peru in 2017, and it is supposed to continue in the near future.

3   Previous Research

The increasing implementation of CCT programs around the world, and especially in Latin America, has been accompanied by a rich literature on the debate of how relevant can CCT interventions be as policy tools (Son, 2008) as well as large evidence on CCT impact evaluations. The majority of these evaluations focus on the effects of these interventions on consumption, education, health, nutrition or poverty reduction and most of them are based on the *Progresa-Oportunidades* or *Bolsa Familia* programs in Mexico and Brazil respectively (see for instance Hoddinott and Skoufias, 2004; Behrman et al., 2005; Glewwe and Kassouf, 2012; Rivera Castiñeira et al. 2009). Distributive effects have received noticeably less attention, despite the implicit potential of these programs to improve equality.

Soares et al. (2009) find equality improving effects of CCT programs in three different countries (*Bolsa Familia* in Brazil, *Progresa-Oportunidades* in Mexico and *Chile Solidario* in Chile) by decomposing the changes in the Gini coefficient into four different household income components: labor income, social security income, CCTs income and other income. In spite of the differences in the design and coverage of the programs analyzed, CCTs contributed highly to the reduction of inequality in the three countries; according to the authors 21% in Mexico and Brazil and 15% in Chile of the inequality decrease from the mid-1990s to the mid-2000s was attributed to CCTs income, even though in the three countries CCTs income represents less than 1% share of total income. The authors argue that this success is due to the effective targeting of the three CCT programs.

Skoufias et al. (2006) claims that while many public transfers turn to be regressive (such as scholarships, food-based assistance programs and social insurance transfers), CCTs are very progressive[32]. The reason behind the equalizing results of CCTs is their targeting mechanisms that are able to reach effectively the poor. Handa et al. (2001) also find a reducing inequality effect in their study of the spillover community impacts of *Progresa-Oportunidades*, using the coefficient of variation and the standard deviation of the logarithms of monthly adult equivalent consumption and a difference-in-differences

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[32] CCT are progressive in the sense that they reach effectively the poor segments of the population and this has a positive redistributive effect in favor to the most disadvantaged.

strategy comparing treatment and control localities (communities that received and did not received the CCTs).

The literature on the effects of CCTs on inequality of opportunity is even scarcer. There are some exceptions, though. Krishnakumar and Chávez-Juárez (2011) measure the impact of *Progresa-Oportunidades* on inequality of opportunity for children in urban and rural areas in Mexico employing the *capabilities* approach[33]. The authors estimate a general "development capabilities" taking into account capabilities in health, education and living conditions by a series of observable functioning (including grades at school, access to health insurance, or electricity and sanitary installations in the house) using a MIMIC[34] model. Then they compare the effect of "circumstances" such as gender, parental education or parental indigenous roots on the estimated capabilities between those villages with the *Progresa-Oportunidades* program (treatment group) and those without the program (control group). The main finding is that, remaining all other circumstances unchanged, capabilities for children are higher in the treated localities so they conclude that CCTs programs can be powerful in reducing inequality of opportunity and increasing social mobility.

Ham (2014) studies the effects of three different CCT programs (*Progresa-Oportunidades* in Mexico, *Programa de Asignación Familiar* in Honduras and *Red de Protección Social* in Nicaragua) on educational inequality of opportunity using primary school enrollment as the main outcome and dividing the population into groups by "types" of circumstances (gender, ethnic, parental education and household type). The programs improve overall enrollment and these gains are higher for the "disadvantaged" than for the "advantaged" having this an equalizing effect on the enrollment distributions between these two groups, reducing inequality of opportunity. As such, according to the author, CCTs programs can be suitable complementary tool to social policies directed to reduce inequality.

This thesis studies the possible effects of CCTs programs on inequality of opportunity analyzing the program *Juntos* in Peru. The original design of *Juntos* did not include an

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[33] The capabilities approach was first developed by Amartya Sen (1990). It makes a distinction between the concepts of *capabilities* (what people are able to do or to be) and accomplished *functioning* (or outcomes). It can be used for the evaluation of social policies with a plural and multidimensional perspective of well-being. See more in Robeyns (2005).

[34] The Multiple Indicators and Multiple Causes (MIMIC) models are causal models that employ latent variables as the dependent variable. A latent variable is a construct that cannot be directly observed but has an operational relation with multiple "indicators" and "causes" so it can be estimated. See Jöreskog and Goldberger (1975).

impact evaluation strategy. Consequently, ten years after its implementation there is still little quantitative information about the impact of the program.

Perova and Vakis (2011) evaluate the impact of *Juntos* for the five first years of implementation (until 2009) employing an instrumental variables (IV) strategy. The aim of that study is to complete the evaluation of Perova and Vakis (2009), which covers the period from 2006 and 2007, and to examine how the impacts of the CCT program change over time. The authors find a significant impact of *Juntos* on consumption, although this impact is low compared to other CCT programs (like *Familias en Acción* in Colombia or *Atención a Crisis* in Nicaragua). In a similar way, they find a moderate impact on the reduction of poverty. According to these studies the program increases the use of health services for children and women in reproductive ages. However, there are not significant impacts on key indicators such as vaccinations. Regarding schooling, they observe positive effects on school attendance for those who are already enrolled but no effects on school enrollment.

The households that participate in *Juntos* receive monthly monetary transfers during four years (conditional on the stipulated commitments). Since there are new households joining the program each year, it is possible to study if the effects of *Juntos* become stronger as the households spend more time in the program. The authors do not observe accumulative effects on the indicators of consumption or poverty; meaning that these impacts do not become stronger over time. However, the impacts on health and education indicators are higher for those beneficiaries who have been participating for a longer period. For instance, the probability of staying healthy is 11% higher for those children who have being beneficiaries of the program during 3 years or more than for those who have been in the program less than one year.

Most of the research about *Juntos* focuses on the reduction of poverty and the evolution and fulfillment of the conditions of nutrition, health and education associated with the program. Nevertheless, some authors also explore the possible impact of *Juntos* on factors in principle beyond the original design of the program such as gender empowerment, community dynamics, quality of public services and children experiences. Vargas (2010) claims that *Juntos* has the potential to address gender vulnerabilities through the reinforcement of the gender approach in the phases of planning and execution. Jones et al. (2008) report adverse community dynamics effects due to difficulties and weaknesses in both targeting and community validation processes; reduction in family violence according to women states; and no improvements in the quality of public services in spite

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of the increased demand. Streuli (2012) argue that although CCT programs like *Juntos* are supposed to be focused particularly on children they are usually considered merely as "future adults" so their needs and experiences while they are still children are understated.

Although there is not much evidence of the effects of *Juntos* on inequality, some studies can be found. Yamada et al. (2016) have reported a decrease in income inequality during the period 2004-2014 in Peru, being larger during the period 2007-2011, using both microdata from household surveys and national accounts. Yamada and Castro (2007) discussed the failing of social policies to support the reduction of poverty and inequality in the short and medium term in Peru using data for the period from 1997 to 2004. However, a few years later Castro et al. (2012) estimated an average annual decrease in the Gini Index of 2.4% during the period 2006-2010 and attributed a 25% of this improvement in inequality levels to the social policies and programs carried out by the Peruvian government, having *Juntos* a major role. This could be an indicator of an important progress in the design, implementation and targeting of social policies in the country in the most recent years. Jaramillo (2013) on the other hand, claims that direct transfers including the CCTs of *Juntos* although being effective in reducing extreme poverty have a minor role in the reduction of inequality.

This thesis contributes to the literature on the impact of *Juntos* with a quantitative analysis of the effects of the program on the well-being in Peru which are still scant due to the fact, to some scope, that it did not incorporate an evaluation strategy from the beginning. This analysis employs the well-known strategy of *difference-in-differences* that has been largely applied in the evaluation of public policies and is especially useful in cases in which there is no randomization. At the same time, it incorporates a new methodology for measuring inequality of opportunity based on the NBI approach, which has increasingly became one of the most popular direct methods to estimate poverty in Latin America but its promising potential for measuring inequality has not been exploited yet. The new methodology to measure inequality of opportunity allows approaching inequality with a multidimensional perspective of well-being, bringing to light the concept of equity which is gaining more and more importance in both academia and policymaking.

4 Data

The principal source of data employed in the empirical analysis of this thesis is the National Institute of Statistics and Informatics (INEI) of Peru. The *Encuesta Nacional de Condiciones de Vida y Pobreza*[35] (ENAHO) is the principal household survey of Peru. It collects information about living conditions and characteristics of the Peruvian households yearly since 2003 at the national range in urban and rural areas of the 24 departments of Peru and the constitutional province of El Callao. With the aim of generating monthly indicators that allow to evaluate the situation of poverty, well-being and living conditions of the households and their patterns over time the ENAHO offers information about the housing conditions, demographic and economic characteristics of the members of the households, education, health, and employment in different modules.

The module 100 of the ENAHO provides micro data on the characteristics of dwelling and housing including information about household expenditure and five NBI indicators: inadequate housing, overcrowding, inadequate sanitary conditions, non-schooling for children and economic dependence. The sixth NBI used in the quantitative analysis is created from five different variables collected in the module 400 of the ENAHO which is dedicated to the information about health. The resulting NBI type 6 that measures the lack of access of the household to health facilities is a dummy variable that takes the value 1 when a member of the household had some disease symptoms but did not seek medical attention because of the following reasons: did not have money, the health center was far away, or he/she does not have any health insurance. The six different types of NBI are defined in Table 2.

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[35] "National Survey of Life and Poverty Conditions" in English.

Table 2. Definition of the NBI indicators used in the analysis

Variable	Definition	Description
NBI type 1	**Inadequate housing**	Households in dwelling with floor and exterior walls built with precarious materials; or makeshift housing (cane, palm leaves, stone, etc.).
NBI type 2	**Overcrowding**	Population in households with more than three people per room; without taking into account the kitchen, the bathroom or the garage.
NBI type 3	**Inadequate sanitary conditions**	Households in dwellings that do not have toilet facilities for pipe network, septic tank or cesspool
NBI type 4	**Schooling**	Presence in the household of at least one child between 6 and 12 years who is a relative of the head of the household and does not attend a school center.
NBI type 5	**Economic Dependence**	Households where the household head has not completed primary education and in households where live more than three people per worker.
NBI type 6	**Health care**	Presence in the household of an individual that in spite of having had a disease did not seek medical attention because of the following reasons: did not have money, do not have health insurance or it was far away.

Source: Self-elaboration from the definitions of the INEI.

The selected variable for measuring inequality of opportunity, conditional on NBI indicators, is household expenditure as an approximation of household consumption. As such, "last monthly household expenditure paid by a household member" as defined in the ENAHO is used to estimate the different weights in the NBI Inequality Index for all the indicators of NBI, geographic areas and type of environment. The two principal outcomes typically used for measuring inequality are income or consumption. In developing countries, consumption is considered a better approximation for well-being since rural households (which tend to be the poorest) many times consume what they produce and this cannot be captured by income. Moreover, income usually fluctuates a lot more than consumption, especially in farm households because of the seasonality characteristic of agricultural employment so consumption is a more reliable indicator of welfare (Perkins

et al, 2012; pp 166). Besides, in the case of Peru household surveys tend to capture expenditure more accurately than income (Casas and Málaga, 2013).

In order to evaluate the impact of *Juntos,* data from before and after the program is needed. The ENAHO 2004 is considered the baseline survey for the analysis since *Juntos* was initiated in Peru in 2005. The beneficiary families received cash transfers during 4 years conditional on the commitments of the program. As such, the outcomes after the program are going to be evaluated in the year 2011. With the aim of examining some possible short-term effects the same outcomes are going to be also evaluated in 2008 when the families which first received the CCTs are still part of the program.

The unit of observation in the module 100 of the surveys is the household while in the module 400 is the individual. Merging both modules of the ENAHO is necessary to have all the information required for the analysis in one single file. The ENAHO 2004 contains information about 21,919 households in the 24 departments of Peru and the constitutional province of El Callao in the module 100 and 86,455 individuals in the module 400. The variables "*vivienda*", "*hogar*" and "*conglomerado*"[36] allows merging these two modules of the survey resulting in a sample of 86,455 individuals to which are added the variables of the characteristics of their respective household. Finally, one observation per household is selected. In this process some observations are lost. The final sample for the year 2004 is composed by 17,616 households. The same process is accomplished for the ENAHOs 2008 and 2011 resulting in total samples of 19,194 and 22,040 households respectively.

The national sample is probabilistic, stratified, multistage and independent in every department of study. Taking into account the survey design is necessary to obtain unbiased and accurate estimates since the stratification and clustering in the sampling process can have a large effect on the standard errors, producing bias in the mean estimates. Therefore, the estimation process using data from the ENAHO involves the use of a probabilistic weigh (*pweight*) in order to the sample to be representative for the whole population[37]. This *pweight* is adjusted taking into account the projections for the population of groups of age and sex and levels of inference proposed in the sample design. The final weights correct for sampling bias, non-interview and non-response bias, and have been recalibrated according to the population demographic characteristics of the

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[36] "Dewlling","household" and "conglomerate".

[37] The variable *factor07* is used to set the survey statement using conglomerates (*conglomerado*) as primary sampling units (PSU). As such, when processing mean estimates and regression parameters Stata takes into account the number of subjects in the population that each observation represents. To learn more about survey setting and *pweights* visit http://www.stata.com/manuals13/svysvyset.pdf.

Census of Population and Housing (CPV[38]) 2007 in the three rounds of the ENAHO used in empirical analysis (2005, 2008, and 2011). The confidence level of the sampling results is 95% (INEI, 2007).

Finally, the CPV 2005 of Peru is going to be employed to analyze the possible differences between the *treatment* and *control* groups in the baseline of the study. The CPV 2005 provides information about the members of the households in all the departments, provinces and districts; except for two districts: Mazamari y Pangoa due to problems of territorial demarcation[39].

4.1 Data Limitations

The NBI indicators are constructed with census information, although they have been recently included in the household surveys. These censuses has the advantage of reaching a very high level of geographic disaggregation with great accuracy data but normally they do not collect information about income or expenditure; and even when income or expenditure information is provided it is not very reliable (Feres and Mancero, 2001). Moreover, due to its periodicity the census do not allow for running evaluations in the short run. Therefore, the best option is usually to combine both census and household surveys[40].

The INEI has combined the information of the national household survey with the census, providing NBI variables in the ENAHO. One recognized problem regarding the NBI indicators is that the "identifiable" needs are limited due to the fact that they are based on census information. As such, NBI variables usually do not include information about health or nutrition. This is the case in Peru. I attempt to deal with this problem in the present research by creating a new NBI indicator for health based on information from the ENAHO.

It is well-known that household surveys tend to underestimate income and expenditure due to a problem of non-compliance: the "rich" systematically refuse to participate in the surveys. This problem is typically greater for income than for expenditure (Ravallion,

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[38] For its acronym in Spanish: *Censo de Poblacion y Vivienda.*

[39] These two districts are located in the province of Satipo, in the department of Junin, which is not part of the *treatment* or the *control* group so the study is not affected.

[40] See for instance Hentschel et al. (2000).

2003). In addition, it is normal to find problems of accuracy in survey data due to recall bias, telescoping bias or social desirability bias (Iarossi, 2006). The INEI tries to correct for these possible measurement errors in the design of the survey by introducing the above mentioned probabilistic weights.

Since the CCTs in *Juntos* were not randomized, systematic differences between the treatment and control groups can lead to biased estimates of the treatment effects. The econometric techniques applied in this thesis try to deal with this problem[41]. Some of the control variables that are going to be added in order to control for these differences are not available at provincial level. Consequently, they have to be aggregated at departmental level.

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[41] This issue will be further discussed in the chapter dedicated to the selection of the treatment and control groups.

5   Estimation Strategy

This thesis evaluates the potential of CCT programs to improve equality of opportunity in developing countries. With the aim of analyzing if this theory is supported by empirical data, it incorporates a quantitative analysis of the effects of the CCT program *Juntos* on inequality of opportunity in Peru. In order to study the impact of the program, I am going to employ a *difference-in-differences* strategy; comparing the level of inequality of opportunity, obtained from estimated household expenditure distribution vectors conditional on NBI indicators, between two groups: one group of provinces that was "treated" with the program and one comparison group of provinces where the program was not implemented by the time the outcomes are measured.

The following chapters explain the quantitative methodology. First, presenting the inequality of opportunity index measured by NBI and then with a description about the difference-in-differences strategy and the selection of the *treatment* and *control* groups.

5.1   NBI Inequality of Opportunity Index

The first step is to estimate a *predicted* distribution vector of monthly household expenditure using an index based on household characteristics. The index takes into account the six types of NBI already mentioned in the previous sections. In order to capture the effect of having more than one NBI, interactions between all the NBI indicators are included since it is easy to notice that the effect of having three NBI indicators, for instance, cannot be as large as the sum of the effect of each of those three NBI separately. With the aim of controlling for the possible geographic and urban/rural living conditions differences, variables of geographic domain and type of environment are also included. The index can be expressed as follows:

(1) $HHexpenditure_i$
$$= \beta_{1i}nbi1_i + \beta_{2i}nbi2_i + \beta_{3i}nbi3_i + \beta_{4i}nbi4_i + \beta_{5i}nbi5_i + \beta_{6i}nbi6_i$$
$$+ \sum_{=0}^{n} \omega_{ji}nbi*_{ji} + \sum_{k=0}^{n} \vartheta_{ki}domain_{ki} + \gamma_i rural_i$$

Where $HHexpenditure_i$ is the assigned level of household expenditure for the household i; *nbi1* to *nbi6* are dummies for the six different types of NBI (inadequate housing, overcrowding, inadequate sanitary conditions, non-schooling, economic dependence and lack of access to health); $nbi*_j$ represents each interaction between the NBI indicators; $domain_k$ corresponds to each variable of geographic area where the household is situated (north, central or south coast; north, central or south highlands; jungle; or metropolitan municipality of Lima); *rural* is a dummy variable which takes the value 1 if the household lives in a rural environment and zero otherwise; β_{ji}, ω_{ji}, θ_{ki} and Y_i are the estimated weights for each variable. A more detail explanation about the index can be found in Appendix A.

By applying this index in the ENAHO, a level of household expenditure is assigned to each household in the sample. The following step is to group the households by province and then measure inequality among households for each province.

Therefore, we will have one expenditure distribution vector per province and with this information it is possible to measure inequality by applying the Gini index on each of them. The Gini index compares the actual income (or expenditure) distribution with the situation of "perfect" equality in which 40% of the population would receive 40% of total income, 60% of the population would receive 60% of total income and so on. The Gini coefficient can be obtained as follows:

(2) $$Gini_{p,t} = 1 - \sum_{i=1}^{n}(X_{i+1} - X_i)(Y_i - Y_{i+1})$$

Where X is the proportion of accumulated population and Y is the accumulated expenditure. This coefficient takes values from 0 to 1, being one perfect inequality and zero perfect equality. I calculate the *Ginis* for the years 2005, 2008 and 2011. Once the different *Ginis* for each province p and year t are calculated, one can study the impact of the CCT program on inequality of opportunity with a *difference-in-differences* strategy.

5.2   Difference-in-differences

The goal is to estimate the *causal* effect of the treatment. As such, we would like to compare the potential outcome of the group exposed to the treatment if they were actually treated with the potential outcome of that same group if they would have never been treated (i.e. with its counterfactual). Obviously, that is not possible because only one of the potential outcomes is observed. Comparing the same group over time can be problematic since other factors that may affect outcomes also may have changed at the same time, so it is not possible to isolate the treatment effect from the effects of other factors. The estimator would be biased. The same problem may occur when comparing the individuals exposed to the treatment with another group of unexposed individuals: the differences observed in their outcomes could be attributed to the treatment but also to pre-existing differences (Duflo et al., 2007). The ideal solution to this problem is randomization. However, the CCTs of *Juntos* were not randomly assigned so it is not possible to perform a randomized evaluation. It is necessary in this case to employ other techniques. The more suitable approach is to apply a quasi-experimental evaluation using a *difference-in-differences* (DiD) strategy. The DiD strategy would provide unbiased estimators solving the problems of omitted variable bias and self-selection, under the assumption of parallel trends.

The DiD estimator compares the difference in the outcome of interest before and after the intervention for the group exposed to the treatment with the same difference for the comparison or control group (Duflo et al., 2012). It can be expressed as follows:

(3) $\widehat{DD} = \left(\bar{Y}_{treatment,after} - \bar{Y}_{treatment,before} \right) - \left(\bar{Y}_{control,after} - \bar{Y}_{control,before} \right)$

Where $\bar{Y}$ are sample means of the outcome of interest. The outcomes of the control group acts as the "estimated" counterfactual for the treatment group[42]. Since there is data available for both periods before and after the program for all the provinces in the country, it is possible to perform this analysis.

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[42] See more about counterfactual estimations in Gertler et al. (2016).

In order to study the impact of *Juntos* on inequality of opportunity in Peru, the following model is estimated:

(4) $$Gini_i = \beta_1 TREAT_i + \beta_2 POST_i + \beta_3 TREAT * POST + \mu$$

(Model 1)

where *Gini$_i$* is the Gini coefficient, calculated as explained in the previous chapter, for the province *i*; *TREAT* is the treatment indicator so it takes the value 1 if the province *i* is treated with *Juntos* and zero otherwise; *POST* is a dummy variable that indicates the time when the program is being evaluated, it takes the value 1 if the time corresponds to after the program and zero otherwise; *TREAT*POST* is the interaction between the treatment and time variables, it takes the value 1 for the treated provinces after the program and zero otherwise; and finally μ is an error term. The standard errors are clustered by province since it is very likely that they present serial autocorrelation within groups (clusters) due to the structure of the data[43].

This model can be estimated using a simple Ordinary Least Square (OLS) regression, being $\hat{\beta}_3$ the parameter of interest: the DiD estimator. The first challenge, though, is to find a valid comparison group.

5.3   Treatment and Control Groups

Every observation in the ENAHO has a "district code" *(ubigeo)* that identifies the district where the household lives so it is possible to group the households at district, provincial and departmental levels creating new variables from the former one. This allows measuring inequality between regions. The open data portal of *Juntos[44]* provides quantitative and qualitative data about the program, including information of the year in which the policy was applied for the first time in each province. This information is employed to create the *treatment* and *control* groups.

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[43] Ignoring intra-class correlation in the error term can bias the estimates. See Angrist and Pischke (2008; pp.221-240). Clustering is a solution that corrects for serial autocorrelation and heteroscedasticity in this case (Duflo et al., 2012).

[44] Visit InfoJUNTOS: http://www.juntos.gob.pe/modulos/mod_infojuntos/index.html.

5.3.1   Groups Selection

As mention above, the CCTs were not randomly assigned to the households. Treatment and control groups are selected taking advantage of the gradual implementation of the program across the Peruvian regions. Since, in theory, all the provinces reached by *Juntos* are similar in the sense that all of them fulfill the selection criteria for the government to intervene in their districts, a counterfactual for those provinces which received the program during the first years of implementation can be found in those other provinces which did not receive the program during those years but would have been "eligible" so they actually received the program some years later[45].

Following this idea, the treatment group is going to be formed by those provinces situated within the four departments which received the program in 2005. On the other hand, the control group will be formed by those provinces reached by the program in 2012 and 2014. Both groups of provinces are illustrated in Figure 5.
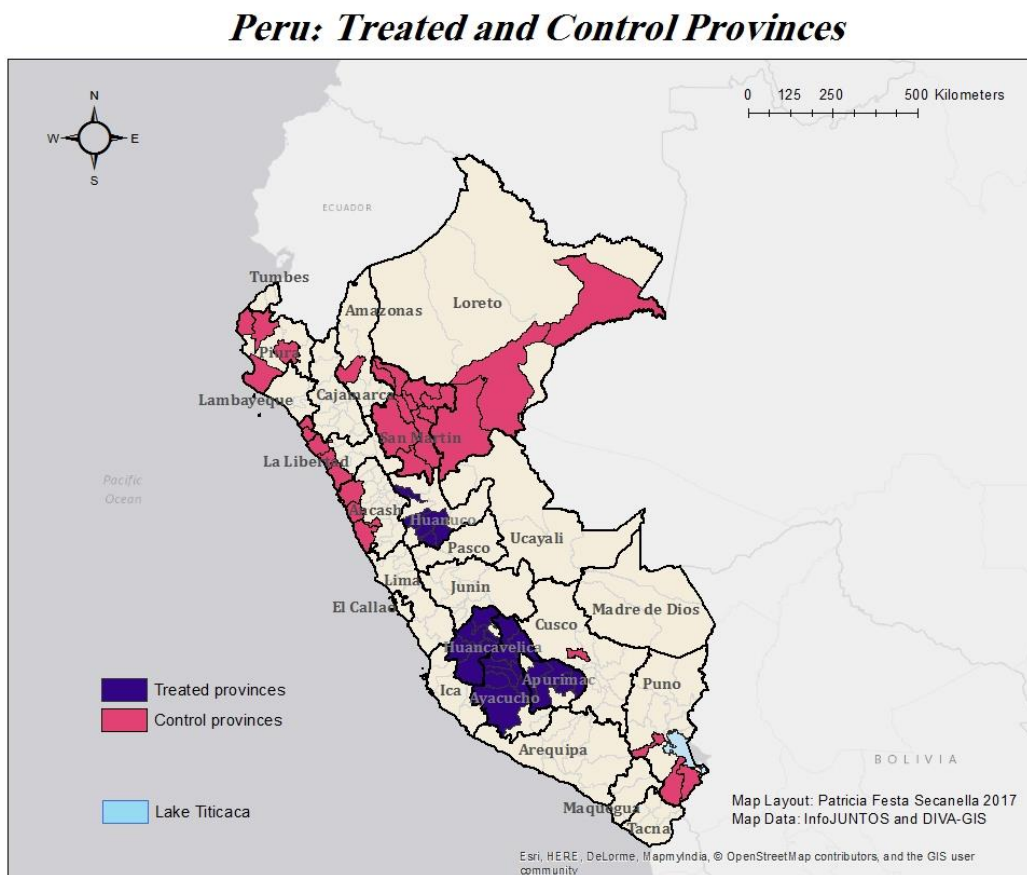

Figure 5. Peru: Treatment and Control Groups
Source: Self-elaboration with data from InfoJUNTOS

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[45] Lundborg et al. (2014) provide an example of this rolling out strategy to choose a valid control group.

The 26 treated provinces are located in the departments of Apurimac, Ayacucho, Huánuco and Huancavelica. The 31 provinces in the control group are situated within the departments of Amazonas, Ancash, Loreto, La Libertad, Piura, Puno and San Martín.

5.3.2   Descriptive Statistics

Since the program was specifically targeted to marginal groups in the poorest areas of the country, the provinces in the treatment group may be very different from the provinces in the control group regarding household characteristics, poverty and economic conditions.

Figure 6 shows the relationship between household expenditure and the number of NBIs. Household expenditure decreases as the number of NBI indicators increases, as expected. There is a big difference in household expenditure between "rich" (the ones that do not have any unsatisfied basic need) and "poor" households (those which have one or more NBI). Among the poor households, expenditure decreases slowly with the increase in the number of NBI. The total national sample and the sub-samples (treatment and control groups) all present this relation although for the treatment group the difference in household expenditure between the rich and the poor is smaller.
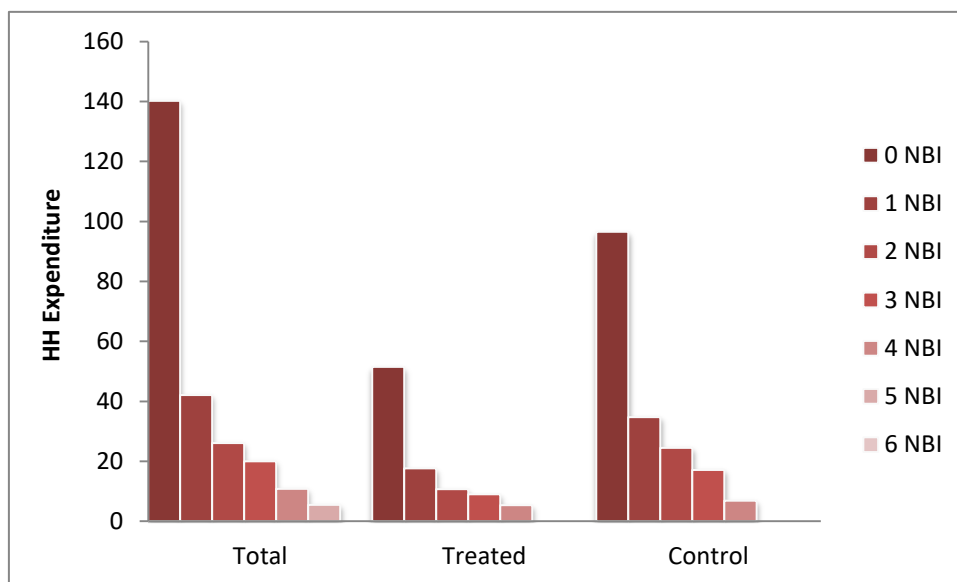

Figure 6. Relation between Household Expenditure and number of NBIs

Source: Self-estimations using data from the ENAHO 2004

Table 3 provides descriptive statistics for the main variables used in this study (household expenditure and NBIs) by type of environment and treatment status. It also includes information about monetary poverty[46].

Table 3. Descriptive Statistics

		NATIONAL			TREATMENT			CONTROL		
Variables		Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
	HH Expenditure	104.88	136.04	13.69	26.32	53.26	9.95	70.25	90.02	12.46
		(3.36)	(4.33)	(0.54)	(1.50)	(3.67)	(0.60)	(2.64)	(3.19)	(0.97)
	Average number NBI	0.479	0.295	1.019	0.869	0.659	1.072	0.486	0.34	1.023
		(0.011)	(0.012)	(0.024)	(0.033)	(0.068)	(0.043)	(0.025)	(0.025)	(0.067)
Poverty	**Non- extreme**	37.28	34.60	40.54	35.65	33.92	37.01	40.01	37.49	46.09
	Extreme	16.11	4.93	31.15	34.48	13.92	50.66	13.36	6.87	29.07
	Households	17,616	11,277	6,339	2,009	900	1,109	2,459	1,760	699

Standard errors in parenthesis.
Source: Self-elaboration with data from the ENAHO 2004.

Mean household expenditure in the total national sample is 104.88 *nuevos soles*; there is a large difference between urban and rural households: urban households spent on average 136.04 *nuevos soles*, while the mean estimation for households living in rural environments is 13.69 *nuevos soles*. These differences are also present in the groups of treatment and control. Household expenditure is much lower in the treatment group than in both the control group and the total national sample. At the same time the highest average number of NBI indicators corresponds to the treatment group. For the control group the mean estimations of this variable are very similar than those for the national sample, although slightly higher in the former case. In the three sub-groups, rural households have a higher number of NBI indicators as expected. There are no big differences in non-extreme poverty: around 37% of the population in Peru was below the poverty line in 2004, according to the estimations of the INEI. Poverty rates are slightly lower in the treatment group however extreme poverty is much higher in this group compared with the other two.

Households in the treatment group are poorer than households in the control group, with a higher average number of NBI indicators and lower levels of household expenditure on average. In urban environments households are richer. This result holds for the three sub-

[46] Calculated by the INEI based on national poverty lines.

samples. There is another important difference between the treatment and control groups: while in the treatment group more than 55% of the households live in a rural environment, only 28% are rural in the control group. These differences may suppose a challenge for the empirical analysis.

5.3.3   Testing the validity of the control group

In order to study the treatment and control groups present statistically significant differences, tests of differences in means[47] are performed.

The following variables are tested with the aim of obtaining an idea about the composition of the households within the two different groups: rural population (%), percentage of household that do not have access to water, percentage of households that do not have electricity, illiteracy rates, children under 12 (%), average number of NBI indicators, mean monthly household expenditure and gender of household head. The results of these tests are reported in Table 4.

The two groups present significant differences in almost all the indicators. This is not surprising since the principal criterion to select the districts of intervention of the program was based on poverty rates and most of the indicators analyzed above are related to poverty status.

Therefore, if the geographic targeting was well performed the treated provinces are expected to be poorer. The results in Table 4 show that treated provinces have a higher proportion of rural population, higher average number of NBIs, lower levels of average household expenditure, higher illiteracy rates and poorer access to electricity. All these differences are statistically significant. There are a higher proportion of children under 12 in the treated provinces; the program is specifically targeted to families with the presence of children. The composition of the households is also slightly different with more women as head of the household in the control provinces on average. There are no significant differences in the access to clean water between the two groups.

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[47] T-tests test the hypothesis that a specific variable has the same mean within two specified groups. See more at http://www.stata.com/manuals13/rttest.pdf

Table 4. Difference in means tests

Variable	Treated	Control	Difference	T-test [p-value]
Rural Population	60.48	36.11	24.37	4.424 [0.0000]
	(3.46)	(4.12)	(5.51)	
Access to water	51.50	42.66	8.84	1.771 [0.082]
	(3.45)	(3.53)	(4.99)	
Electricity	55.79	40.13	15.66	3.338 [0.0015]
	(3.19)	(3.36)	(4.69)	
Illeteracy	25.43	15.10	10.33	7.972 [0.0000]
	(0.98)	(0.85)	(1.29)	
Children under 12	30.54	22.91	7.63	4.378 [0.0001]
	(0.65)	(1.98)	(1.75)	
NBI	0.869	0.486	0.383	9.00 [0.0000]
	(0.033)	(0.025)	(0.042)	
HH Expenditure	26.32	70.25	-43.93	-13.30 [0.0000]
	(1.50)	(2.64)	(3.29)	
Gender	1.210	1.84	-0.63	2.421 [0.0155]
	(0.008)	(0.007)	(0.011)	
Observations	26	31		

Standard errors in parenthesis.
Source: Self-estimations with data from the ENAHO 2004 and the CPV 2005.

However, the treatment and control groups do not need to be equal (or even similar). The only assumption needed for the DiD estimator to be valid is that the average outcomes of the two groups would have followed parallel trends in the absence of the program (Angrist and Pischke, 2008 pp.165-283). The main problem with this type of analysis is that in order to obtain a causal effect of the treatment it is necessary to assure that the difference observed in the outcome of interest between the groups is explained by and only by the program. For instance, if the outcome of interest is inequality no external shock should have affected inequality in the provinces within the control group differently from the provinces exposed to the treatment so the parallel trends assumption holds.

One could assume that if they did follow parallel trends in the past, they would have also followed parallel trends in successive years in the absence of the program. Using data from the period before the program was initiated, it is possible to examine if the two groups had followed parallel trends in the past. Panel A of Figure 7 plots the evolution of average monthly household expenditure grouped by "treated" and "control" provinces from 2001 to 2007. Panel B of Figure 7 plots the same evolution for the average number of NBI indicators present in the households between the years 2001 and 2007 by treatment status. The vertical line marks the start of the CCT program (in 2005).

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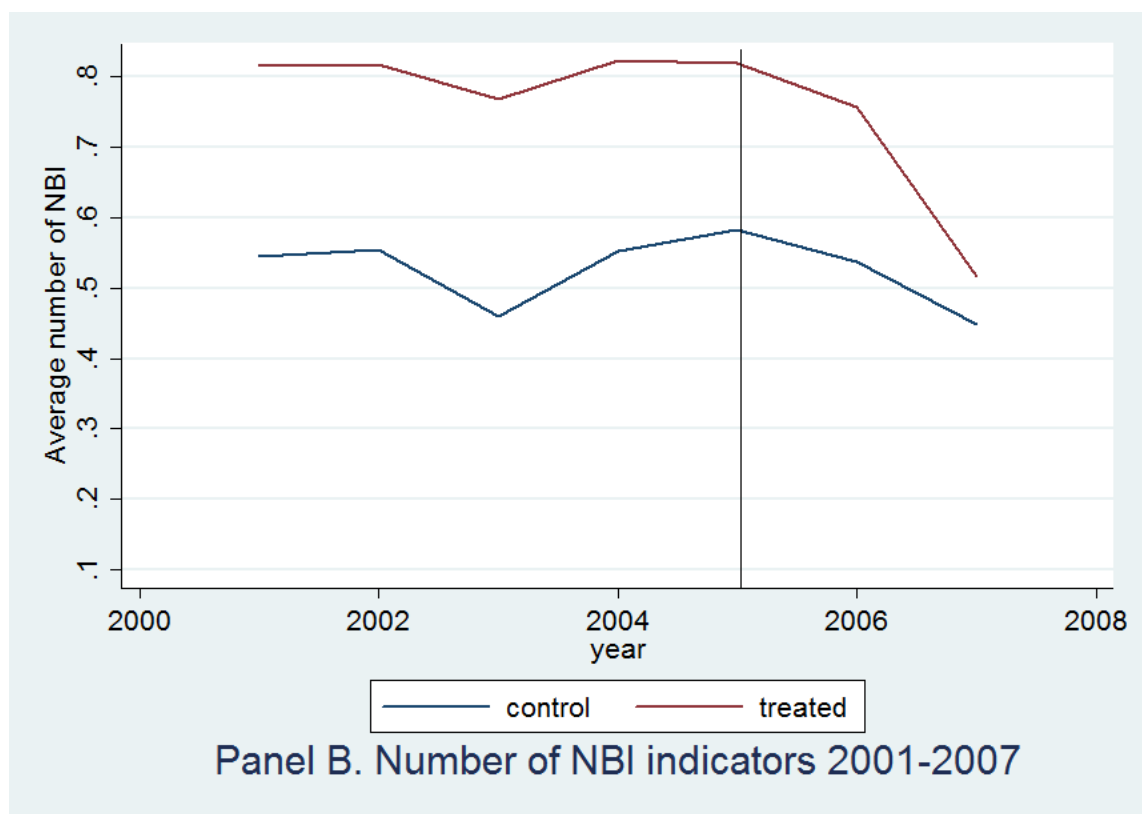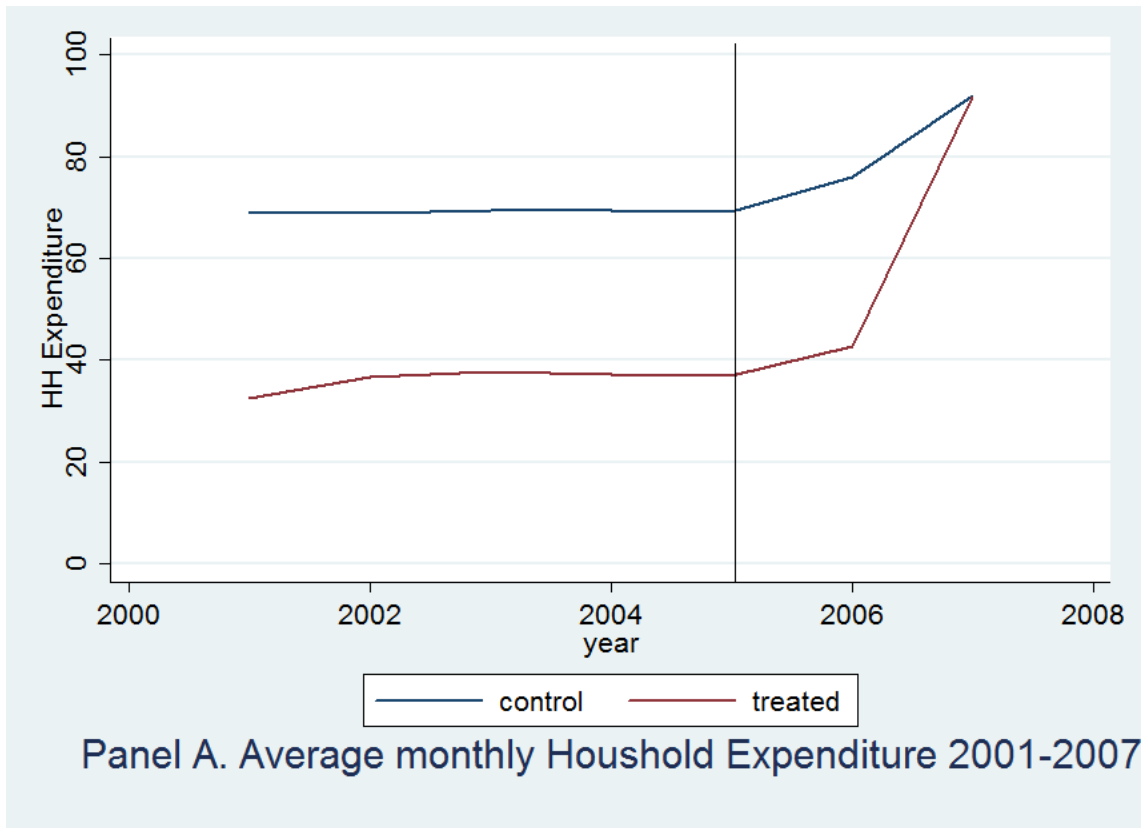Panel A. Average monthly Houshold Expenditure 2001-2007

Panel B. Number of NBI indicators 2001-2007

Figure 7. Parallel Trends: Household Expenditure and NBI indicators by treatment status

Source: Self-estimations with data from the ENAHO.

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It seems that the two outcomes for the two groups moved together during the years previous to the program. Only after 2005 (when the program was implemented in the treatment group) the graphs show notably different trends. In addition to this, I calculate the trends of the two variables and perform a difference in means test on their growth rates for the period 2001-2004 without finding any significant difference in the change of household expenditure between the treatment and control groups during that period. The trends in the average number of NBI indicators do not present any significant difference between the treatment and control groups, either. These results are reported in Table 5.

Table 5. Difference in means tests: growth rates

	Treated	Control	Difference	T-test [p-value]
Change in HH Expenditure	-0.023 (0.019)	-0.030 (0.015)	-0.007 (0.024)	-0.271 [0.7878]
Change in NBI	0.012 (0.009)	0.036 (0.024)	-0.024 (0.028)	-0.883 [0.3816]
Observations	26	31		

Standard errors in parenthesis.

Source: Self-estimations with data from the ENAHO.

The results reported in this chapter suggest that treatment and control groups followed parallel trends in the past. Based on this, it can be assumed that the two groups would have also followed parallel trends for the period after 2005 in the absence of the program, legitimizing the use of the *difference-in-differences* strategy in this case. The DiD estimator would eliminate any previous difference between the two groups of the analyzed provinces providing unbiased estimators of the impact of the program.

Since the groups are quite different, though, time-varying control variables are included to control for specific trends and to assure that the DiD estimator captures the effect of the treatment. A set of control variables (X) is added to the model:

(5) $Gini_i = \varphi_1 TREAT + \varphi_2 POST_i + \varphi_3 TREAT * POST + \varphi_i X_i + \mu$

(Model 2)

Model 2 is estimated including the following controls: rural population, unemployment rates, and GDP per capita. These variables are aggregated at departmental level. The coefficient of the interaction term ($\hat{\varphi}_3$) is the DiD estimator and, under the assumption of parallel trends, will provide an unbiased estimator of the impact of the CCT program *Juntos* on inequality of opportunity.

6   Empirical Analysis

6.1   Results

The DiD strategy is the empirical approach employed to estimate the effect of the CCT *Juntos* on inequality of opportunity in Peru. After computing inequality through the NBI Inequality of Opportunity Index in the different provinces of Peru, Model 1 and Model 2 are estimated using OLS regressions. The DiD estimator is supposed to provide unbiased estimates of the impact of the program but only under the assumption of parallel trends. Since the treatment and control groups present significant differences in multiple indicators, some control variables that can affect inequality or that can be related to the targeting process of the CCT program are added to the model. This is captured in Model 2.

The results of these estimations are reported in Table 6. The impact of the program is evaluated twice: in 2008 and 2011. The estimations of Model 1 show significant differences in inequality of opportunity between the treatment and control groups previous to the program: in the treated provinces inequality is higher (the coefficient of the treatment variable is positive and significant). Inequality of opportunity decreases, becoming this effect stronger over time in both magnitude and significance. This is captured by the coefficient of the time dummy: in 2008 overall inequality of opportunity is 0.05 points lower than in 2004; in 2011 is almost 0.08 points lower. Finally, the coefficient of the interaction between the treatment and control variables captures the impact of the CCT program. There is no significant effect of *Juntos* on inequality of opportunity in 2008. However, *Juntos* has a positive effect in 2011 improving equality of opportunity in almost 0.06 points.

Table 6. Results: difference-in-differences estimations

| | Model 1 | | Model 2 | |
	2008	2011	2008	2011
VARIABLES	*Gini*	*Gini*	*Gini*	*Gini*
TREAT	0.0811***	0.0811***	0.0177	0.0224
	(0.0241)	(0.0241)	(0.0408)	(0.0377)
POST	-0.0513**	-0.0773***	-0.0307	-0.0536*
	(0.0221)	(0.0169)	(0.0282)	(0.0294)
*TREAT*POST*	-0.0313	-0.0576**	-0.0449	-0.0533**
	(0.0252)	(0.0221)	(0.0273)	(0.0265)
Controls	No	No	Yes	Yes
Constant	0.296***	0.296***	0.838**	0.807**
	(0.0201)	(0.0201)	(0.364)	(0.335)
Observations	112	112	112	112
R-squared	0.185	0.282	0.288	0.339

Source: Self-estimations
Robust standard errors in parentheses
Note: Standard errors are clustered by province

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

Adding control variables to the model does not change the results of the impact of the program. The coefficients of the treatment (*TREAT*) and time (*POST*) variables are noticeably smaller when adding controls to the model. The previous differences between provinces become not significant as well as the effect of time on inequality of opportunity since now these effects might be captured by the specific control trends; time has still a significant effect (at 10% level) in the year 2011. However the coefficient of the interaction term (*TREAT*POST*), which is the DiD estimator, does not change very much when including controls in the model: for the year 2008 is slightly higher and still not significant and for the year 2011 is very similar to the one obtained when estimating the model without controls and statistically significant at 95% level of confidence.

The results of the quantitative analysis show a significant impact of the CCT program *Juntos* on inequality of opportunity. *Juntos* reduced inequality of opportunity (measured through NBI) in around 0.05 points between the years 2005 and 2011. The CCT program does not have any significant effect on inequality of opportunity in the short run (2008).

6.2   Sensitivity Analysis

As reported in the previous chapter, the models are robust to the inclusion of control variables. That is an indicator of the validity for both the models and the selected comparison group. In addition to this, an analysis is performed in order to evaluate if the results are sensitive to changes in the definition of the NBI type 6. I defined this variable as the lack of access to health services using information from the health module of the ENAHO as follows: the NBI type 6 is a dummy that takes the value 1 when a member of the household presented symptoms of any disease but did not seek medical attention because of the following reasons: did not have money, it was far away or do not have health insurance. Figure 8 summarizes all the reasons why the individual did not visit any health center in spite of having a disease included in the ENAHO among which the respondent can choose in the questionnaire.
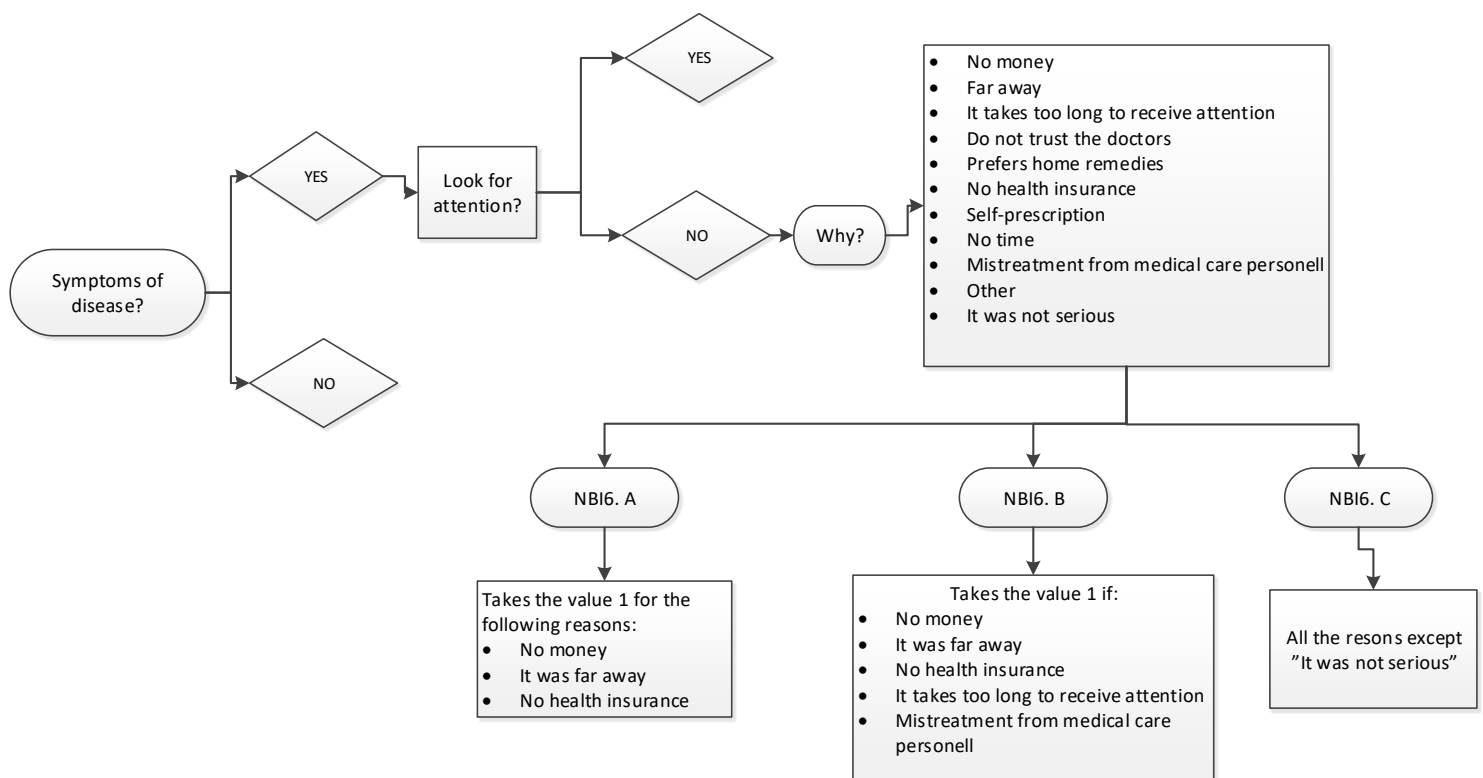

Figure 8. Sensitivity Analysis: Different definitions for the NBI type 6

Source: Self-elaboration using information from the questionaire of the ENAHO

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Model 1 and Model 2 are re-estimated changing the definition of the NBI type 6. First, from the definition of NBI6.A[48] to NBI6.B and then to NBI6.C. The outcomes are evaluated in both 2008 and 2011. The results of the sensitivity analysis are reported in Tables 8 and 9 in Appendix B. The results obtained in the previous chapter do not change (neither in magnitude nor in statistical significance) with the changes of the definitions.

6.3   Discussion

The results of this thesis showed that the CCT *Juntos* had a positive effect on the reduction of inequality of opportunity in Peru. There are several mechanisms through which conditional cash transfer policies might affect this type of inequality.

First, the direct transfer of cash to the poorest households of the society would improve the distribution of income. The feature that makes CCTs different from other social programs is their ability of fighting against not only today's poverty but also future poverty by the incentives to invest in different aspects of human capital through the "conditionalities" stipulated in their design. Every program is different from each other in this aspect and the planning of the different commitments may change the results of the policies depending on the context (Bastagli, 2010).

Juntos includes several conditions related to education, health, nutrition and identity that could help to reduce future poverty and inequality of opportunity. The improvement in the access to health and education facilities in the provinces with *Juntos* could be affecting the NBI indicators of health and education directly leading to an improvement of inequality of opportunity measured through the NBI Inequality of Opportunity Index.

In one of the first attempts to evaluate *Juntos*, Diaz et al. (2009) accounts for an increase in school attendance in the departments reached by the program but not in school enrollment. They observe a positive change in the use of health facilities, being this effect more direct. People that do not have an identity document cannot beneficiate from governmental services or programs in Peru, therefore by providing identities *Juntos* may also be improving the access to basic social services, improving inequality of opportunity.

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[48] This is the initial definition of the indicator used in the quantitative analysis.

Although there is no very reliable data available regarding identity, according to the authors there seems to be an increase in the expedition of IDs and birth certificates in some of the departments that received *Juntos.*

According to the results in this thesis, there are no visible effects of *Juntos* when evaluating the program in 2008. One might think that the direct transfer of money would have a short term effect in the economic situation of the individuals, however NBI indicators are very stable[49] and more time may be needed to observe any effect on them. For instance, a family living in an inadequate household may need more than the monthly 100 *soles* received from the program in order to move to another dwelling or to improve the conditions of its actual one; savings need time. Moreover, Perova and Vakis (2011) estimate long term and accumulative effects of *Juntos* on educational attendance, child work and mothers health; the only immediate effects reported in their paper are those on income and child health (for children under 5). This is another reason that can explain the effects in the long but not in the short run found in this thesis.

In addition, Jones et al., (2008) claim that the supply and quality of services provided by the Peruvian state did not improve during the initial phases of *Juntos* according to the increasing demand of those services. In order to improve the use of health and educational services might not be enough to incentivize the demand side. If a mother has two hours walk to the closer health post probably she is not going to bring her children although she would like to. Situations like that were reported in Huber et al. (2009) during the first years of the implementation of *Juntos.* Finally, the targeting strategy which is one of the most valuable strengths of CCT programs was notably improved in *Juntos* since 2008 (Bustamante et al., 2016).

The quantitative results of this thesis suggest that CCT programs could be very valuable policy tools for reducing inequality of opportunity. Nevertheless, relying excessively on *conditionalities* when designing social policies might be risky. Marginalized groups that have more difficulties to meet the commitments of the programs may experience higher risks of being excluded from them. Álvarez et al. (2006) find that the probabilities of dropping out Mexico's *Progresa/Oportunidades* program are higher for indigenous populations in extreme poor and highly unequal communities. The analysis performed in this thesis takes the provinces where *Juntos* was first launched as the *treatmen*t group.

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[49] The NBI method has been criticized for being only able to capture structural poverty due to this "stability" of the indicators (Feres and Mancero, 2001).

These provinces are located within the highlands (*sierra*) of Peru and, being highly poor and with the presence of large indigenous population, are relatively easy to access. The program was later extended to more inaccessible departments. The results of the impacts of the program may be different there, although Bustamante et al. (2016) reports high grade of fulfillment of the conditions of the program in 2015 when *Juntos* had already reached many communities within the Amazon jungle.

The NBI Inequality of Opportunity Index used in this research has the same limitation as the CCT programs themselves: it is only focused on the improvement in the access to services but it is not able to capture any changes in the quality of those services. Consequently, it is possible to measure the reduction of inequality of opportunity in the access to basic services with this method but nothing can be said about the real impact of CCT programs on the improvement of human capital.

Since *Juntos* was not randomly implemented across the different regions of Peru, one of the main concerns regarding the empirical strategy is the selection of a proper group of comparison. Therefore, some tests and analysis were performed after the quantitative analysis corroborating the robustness and validity of the method since the results remain consistent.

7   Conclusion

This thesis explores whether CCT programs could have a positive effect in reducing inequality of opportunity in a context of a developing country with high levels of inequality in multiple aspects, Peru. CCTs are designed with the goal of eliminating intergenerational transfer of poverty and they are precisely focused on fighting future poverty through the incentives to invest in human capital. This makes this type of social policies highly suitable to equalize opportunities.

Inequality of opportunity is gaining importance in the development agenda. At the same time CCTs has experienced an explosion around the world, especially in Latin America where almost every country has its own program. Within this framework, the topic of this research becomes very relevant for development economics. Peru has been the country chosen to perform the analysis, being one of the most unequal countries of one of the most unequal regions in the world. The CCT program *Juntos* was initiated in the country a decade ago and compared to similar programs in the region is still relatively unexplored regarding its possible effects on inequality (of income and opportunity), at least in quantitative terms.

An original methodology to measure inequality of opportunity has been introduced in this work. This is based on the popular NBI method created in Latin America to estimate poverty through the direct identification of households that lack the access to basic goods and services. It is the first time that this method has been used to approximate inequality of opportunity and to measure the impact of a social program. The NBI Inequality of Opportunity Index allows addressing inequality from a multidimensional perspective since it is supposed to be able to capture the disparities in different dimensions of well-being. In addition to this, solid econometric techniques are applied in order to estimate the causal effect of *Juntos*.

CCT programs are believed to be more efficient in reducing poverty than other types of policies due to their capacity of concentrate social investments into the more vulnerable sectors in society thanks to their targeting strategy. Therefore they are also supposed to "contribute to a better distribution of income and opportunities for the population" (Romero, 2015).

The empirical results confirm the hypothesis of this research: there is a positive impact of *Juntos* on the reduction of inequality of opportunity measured by the NBI method, although this effect is only significant in the long run. These results are in line with previous studies that found an improvement in the use of educational and health facilities in Peru due to the CCT program, a decrease in overall inequality and accumulative effects for those who has been participating in *Juntos* for a longer period of time. This last finding could explain to some degree why the results of this thesis do not show significant effects of the program when evaluating the outcomes in 2008.

7.1   Practical Implications

Now that inequality of opportunity has a privileged position in the political agenda, the results of this thesis encourage considering CCTs as valuable policies to equalize opportunities. However, it has to be taken into account that the empirical part of the study is accomplished within a particular framework in one particular country and that generalizations in these types of studies are very difficult to make. In the context of Peru *Juntos* had a positive effect on the reduction of inequality of opportunity, nevertheless deeper research on the topic and more quantitative studies are needed to provide external validity to the results reported in this paper.

This thesis contributes to the literature not only with an impact evaluation of a CCT program but also with the introduction of an innovative method for measuring inequality. The NBI Inequality of Opportunity Index (as I named it in this work) allows for the use of census information, without the need of using monetary variables, to study the evolution of inequality of opportunity over time and also to evaluate the impact of development programs when information from household surveys is not available or is not reliable. The method also permits to evaluate not only the outcomes in terms of inequality but the channels in which CCT programs, as well as other policies, can improve equality (or equity).

7.2   Future Research

There is a large space for future research on this topic. First, as mentioned before more evidence is needed to deeper understand the relationship between CCTs and inequality of opportunity. Regarding the method, since the definition of the NBI indicators is subjective it would be interesting to apply the index in different contexts (different countries for instance) with different definitions for the NBIs and to study which of these NBI indicators are more likely to be affected by this kind of programs, with the aim of improving the design of CCTs (and maybe other social) policies.

The NBI method has the same limitation as the CCTs themselves, their only concern is the improvement in the access to social services but the quality of those services is not taken into consideration. If the goal of these policies is truly to develop future human capital in order to eradicate the intergenerational transfer of poverty, the enhancement of the access to basic services should be only the first step. Therefore, there is a need for more evidence not only about the fulfillments of the conditions of the programs (that are supposed to reduce the disparities in the access to opportunities) but also on the real impact of CCTs on the improvement of human capital that could lead to the breaking of inequality and poverty traps.

7.3   Final remarks

Finally, I would like to highlight that, being aware of its limitations, this thesis has hoped to shed some light on the relation between two highly relevant concepts in the mainstream development economics: equity and CCTs. Inequality of opportunity is not the only type of inequality to be concerned about, but its relevance in today's research and political agendas is undeniable. Consequently, to understand the mechanisms through which it can be reduced and to explore new methods for its measurement can be very valuable. To equalize opportunities could be the first effective stage for developing a fairer world, more accessible for everyone.

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Appendix A

The following index is applied to create a "fictitious" or "predicted" household expenditure distribution vector on which inequality is going to be computed:

$$\widehat{HHexp_i} = \alpha + \beta_1 nbi1 + \beta_2 nbi2 + \beta_3 nbi3 + \beta_4 nbi4 + \beta_5 nbi5 + \beta_6 nbi6$$

$$+ \beta_7 nbi12 + \beta_8 nbi13 + \beta_9 nbi14 + \beta_{10} nbi15 + \beta_{11} nbi16$$

$$+ \beta_{12} nbi23 + \beta_{13} nbi24 + \beta_{14} nbi25 + \beta_{15} nbi26 + \beta_{16} nbi34$$

$$+ \beta_{17} nbi35 + \beta_{18} nbi36 + \beta_{19} nbi45 + \beta_{20} nbi46 + \beta_{21} nbi56$$

$$+ \beta_{22} nbi123 + \beta_{23} nbi124 + \beta_{24} nbi125 + \beta_{25} nbi126 + \beta_{26} nbi134$$

$$+ \beta_{27} nbi135 + \beta_{28} nbi136 + \beta_{29} nbi145 + \beta_{30} nbi146 + \beta_{31} nbi156$$

$$+ \beta_{32} nbi234 + \beta_{33} nbi235 + \beta_{34} nbi236 + \beta_{35} nbi245 + \beta_{36} nbi246$$

$$+ \beta_{37} nbi256 + \beta_{38} nbi345 + \beta_{39} nbi346 + \beta_{40} nbi356 + \beta_{41} nbi456$$

$$+ \beta_{42} nbi1234 + \beta_{43} nbi1235 + \beta_{44} nbi1236 + \beta_{45} nbi1245 + \beta_{46} nbi1246$$

$$+ \beta_{47} nbi1256 + \beta_{48} nbi1345 + \beta_{49} nbi1346 + \beta_{50} nbi1356 + \beta_{51} nbi2345$$

$$+ \beta_{52} nbi2346 + \beta_{53} nbi2356 + \beta_{54} nbi2456 + \beta_{55} nbi3456 + \beta_{56} nbi12345$$

$$+ \beta_{57} nbi12346 + \beta_{58} nbi12459 + \beta_{59} nbi13456 + \beta_{60} nbi23456$$

$$+ \beta_{61} nbi123456 + \delta_1 cnorte + \delta_2 ccentro + \delta_3 csur + \delta_4 snorte$$

$$+ \delta_5 scentro + \delta_6 ssur + \delta_7 selva + \delta_8 lm + \theta_1 rural$$

Where $\widehat{HHexp_i}$ is the "fictitious" level of household expenditure for the household i; α is a constant term. The variables *nbi12*, *nbi13*, *nbi14, nbi15, nbi16, nbi23, nbi24, nbi25, nbi26, nbi34, nbi35, nbi36, nbi45, nbi46* and *nbi56* are interactions between two different types of NBI. For example, *nbi13* is a dummy that takes the value 1 when the household has the NBI type 1 (inadequate housing) and at the same time the NBI type 3 (inadequate sanitary conditions); and zero otherwise. The variables *nbi123, nbi124, nbi125, nbi126, nbi134, nbi135, nbi136, nbi145, nbi146, nbi156 nbi234, nbi235, nbi236, nbi245, nbi246, nbi256 nbi345* and *nbi346* are interactions between three NBI indicators. The variables *nbi1234, nbi1235, nbi1236, nbi1245, nbi1246, nbi1256, nbi1345, nbi1346, nbi1356, nbi2345, nbi2346, nbi2356, nbi2456* and *nbi3456* are interactions between four NBIs. The variables *nbi12345,*

nbi12346, nbi12456, nbi13456 and *nbi23456* are the interactions between five types of NBI. Finally, the variable nbi123456 is the interaction between the six types of NBI indicators considered in this study.

The variables *cnorte, ccentro, csur, snorte, scentro, ssur, selva* and *lm* are dummies that indicate if the household lives in the coast (north, central or south); in the highlands (north, central or south); in the jungle or in the metropolitan municipality of Lima. They are created from the variable "domain" (*dominio*) available in the ENAHO. Finally the variable *rural* is a dummy for the type of environment: takes the value one if the household lives in a rural area. It is created from the variable "conglomerate" (*conglomerado*) provided in the ENAHO.

In a first stage this relation is estimated with an OLS regression using data from the ENAHO 2007. The parameters obtained are the weights used in the index to estimate the distribution vectors for the different years (2004, 2008 and 2011). The index assigns a different level of expenditure for each household depending on the number and types of NBI that they have, the domain in which it is located and the type of environment in which it lives.

The estimated weights are reported in Table 7. Let's illustrate how the index works with an example. If a family lives in a household with inadequate sanitary conditions (NBI type 2) and the children do not attend school (NBI type 3), has all the rest of basic needs covered and is located in a rural area within the north coast it will be assigned with a level of expenditure of 34.54 *nuevos soles* (126.1-79.75-105.3+95.21+2.325-4.048).

Table 7. Coefficients of the NBI Inequality of Opportunity Index

NBI	$\hat{\beta}$	2 NBI INTER.	$\hat{\beta}$	3 NBI INTER.	$\hat{\beta}$	4 NBI INTER	$\hat{\beta}$	AREA	$\hat{\delta}/\hat{\theta}$
nbi1	-95.97	*nbi12*	66.41	*nbi123*	-61.85	*nbi1234*	93.61	*cnorte*	2.325
nbi2	-79.75	*nbi13*	90.64	*nbi124*	-79.48			*ccentro*	3.664
nbi3	-105.3	*nbi14*	97.79	*nbi125*	-75.21			*csur*	-4.045
nbi4	-78.21	*nbi15*	76.15	*nbi126*	53.49			*scentro*	4.254
nbi5	-82.45	*nbi16*	8.644	*nbi134*	-96.58			*ssur*	3.302
nbi6	-9.321	*nbi23*	95.21	*nbi135*	21.91			*selva*	3.508
α	126.1	*nbi24*	68.65	*nbi136*	-7.739			*lm*	5.048
		nbi25	76.03	*nbi234*	-91.95			*rural*	-4.048
		nbi26	3.709	*nbi235*	-101.3				
		nbi34	75.59	*nbi236*	44.76				
		nbi35	88.35	*nbi345*	-4.741				
		nbi36	8.852	*nbi356*	-8.541				
		nbi45	47.13						
		nbi46	4.054						
		nbi56	6.278						

Note: Some variables are omitted due to multicollinearity issues. Those variables are not included in the table.

Appendix B

Table 8. Sensitivity Analysis: Model 1

	2008				2011		
VARIABLES	NBI6. A	NBI6.B	NBI6.C		NBI6. A	NBI6.B	NBI6.C
	(1)	(2)	(3)		(4)	(5)	(6)
	Gini	*Gini*	*Gini*		*Gini*	*Gini*	*Gini*
TREAT	0.0811***	0.0804***	0.0786***		0.0811***	0.0804***	0.0786***
	(0.0241)	(0.0250)	(0.0249)		(0.0241)	(0.0250)	(0.0249)
POST	-0.0513**	-0.0519**	-0.0515**		-0.0773***	-0.0785***	-0.0774***
	(0.0221)	(0.0236)	(0.0236)		(0.0169)	(0.0167)	(0.0167)
*TREAT*POST*	-0.0313	-0.0314	-0.0290		-0.0576**	-0.0566**	-0.0541**
	(0.0252)	(0.0264)	(0.0262)		(0.0221)	(0.0220)	(0.0217)
Controls	No	No	No		No	No	No
Constant	0.296***	0.298***	0.298***		0.296***	0.298***	0.298***
	(0.0201)	(0.0211)	(0.0211)		(0.0201)	(0.0211)	(0.0211)
Observations	112	110	110		112	110	110
R-squared	0.185	0.181	0.177		0.282	0.278	0.273

Source: Self-estimations
Robust standard errors in parentheses
Note: standard errors clustered by province

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

The first three columns of Table 8 show the results of Model 1 when evaluating the outcomes in 2008 with the three different definitions of NBI type 6. Column (1) of Table 7 reports the estimations of Model 1 with the original definition of NBI type 6 (NBI6.A as described in Figure 8) followed by the estimations of the same model with the two alternative definitions (NBI6.B in column (2) and NBI.C in column (3)). Columns from (4) to (6) reports these results when evaluating the outcomes in 2011. The results are very similar regardless which definition is used.

Table 9. Sensitivity Analysis: Model 2

	2008			2011		
	NBI6.A	NBI6.B	NBI6.C	NBI6. A	NBI6.B	NBI6.C
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	*Gini*	*Gini*	*Gini*	*Gini*	*Gini*	*Gini*
TREAT	0.0177	0.0186	0.0168	0.0224	0.0229	0.0208
	(0.0408)	(0.0414)	(0.0410)	(0.0377)	(0.0380)	(0.0376)
POST	-0.0307	-0.0321	-0.0319	-0.0536*	-0.0553*	-0.0538*
	(0.0282)	(0.0295)	(0.0296)	(0.0294)	(0.0295)	(0.0296)
TREAT*POST	-0.0449	-0.0454	-0.0428	-0.0533**	-0.0520*	-0.0497*
	(0.0273)	(0.0288)	(0.0285)	(0.0265)	(0.0267)	(0.0265)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.838**	0.837**	0.827**	0.807**	0.808**	0.805**
	(0.364)	(0.362)	(0.360)	(0.335)	(0.348)	(0.345)
Observations	112	110	110	112	110	110
R-squared	0.288	0.287	0.284	0.339	0.336	0.332

Source: Self-estimations
Robust standard errors in parentheses
Note: standard errors clustered by province

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

Model 2 is re-estimated using the definitions NBI6.B and NBI6.C for both years 2008 and 2011. Table 9 reports these estimations in columns (2), (3), (5) and (6), respectively; and compares these results with the ones obtained using the original definition of NBI type 6 (NBI6.A) which are reported in columns (1) for 2008 and (4) for 2011. The results also remain consistent in this case.