12-14-2011

Essays on Labor Economics and Fiscal Decentralization

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ESSAYS ON LABOR ECONOMICS AND FISCAL DECENTRALIZATION

BY

GUSTAVO JAVIER CANAVIRE BACARREZA

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree
of
Doctor of Philosophy
in the
Andrew Young School of Policy Studies
of
Georgia State University

GEORGIA STATE UNIVERSITY
2011

ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has not been approved and accepted by all members of that committee, and it has not been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

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ACKNOWLEDGMENTS

I would like to extend thanks to all those who helped me achieve my goal of becoming a Ph.D. economist. While I cannot name all of you in such a small amount of space, there are a few individuals whom I would like to recognize.

First, I want to thank my family, especially my parents, Freddy and Helga, for making education a priority in my life and for supporting me in many ways so that I could reach this day. I cherish the advice, example, and care that you have given me over the years. I love you both very much. I also am very lucky to have a fantastic sister and an amazing niece; Fabiola and Corina, whose support and sweetness have always motivated me to press harder to achieve my goals. You two are just great! Having a big and wonderful family is a blessing, and I would like to thank all of my family members (uncles, aunts, cousins), for the help and motivation they have given me over the years. I wouldn't have earned my Ph.D. without the help and encouragement of my uncles, Galo and Hugo (+), and my aunts, Cecy and Quica. I would also like to thank Uncle Remmy and Aunt Teresa for their help and support during my stay in Germany.

I want to thank Dr. Jorge Martinez-Vazquez for giving me the opportunity to learn from his mentorship. Your guidance and encouragement has helped me grow both as an individual and as an economist. You played a very important role in my professional development. Your influence on my professional life is far greater than that of a dissertation chair. I have the utmost respect for you. I am also indebted to the members of my dissertation committee, Dr. Erdal Tekin, Dr. Klara Sabirianova Peter, Dr. Francois Vaillancourt and readers Dr. Roy Bahl, Dr. Barry Hirsch and Dr. Jhonatan Rork for their insightful comments and suggestions. A very special thanks goes to Dr. Felix Rioja, whose friendship, support and shared knowledge have been keys to my success. In addition, I would like to thank Wilson Jimenez, who guided me to the path of economics. Without his motivation, I would not have completed a PhD. You trusted in me when I did not necessarily trust in myself.

I would like to thank the Department of Economics at Georgia State University for giving me the opportunity to study in such a great environment. I learned a lot from an excellent group of professors, and I suffered together with a great group of classmates. Also, my experience at the Federal Reserve Bank of Atlanta gave me new insights on economics that encourage me to be a better economist, and it was a place to make great friends. Thank you Dr. Stephen Kay, Dr. Myriam Quispe-Agnoli, Dr. Julie Hotchkiss, Dr. Pedro Silos, Dr.Federico Mandelman and Nicole Baerg.

I am also grateful to my friends who have shared this journey with me and helped me along the way. Andrew Balthrop, Merlin Hanauer, Zack Hawley, Kelly Wilkin, Fernando Rios-Avila, Juan Jose Miranda, Violeta Vulovic, Tatyana Zelenskaya and Tamoya Christie, thank you for your support over the years. Discussions about economics and sports and drinks at Manuels made me like Atlanta.

I would like to dedicate this dissertation to my mother and my father.

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ABSTRACT

ESSAYS ON LABOR ECONOMICS AND FISCAL DECENTRALIZATION

BY

GUSTAVO JAVIER CANAVIRE BACARREZA

December 2011

This dissertation comprises two essays. While the topics of both essays are different both are interrelated on the base of economic development. The first essay examines ethnic wage gaps on segmented labor markets with evidence from Latin American countries.
The second essay revisits the determinants of fiscal decentralization with an emphasis on the role that geography plays in determining fiscal decentralization.
The first essay contributes to limited literature on ethnic wage gaps in Latin America. It examines ethnic wage gaps for workers in formal and informal labor markets. Using household survey data from Bolivia, Brazil, Guatemala, and Peru, we estimate and examine across-ethnic wage gaps for informal and formal markets, their changes over time, factors that explain their differences, and the wage gap distribution. More specifically, we verify that different ethnic wage gaps do exist across formal and informal markets; they behave differently not only at their means but also along the wage distribution. The results indicate that higher ethnic wage gaps in informal sectors exist not only on average but also throughout the distribution. In addition, we find that wage gaps have declined significantly over the last 10 years. we explain this by examining changes in the prices of institutional factors and changes in human capital endowments. The distributional analysis shows a decrease in the unexplained component, especially in the top part of the distribution.
The second essay contributes to the existing literature on the determinants of fiscal decentralization by motivating theoretically and exploiting in depth the empirical relevance that geography has as a determinant of fiscal decentralization. The relationship between decentralization and geography is based on the logic that more geographically diverse

countries show greater heterogeneity among their citizens, including their preferences and needs for public goods and services provisions. Communications and physical distance are also a very important issue and play a key role on the effect of geography over time. (Lora et. al., 2003) argue geography plays a key role in economic and social development, as well as in the institutional design of the countries; yet, this effect could be enhanced (or diminished) in the presence of better physical infrastructure or communications. The theoretical model in this paper builds on the work by Arzaghi and Henderson (2002) and Panizza (1999). For the empirical estimation, we use a panel data set for approximately 91 countries for the period 1960-2005. Physical geography is measured along several dimensions, including elevation, land area and climate. we construct a geographical fragmentation index and test its effect on fiscal decentralization. In addition, we interact the geographical fragmentation index with time-variant infrastructure variables in order to test the effect that infrastructure and communications have on the relationship between geography and fiscal decentralization. For robustness, we construct Gini coefficients for in-country elevation and climate. we find a positive and strong correlation between geographical factors and fiscal decentralization. we also find that while the development of infrastructure (in transportation, communications, etc.) tends to reduce the effect of geography on decentralization, this effect is rather small and mostly statistically insignificant, meaning that the impact of geography survives over time. The strategy has additional value because geography may be used as an instrument for decentralization in future econometric estimations where decentralization is used as an explanatory variable, but may be suspected to be endogenous to the economic process being studied (economic growth, political instability, macroeconomic stability, income distribution, etc.).

1 INTRODUCTION

This dissertation contains two essays. While the topics of the essays are different, they are interrelated, dealing with the basis of economic development. In recent decades, two topics that have played a key role in the economic agenda are labor market asymmetries and fiscal decentralization.

On the one hand, the study of asymmetries in labor markets, especially wage differentials, has a direct impact on economic growth and on individual well-being. Developing countries present a good stage for studying wage differentials, especially in the presence of minorities, such as indigenous populations. These differences tend to be accentuated in the presence of dual formal and informal labor markets. On the other hand, there is an increasing interest in government design. The main questions asked are whether it is advantageous to give subnational governments more authority and autonomy in revenue and expenditure decisions or whether it is better to make those decisions at the central level of government. Understanding the causes for fiscal decentralization leads to a better understanding of the fiscal design of countries. Many scholars and policymakers have sought to understand the consequences of fiscal decentralization. Far less effort, however, has gone into discerning the causes of fiscal decentralization. The origins of fiscal federalism are the outcome of a myriad of factors: history, culture, politics, and even physical geography.

The first essay in this dissertation studies ethnic wage gaps in segmented labor markets with a focus on Latin American countries. Labor market asymmetries are an important topic in labor economics. Ethnic differences have been studied in different contexts; however, there has not been enough attention paid to differences between sub-markets. Latin America presents an ideal scenario for studying this phenomenon, not only because of the high segmentation of its labor markets (formal vs. informal) but also because of the existence of significant ethnic differences between the indigenous and non-indigenous populations.

High levels of informal labor market activity have been a key characteristic of labor markets in many developing areas. Latin America is no exception; In fact, more than half of Latin American workers belong to the informal sector (Perry et al., 2006).

Latin America is also characterized by large indigenous populations, especially in countries such as Bolivia, Guatemala, and Mexico (Lee Van Cott [2010]). In these countries, the indigenous population accounts for approximately 40% of the total population (Patrinos 2000). Over the past ten years, there has been a significant increase in indigenous-population importance in Latin American societies, which has generated slightly better employment conditions and gains in political power for these groups. Such changes have yielded positive effects on their standard of living and political incorporation. At the same time, however, such positive effects are not homogenous across countries and sectors of the economy. While many indigenous populations are able to obtain better jobs (in the private and public sectors) due to changes in labor market participation, many still suffer chronic unemployment and job turnover; high labor market segmentation keeps many members of the indigenous community working in informal labor markets (Atal et. al.(2010), Albo [2002]).

This essay contributes to the existing literature by examining ethnic wage gaps and their evolution, components and distribution in the presence of segmented labor markets, formal markets and informal markets using an inter-temporal framework. More specifically, the essay verifies the existence of ethnic wage gaps between formal and informal employment and documents how they have changed over time, not only on average but also across the full distribution of returns to employment. Authors such as Psacharoupoulos (1994), Hall and Patrinos (2006), and Atal, et al. (2010) examine similar topics.

In order to better understand ethnic wage gaps in segmented labor markets, this essay employs household survey data from four Latin American countries in which the indigenous populations represent a relatively high share of the population (Bolivia, Guatemala, Brazil and Peru) and applies a set of inter-temporal wage gap decomposition techniques based on the works by Oaxaca-Blinder (1973), Hotchkiss and Shiferaw (2010) and Pham and Reilly (2007).

For the distributional analysis, the essay presents inter-temporal techniques in line with Melly (2005) and Chernuchov, Fernandez-Val and Melly (2010). The goal of these methodologies is two-fold: on the one hand, decomposing the gap intertemporally into a component due to differences in human capital characteristics, such as education and age (the composition effect), and on the other hand, showing the differences in the rewards for these characteristics (the price effect) not only at the means but also along the distribution.

The second essay in this dissertation revisits the determinants of fiscal decentralization with a focus on geographical factors. Public finance literature has taken an increasing interest in the design of governments. The main question asked is whether it is advantageous to give subnational governments more authority and autonomy in revenue and expenditure decisions, or whether it is better to make those decisions at the central level of government. Many scholars and policymakers have sought to understand the consequences of fiscal decentralization.[1] Far less effort, however, has gone into discerning the causes of fiscal decentralization. Some authors, such as Treisman (2006), Arzaghi and Henderson (2002), Panizza (1999) and Oates (1972), among others, have proposed plausible models for the determinants of fiscal decentralization. The origins of fiscal federalism, they argue, arise from a myriad assortment of factors: history, culture, politics, and even physical geography.

However, none have really examined the role that geography has in fiscal decentralization.

Despite these past studies, we still have limited knowledge on the role that geography plays as a determinant of decentralization; this includes the modeling of geography in the theory of decentralization and what empirical role geography actually plays. Panizza (1999) and Arzaghi and Henderson (2005) examine theoretically and empirically the effects of country size on fiscal decentralization, while others, such as Letelier (2005) and Triesman (2006), test the same relationship empirically. However, to our understanding, there is no study that takes an in-depth look at the relationship between geography and fiscal decentralization.

[1] In fact, there is extensive literature that examines the relationship between fiscal decentralization and its effects on growth, income distribution and poverty, corruption and so on. See, for example, Martinez-Vazquez and McNab, (2001) and the articles in the special issue of *Environment and Planning: C (2009) Issue 2.*

Understanding the determinants of fiscal decentralization is increasingly important for many areas of economic research. Given the pervasiveness of decentralized institutions and decision making in many areas of economic policy including economic growth, income redistribution, poverty and welfare, anticorruption, and others, it has become a necessity in empirical studies to control for the role and impact of fiscal decentralization on those policies. A common problem shared by all these empirical studies is the inability to properly address the potential for endogeneity of decentralization and the dependent variables of interest. Generally speaking, there is a lack a proper external instruments when assessing the relationship between decentralization and economic outcomes. Often, remedies for the endogenous nature of fiscal decentralization are sought in the use of new econometric techniques, such as difference or system dynamic panel estimation, while there is very limited use of valid external instruments.

Geography has clear exogeneity credentials because it is not the cause of economic outcomes.[2] Some geographical elements have been used in past empirical studies as instruments for decentralization.[3] Thus far in the literature review, there has not been a systematic exploration of what geographical elements may be most important. However, it should be recognized from the outset that the use of geography as an instrument for decentralization is limited by the type of estimation approach being used; what makes geography a good external instrument, and one fixed by nature, largely rules out its use in certain econometric approaches, such as panel estimation using fixed effects.

The main objective of this paper is to theoretically motivate the role of geography, building on the work by Arzaghi and Henderson (2002) and Panizza (1999) and exploring in depth its empirical relevance as a determinant of decentralization. For the empirical estimation, we use a panel data set for approximately 91 countries from 1960 to 2005. Physical geography is measured along several dimensions, including elevation and land area. The additional value

[2] Even if the economy may affect access to markets and urban centers, especially in rich countries, economic outcomes cannot directly affect geographical factors, such as elevation or climate, among others.

[3] Treisman (2006) and Panizza (1999) use land area as a proxy for geographical measures.

added of this strategy is that geography may be used as an instrument for decentralization in future econometric estimations, where decentralization is used as an explanatory variable but may be suspected to be endogenous to the economic process being studied (economic growth, political instability, macroeconomic stability, income distribution, etc.).

The relationship between decentralization and geography is based on the logic that more geographically diverse countries show greater heterogeneity among their citizens, including their preferences and needs for the provision of public goods and services.

Communications and physical distance are also important issues that play a critical role in the effect of geography over time. As Lora et. al. (2003) argue, geography plays a key role in economic and social development as well as in the institutional design of countries; yet, this effect could be enhanced (or diminished) in the presence of better physical infrastructure or communications. Indeed, we find that there is a strong correlation between geographical factors and fiscal decentralization. We also find that while the development of infrastructure in transportation, communications, etc., tends to reduce the effect of geography on decentralization, the reduction is small and mostly statistically insignificant, meaning the impact of geography survives over time.

The remainder of this dissertation is organized as follows. Chapter 2 presents an essay on the ethnic wage gaps in segmented labor markets from a Latin American perspective. Chapter 3 presents an essay that examines the role of geography as a fiscal decentralization determinant. Chapter 4 concludes the dissertation. The back matter of the dissertation contains the conclusion, appendices, references and vita.

2 ETHNIC WAGE GAPS IN SEGMENTED LABOR MARKETS: A LATIN AMERICAN PERSPECTIVE

Introduction

Over the past two decades, high levels of informal labor market activity, or informality, has characterized labor markets in many developing countries, especially in Latin America. At the same time, in Latin America, the importance of indigenous populations has increased throughout the continent but more so in a smaller number of countries, namely Bolivia, Guatemala, and Mexico(Lee Van Cott [2010]). In these countries, the indigenous population accounts for approximately 40% of the total population (Patrinos 2000). Increases in the indigenous population have generated slightly better employment conditions and gains in political power for these groups. Such changes have yielded positive effects on their standard of living and political incorporation. At the same time, however, such positive effects have not been homogenous across countries and sectors of the economy. While many indigenous populations are able to obtain better jobs (in the private and public sectors) due to changes in labor market participation, many still suffer chronic unemployment and job turnover; high labor market segmentation has kept many of the indigenous community working in informal labor markets (Atal et. al.(2010), Albo [2002]). Given the changes in indigenous labor market participation, we examine ethnic wage gaps, and their evolution, components and distribution in the presence of segmented labor markets, formal and informal markets. More specifically, we verify the existence of different ethnic wage gaps between formal and informal employment and document how they have changed over time, not only on average but also across the full distribution of returns to employment. Authors such as Psacharoupoulos (1994), Hall and Patrinos (2006), and Atal, et al. (2010) examine similar topics. The contributions of my study are first, that we examine the indigenous ethnic wage gap and its evolution in segmented markets and second, we do this using an inter-temporal framework, while previous studies have only considered longitudinal analysis.

In order to better understand ethnic wage gaps in segmented labor markets, we employ household survey data from four Latin American countries in which the indigenous populations represent a relatively high share of the population (Bolivia, Guatemala, Brazil and Peru) and apply a set of inter-temporal wage gap decomposition techniques based on the works by Oaxaca-Blinder (1973), Hotchkiss and Shiferaw (2010) and Pham and Reilly (2007). For the distributional analysis, we apply inter-temporal techniques in line with Melly (2005) and Chernuchov, Fernandez-Val and Melly (2010). The goal of these methodologies is two-fold: on the one hand, we try to decompose the gap, inter-temporally, into a component, due to differences in human capital characteristics, such as education and age (composition effect) and on the other hand, to show the differences in the rewards to these characteristics (price effect) not only at the means, but also along the distribution.

The rest of this paper is structured as follows: Section 2 presents a review of the literature regarding wage gaps theory and wage gaps in Latin America, and it describes briefly the informality and indigenous populations in Latin America. Section 3 describes the empirical strategy and the datasets used in the paper. Section 4 presents the main results, and Section 5 concludes.

Wage differentials, informality and ethnic gaps: a brief review of the literature

It is necessary to define the two main concepts used in this study, informality and indigenous population.

What is informality? There is no universal definition of informality; nevertheless informality often relates to unprotected workers (in terms of retirement pensions) , avoidance of regulation, low productivity evasion of the rule of law, underpayment or nonpayment of taxes, and work performed underground or in the shadows (Arias, Landa & Yañez, 2007). Two main characteristics are often used. First, there is a legalistic view. This view defines informality through participation in non-registration of economic activity, evasion of the rule of law, and tax evasion. This definition is used, for example, in Perry, et al. (2007). Similarly, the informal labor market is also one in which there is non-compliance with rules. Non-compliance means evasion of labor laws and the social security system. According to this definition, workers and the self-employed whom are non-compliant with the state's regulations or those without access to the social security system are informal workers. Second, there is a productivity definition. This definition characterizes informality in the labor market according to job characteristics. The informal sector, under this definition, is made up of non-professionals, the unskilled, marginal workers, the self-employed, domestic and family workers, and workers in firms with up to five employees (Perry et al. 2007). These two definitions of the informal labor market can, overlap but they differ from each other (Gasparini & Tornarolli 2009).

There are also two ways to define indigenous peoples: self-identification and language use. These widely accepted definitions are closely dependent upon the data available and its accuracy. The first definition, self-identification, accepts at the outset the right of people everywhere to self-identify themselves as they wish. Nevertheless, it should be recognized that one of the main drawbacks of this definition is that it is dependent upon self-reporting and given the stigmas (positive and negative) attached to being indigenous, self-reporting may produce a biased sample of self-reporters. The second definition relates ethnicity to language. Here, people are classified according to their mother-tongue. This definition is the most commonly used definition for empirical studies in Latin America not only because of the availability of information but also because it yields a more reliable measure.

A brief review of the wage gaps literature

Wage differentials have been extensively studied over time and in different contexts, both in developed and in developing countries. Moreover, the growing importance of this issue can be seen by its presence in the major labor economic textbooks: Card and Ashenfelter (2010), Cahuc and Zylberberg (2004), and Hotchkiss and Kauffman (2006), among others.

The contexts in which wage differentials are analyzed vary, but traditionally the literature has examined gender, race and regional wage gaps.

Research studying wage gaps have also examined the evolution of wages and labor market segmentation in developed countries. Empirical econometric developments have also contributed to a better understanding of the size, evolution, and channels through which wage gaps persist.

Seminal papers such as Oaxaca (1973), Blau (2006), Machado-Mata (2005), Altonji and Blank (1999), argue that the primary research objective is to determine those observables and non-observables factors that contribute to wage gaps. Moreover, they argue that researchers should do this not only for average (mean) returns but also across the wage distribution.

Nevertheless, for segmented labor markets, wage gaps analyses are not widely used. One exception is a paper by Rokicka and Ruzik (2009). These authors examine gender gaps in informal labor markets in Poland. They find that the size and characteristics of wage gaps by gender differs depending on the level of wages. They also find that the inequality of wages among unregistered women and men is more pronounced at the bottom end of the wage distribution. In the case of formal employees, inequality at the top of the distribution tends to be larger.

Wage gaps in Latin America

Researchers examining formal and informal labor markets in Latin America similarly show that wage differentials between these two sectors are statistically significant, even after controlling for several personal and household characteristics as well as selectivity bias.[4] All previous studies find labor market segmentation. In addition, these authors find that for those working in the informal sector, returns to education are smaller or insignificant.

[4] Gindling (1991) for Costa Rica, Funkhouser (1996) for the five Central American countries, Marcouiller et al (1997) for Mexico, El Salvador and Peru, Saavedra and Chong (1999) for Peru, Orlando (2000) for Venezuela, and Jimenez (1999) for Bolivia

Such evidence has not gone undisputed, however. For instance, Tannen (1991) found no difference between formal and informal wages in Northeast Brazil, after controlling for other variables and selectivity.

More subtly, Pradhan (1995) argues that differences between formal market and informal market wages are due to compensating differentials rather than strictly due to market segmentation. In other words, individuals may accept different wages in different sectors simply because non-pecuniary characteristics differ between jobs. However, in general, the consensus is that, for one reason or another, there exists a wage gap between informal and formal sectors, with workers in the informal sector accruing lower wages.

As pointed out by Atal et al. (2010), the study of ethnic wage gaps is constrained for two reasons: data is limited, especially household survey data, and there exists a significant number of individuals belonging to ethnic minorities who have decided not to identify themselves as indigenous. Despite these constraints, researchers have made important analytical efforts in order to examine different type of gaps in human capital, labor market differences and access to services. Perhaps one of the most influential works in the area are Psacharoupoulos and Patrinos (1994) and Hall and Patrinos (2006). These authors analyze indigenous characteristics and discrimination in the 1990s and in the 2000s in urban Bolivia, Guatemala, Mexico and Peru.

Two other interesting determinants used to analyze ethnic wage gaps is the impact of dominant language proficiency, as well as regional differences (e.g., urban/rural, north/south, etc.) (Chiswick, Patrinos & Hurst, 2000).

Despite improvements in educational achievements, indigenous groups are still found to earn significantly less than their non-indigenous counterparts (Psacharapoulos, 1994). Although indigenous peoples have on average, lower education and this explain some persistence in ethnic wage differentials in some countries, in other countries, the wage gap is explained only partially by productive characteristics (Patrinos, 2000).

Researchers have gone beyond looking only at quantity of education. Some authors explore other indicators, such as quality of education, measured in terms of certification of teachers, teacher/pupil ratio pertinence and materials (Levy, 1986). Similarly, analysis has been carried out which considers differences in returns by educational levels compared to years of schooling (i.e.,, primary, secondary and tertiary). Still, most of the pay differential remains unexplained (Hall & Patrinos, 2006).

For many topics, the analysis has been constrained to country case studies, limiting their conclusions to a specific labor market and wage structure and with less power to generalize across a broader universe of cases. Most authors agree that, while additional research is needed to explain the unexplained portion of ethnic wage differentials, human capital endowments are a critical component. In other words, it is thought that important progress can be made in reducing indigenous wage gaps if policies are geared towards improving human capital accumulation among indigenous peoples. Additional complementary policies to increase their return on investments in human capital are also often called for (Hall and Patrinos, 2006).

More recently, Atal et al. (2010) examine ethnic wage gaps in 18 Latin American countries using non-parametric techniques. These authors find that men earn 9-27% more than women, with high cross-country heterogeneity. Their estimations show that the unexplained pay gap is higher among informal and self-employed workers, and those in small firms. This paper extends their work by looking not only the composition of the wage gaps but also the evolution of the ethnic wage gaps, including changes in its mean and also changes to its distribution.

Finally, the interplay of ethnicity and informality is crucially important. One of the most recurrent stylized facts is that indigenous groups working in informal markets appear to fare the worst in many measures of labor market outcomes.[5]

In sum, many studies examining labor market returns in Latin America contribute important findings. Most of them find evidence of an indigenous wage gaps even for those

[5] Statistics in this area, however, are not homogeneous and enormous discrepancies exist between sources (Atal et. al. (2010) and Nopo et.al. (2011)).

that have significant human capital. Where the literature is less extensive, however, is taking into account informal labor markets. Given that employment in informal markets is really high, it is important to examine indigenous wage gaps in both formal and informal labor markets.

Data and Empirical Methodology

The data we use are household surveys from a sub-sample of Latin American countries (LAC). While it is widely recognized that household surveys have several problems, they are still the best source of information for national socio-economic analysis in the developing world. Household surveys provide valuable information as they are the best available source for generating representative statistics about a population. One drawback is that household surveys are not uniform across Latin American countries and differ significantly in terms of geographical coverage and questionnaire type. Surveys also vary within countries over time. LAC governments have been improving their household surveys over the past decade, changing coverage and questionnaires. The issue of comparability is, hence, of great concern. Therefore, we try to standardize the questions we use to make them as comparable as possible across countries and over time by using similar definitions of variables.

A brief description of the sources

The countries selected for the analysis are Bolivia, Peru, Guatemala, and Brazil. we select these countries not only because of their large indigenous populations, but also because of the surge of indigenous support for sub-national and national governments over the past decade which have higher political representation. This is especially important given that the scope of the paper is to examine changes in countries where there have been increases in the importance of indigenous populations.

For Bolivia we use the household survey "Encuesta de hogares" for the years 1999 and

2007. Before 2004, it was part of a World Bank program, called Mecovi, but it is now independently carried out by the national statistical office.

In Guatemala, the Mecovi program carried out household surveys in 2000, 2004 and 2006. For the examination of changes we employ the surveys for 2000 and 2006.

For Peru, we use the household survey ENAHO. This survey has four waves between 1997 and 2007. Given the restriction on indigenous population data, in the Peruvian household survey,[6] we restrict the analysis to the years 1999 and 2006.

For Brazil we use the household survey PNAD (Pesquisa Nacional por a Mostra de Domicilios), administered by the national statistical office, Instituto Brasilero de Geografia y Estadisticas (IBGE), every September. we use the years 1996 and 2006 for the analysis.

Data description

The sample used from each survey includes workers aged 15 to 65 in urban areas. we exclude rural areas because labor market characteristics are different and under any classification of informality most workers in these regions would be classified as informal workers.

As the understanding of informality is not uniform across the countries, we use the legalistic concept, which considers tax payments and social security contributions as an identifier for informality. we consider ÅgformalÅh to be those workers who work in firms that pay taxes, who pay income tax (where applicable) or make contributions to the social security system. In countries where this identification data is not available, we use a different definition instead. Following the productivity definition, we classify as formal workers those who work in firms with five or more employees and receive salaries, or are self-employed with more than 12 years of education. The informal sector includes workers who are self-employed with less than 12 years of education,[7] and workers that are in firms

[6] Peruvian Household surveys prior 1997 do not include variables that allow identifying (comparably) indigenous populations.

[7] The cut-off of 12 years old is to some extent arbitrary but would exclude high skilled self-employed such as lawyers, medical doctors, etc.

with fewer than five employees. This definition is the standard ILO definition, given the availability of data. As was highlighted in the literature review, the two definitions have some overlap but are not exactly the same. Therefore, even there could be some differences on the results when using either definition, the results do not change significantly from using one or the other.[8] The definition of indigenous population largely depends on data availability in each household survey data. For this reason, one of the following two definitions of indigenous is used when available. The first is related to mother tongue. The logic behind is that if a person learns an indigenous language as a child, there is a high probability that this person belongs to the indigenous population. The second definition is based on self-identification/self-assessment of the individual.

The main variable we used to decompose wage differentials is wage per working hour. This variable is constructed using available data in the household surveys. It includes wages and salaries, extra-hours payments, and in-kind payments. Given that a large subsection of informal workers are self-employed, we include self-employed workers in the sample and estimate their wages based on others reported incomes. This information is available for all household surveys named above. On the right-hand side, the independent variables used to analyze the extent of wage gaps are schooling, experience, experience-squared, a married dummy, a health dummy, a migrant dummy, number of household members, and gender.

Empirical Strategy

The empirical strategy consists of three parts. The first part involves simple OLS wage equations, corrected for self-selection and estimated for each country, including controls for informality and indigenous population. we do this in order to obtain a first estimate of ethnic wage gaps in segmented markets. we estimate two sets of wage equations and compare the coefficients. The first set are wage regressions that include dummies D_i^{ni} for

[8] Bolivian household survey allows estimating wage equations using both definitions, ; the results do not change significantly.

informal non-indigenous, D_f^i for formal indigenous, and D_f^{ni} for formal non-indigenous.[9] The second set includes the same dummies and also includes control variables. we estimate[10] wage equations of the type:

$$\ln W_j = \alpha_j + \beta_j^1 D_i^{ni} + \beta_j^2 D_f^i + \beta_j^3 D_f^{ni} + \epsilon_{ij}$$

$$\ln W_j = \alpha_j + \alpha_j^0 X_j + \alpha_j^1 D_i^{ni} + \alpha_j^2 D_f^i + \alpha_j^3 D_f^{ni} + \nu_{ij}$$

Where W_j represents hourly earnings for each worker in country $_j$, and X_j represents the control variables (e.g., male, which is expected to be negative because males tend to earn lower wages due the fact that their reservation wages are lower as compared to non-indigenous).

we include dummies for secondary and tertiary education. The coefficients for these forms of education are expected to be positive from the theory of human capital, which states that those with more education will receive higher wages than those with lower education. Marriage could have either positive or negative effects and these would depend on the externalities that couples create. we consider a dummy for health that takes the value of one if the person has been sick in the reference period.[11] The coefficient for this dummy is expected to be negative because bad health would have negative effects on productivity and thus reduce wages. According to evidence in the existing literature, experience is expected to be positive factor but at a decreasing rate (experience square negative).[12] A migrant variable[13] is also included as is a variable for the number of household members. Thus, the unconditional wage gap for the indigenous in informal and formal markets can be expressed as $WG_i = \beta_j^1$ and $WG_f = \beta_j^3 - \beta_j^2$ and the conditional wage gaps will be given

[9] I use informal indigenous as a base dummy for the OLS regressions.

[10] It should be noted that this estimation and the wage decomposition were estimated both with and without sampling weights in the surveys, but the results do not change substantially. Therefore, the results generated using weights are presented here.

[11] The period of reference in the surveys is the previous three months.

[12] Mroz (1987) proves, with different specifications, that experience (measured as age-schooling-6) affects wages at a decreasing rate.

[13] The migrant variable is composed by international and domestic migration.

by $WG_i = \alpha_j^1$ and $WG_f = \alpha_j^3 - \alpha_j^2$. (Results are in the appendix, table 2[14])

The results above give a static view of the wage gaps and their size. Nevertheless, we also aim to study inter-temporal changes in wage gaps. The second part of the analysis therefore consists of the estimation on an extension of Oaxaca-Blinder decompositions to an inter-temporal framework in line with the works of Smith and Welch (1989) and Hotchkiss and Shiferaw (2010).

Assume wage functions represented by the following equations:

$$Y_{ni,t} = X_{ni,t}\beta_{ni,t}$$

$$Y_{i,t} = X_{i,t}\beta_{i,t}$$

i refers to the indigenous population, ni refers to the population that is not indigenous, and t is the base year. We can extend Oaxaca-Blinder to decompose the changes between two periods as follows:

We can extend Oaxaca-Blinder to decompose the changes in two periods, as follows:

$$\begin{aligned}
[(Y_{ni,t} - Y_{i,t}) - (Y_{ni,t-1} - Y_{i,t-1})] \quad = \quad & \\
& [(X_{ni,t} - X_{ni,t-1}) - (X_{i,t} - X_{i,t-1})]\beta_{ni,t} \\
& + X_{i,t-1}[(\beta_{ni,t} - \beta_{ni,t-1}) - (\beta_{i,t} - \beta_{i,t-1})] \\
& + [(X_{i,t} - X_{i,t-1})(\beta_{ni,t} - \beta_{i,t})] \\
& + \left[(X_{ni,t-1} - X_{i,t-1})(\beta_{ni,t} - \beta_{i,t-1})\right]
\end{aligned}$$

The left-hand side term measures the change over the time period under consideration in the gap between the mean outcomes of non-indigenous and indigenous. The first term on the right-hand side gives the portion of the difference in outcomes due to changes over time

[14] Given the characteristics of the female population in these countries is necessary to include a selection term in the regression. To this aim I apply the usual Heckam selection term as described in Cameron and Trivedi (13)

in the mean levels of endowments (or, equivalently, changes in the endowments of non-indigenous and indigenous). There are various ways of viewing the estimation of this measure. It can be thought of as the result of a series of binary comparisons between the current period male outcome ($Y_{ni,t}$) as well as the current period non-indigenous outcome ($Y_{ni,t}$), the base period non-indigenous outcome ($Y_{ni,t-1}$) and the base period non-indigenous outcome ($Y_{i,t-1}$), using the current period non-indigenous coefficients ($\beta_{ni,t}$) to construct in each instance the hypothetical corresponding wage. This enables the endowment component of the differential in outcomes to be evaluated using the same set of coefficients (e.g., $\beta_{ni,t}$).

The second term on the right-hand side of the equation above captures differences in outcomes due to changes in coefficients, evaluated at the indigenous' endowments at the start of the time period under consideration. To have the changes in coefficients evaluated with a common set of endowments at the same time that the changes in endowments are evaluated with a common set of coefficients, there is a need to mix hypothetical wage structures. Consequently, residual terms emerge in the decomposition. As with the decomposition used by Masters (1974), these residual terms can be presented in the form of interaction terms.

The first of these interaction term records changes over time for indigenous in the mean level of the explanatory variables, weighted by the ethnic differential in the estimated coefficients at the end-point of the comparisons.

A positive value of this interaction term would indicate growth in non-indigenous endowments in areas where they are disadvantaged in terms of returns (smaller coefficients). For example, the mean level of labor market experience for the indigenous might increase over time, but this could be a factor where the non-indigenous receive a greater payoff than the indigenous. This interaction term is analogous to the decomposition outlined by Masters (1974).

The second interaction term record changes over time in the estimated impact of the explanatory variables for the non-indigenous, weighted by the ethnic gap in the explanatory variables. A positive value for this interaction term indicates an increase in the estimated coefficients for those characteristics in which non-indigenous have an advantage. For example, the return to schooling for the non-indigenous might increase over time, and the non-indigenous may have more schooling than the indigenous.

A second extension of the decomposition we apply presents an extension of Wellingtons (1993), considering the self-selection term.

$$
\begin{aligned}
[(Y_{ni,t} - Y_{i,t}) - (Y_{ni,t-1} - Y_{i,t-1})] \quad = & \\
& \left[(X_{ni,t} - X_{ni,t})\,\beta_{ni,t} - (X_{i,t} - X_{i,t-1})\,\beta_{i,t}\right] \\
& + \left[X_{ni,t-1}(\beta_{ni,t} - \beta_{ni,t-1} - X_{i,t-1}(\beta_{i,t} - \beta_{i,t-1})\right]
\end{aligned}
$$

As with the first equation, the term, on the left-hand side measures the change overtime in the difference in the mean outcomes of the non-indigenous and indigenous. The first term in the square brackets on the right-hand side measures the portion of this change that can be linked to changes in the endowments of the non-indigenous and indigenous (e.g. the mean levels of the labor market experience of the indigenous increasing relative to those of the non-indigenous). This term equates to the sum of the first and third terms in the Smith and Welch (1989) decomposition. The second term, in square brackets on the right-hand side of the above expression, measures the portion of the changes in the mean outcomes of the non-indigenous and the indigenous that cannot be explained by changes in the mean levels of endowments of the two groups.

The unexplained portion of the differential depicts the impact of changes in the estimated coefficients, that are advantageous for either non-indigenous (where the values calculated are positive) or for indigenous workers (where the values calculated are negative). The second term of the Wellington decomposition is equal to the sum of the second and fourth terms in the Smith and Welch (1989) and Hotchkiss and Shiferaw (2010) decomposition.

Wellington's decomposition involves two connected decompositions: (i) where the changes over time in outcomes for non-indigenous are decomposed using a hypothetical outcome for non-indigenous in the base period; and (ii) where the changes over time in outcomes for indigenous are decomposed using a hypothetical outcome for indigenous in the base period. As the decomposition uses these hypothetical values consistently, interaction terms do not have to be included in the analysis. However, as separate hypothetical values are used for each ethnic group, neither the changes over time in endowments, nor the changes over time in coefficients, are evaluated using values common to both non-indigenous and indigenous. Finally, we aim to study the distributional changes of the wage gaps over time. To achieve this, we employ quintile regression methods. we follow the Machado Mata (2005) counterfactual with the correction that Melly (2005) proposes. As in the case of Oaxaca-Blinder decomposition, this method allows for the decomposition of the wage gap between coefficient effects and residuals (attributed as discrimination). The estimator is based on following Koenker and Bassett (1978) :

$$F_{y|x}^{-1}(\varsigma|x_i) = x_i\beta(\varsigma), \qquad for\ all\ \varsigma\ \epsilon(0,1)$$

Where $F_{y|x}^{-1}(\varsigma|x_i)$ is the ςth quantile of y conditionally on x_i. The dependent variable is the logged wage and the covariates are human capital characteristics. Thus, the quantile regressions coefficients can be interpreted as rates of return to the different characteristics at the specified quantile of the conditional distribution.

As Koenker and Basset (1978), show $\beta(\varsigma)$ can be estimated by:

$$\beta(\varsigma) = argmin_{b\epsilon R}\tfrac{1}{N}\sum_{i=1}^{N}(y_i - x_ib)(\varsigma - 1(y_i \leq x_ib))$$

Where 1(.) is the indicator function, $\beta(\varsigma)$ is estimated separately for each ς. Let $(\varsigma_0 = 0, \varsigma_1, ..., \varsigma_j = 1)$ be the points where the solution changes. $\beta(\varsigma)$ prevails from $\varsigma_j - 1$ to ς_j for $j = 1, ..., J$. Let β be the vector of all different quantile regression coefficients $\beta(\varsigma) = \beta(\varsigma_1, ...\beta(\varsigma_{1j}), ...\beta(\varsigma_{j1}))$.

This is a model for the conditional quantiles of y, but we want to estimate the unconditional quantiles of y. We therefore need to integrate the conditional distribution over the whole range of the distribution of the regressors. However, a problem with quantile regression is the potential lack of monotonicity, which is resolved by Melly (2005) by using the following property:

$$q\left(\beta, X\right) = \inf\left\{q : \frac{1}{N}\sum_{i=1}^{N}\sum_{j=1}^{J}\left(\varsigma_j - \varsigma_{j-1}\right)1\left(X_d\beta_{(\varsigma)} \leq q\right) \geq \theta\right\}$$

Melly (2004) proves de consistency and asymptotical normality of this estimator. We use the same framework as Jhun Murphy and Pearce (1993) to decompose the differences in wage distributions between indigenous and non-indigenous for each period and each country. Taking the median as a measure of the central tendency of a distribution, we can write a simple wage equation for each country and period:

$$\begin{aligned} Y_{ni,t} &= X_{ni,t}\beta_{ni,t}(0.5) + u_{ni,t} \\ Y_{i,t} &= X_{i,t}\beta_{i,t}(0.5) + u_{i,t} \end{aligned}$$

Where i is indigenous, ni is non-indigenous,t is the period of the estimation, $\beta_{ni,t}(0.5)$ and $\beta_{i,t}(0.5)$ are the coefficient vectors of the median regression for indigenous and non-indigenous in period t. we can now isolate the effects of changes in characteristics X, coefficients $\beta(0.5)$ and residuals u . We first estimate the counterfactual distribution of wages that would have prevailed in non-indigenous if the distribution of individual attributes had been as it is one of the indigenous by minimizing (1) over the distribution of x of non-indigenous and using the coefficients estimated for the indigenous. Formally,

$$q(\beta^{ni}, X^{i}) = inf\{q : \frac{1}{N}\sum_{d=1}^{N}\sum_{j=1}^{J}\left(\varsigma_j - \varsigma_{j-1}\right)1(X_d^{i}\beta_{(\varsigma_j)}^{ni} \leq q) \geqslant \theta$$

is the θ th quantile of this counterfactual distribution of wages. Thus, the difference between $q(\beta^{ni}, X^i)$ and $q(\beta^i, X^i)$is explained by changes in characteristics.

This decomposition is less restrictive than the JMP decomposition, because the characteristics are allowed to influence the whole conditional distribution of y.

To separate the effects of coefficients from the effects of residuals, note that the ςth quantile of the residuals distribution conditionally on x is consistently estimated by $X(\beta(\varsigma) - \beta(0.5)$. We define the $Jx1$ vector $\beta^{mni,ri}_{(\varsigma_j)}$, where its jth element is given by $\beta^{mni,ri}_{(\varsigma_j)} = \beta^{ni}(0.5) + \beta^{i}_{(\varsigma_j)} - \beta^{i}(0.5)$. Thus, we estimate the distribution that would have prevailed if the median return to characteristics had been the same as for non-indigenous, but the residuals had been distributed as for indigenous, to be $q(\beta^{mi,rni}, x^i)$. Therefore, the difference between $q(\beta^{mi,rni}, x^i)$ and $q(\beta^i, x^{nii})$ can be seen to be due to changes in coefficients, since characteristics and residuals are kept at the same level. Finally, the difference between $q(\beta^i, x^i)$ and $q(\beta^{mi,rni}, x^i)$ is due to residuals.

The final decomposition is the following

$$
\begin{aligned}
q(\beta^i, x^i) - q(\beta^{ni}, x^{ni}) &= ((q(\beta^i, x^i) - q(\beta^{mi,rni}, x^i)) \\
&\quad +(q(\beta^{mi,rni}, x^i) - q(\beta^{ni}, x^i)) \\
&\quad +(q(\beta^{ni}, x^i) - q(\beta^{ni}, x^{ni}))
\end{aligned}
$$

where the first bracket represents the effect of changes in residuals, the second the effects of changes in (median) coefficients, and the third the effects of changes in the distribution of the covariates. Note that we can decompose all statistics (variance, difference between the 9th and the 1st deciles, Gini coefficient, coefficient of variation, etc.) since we can estimate the whole counterfactual distribution.

Results

The countries with higher indigenous populations are Bolivia, Guatemala and Peru, where the indigenous account, respectively, for 21%, 23% and 14% of the working population of the sample (see table 1). As was stated before, informality is a very important phenomenon in Latin American countries; the results go in line with Perry et, al. (2007) since we find that there exists a slight reduction in the informal sector for each of my pair of years. However informality still accounts for nearly 55% of the Latin American labor markets, ranging from 45% in Brazil (on average) to more than 60% in Bolivia (see Table 1).

Table 1: Descriptive Statistics

	Brazil		**Guatemala**		**Peru**		**Bolivia**	
	1996	**2005**	**2000**	**2004**	**2000**	**2005**	**1999**	**2006**
Age-Mean	34.34	35.57	33.85	34.99	35.50	37.23	32.63	33.02
	(11.85)	(11.90)	(12.43)	(12.71)	(12.18)	(12.47)	(13.18)	(13.41)
Sex (1=male)	60.3	57.3	55.0	59.3	56.4	56.7	52.1	52.4
	(0.49)	(0.49)	(0.50)	(0.49)	(0.50)	(0.50)	(0.50)	(0.50)
Schooling mean years	6.98	8.33	7.32	6.96	9.40	10.15	9.63	10.24
	(4.32)	(4.24)	(5.10)	(4.74)	(3.76)	(4.23)	(4.50)	(4.69)
Experience mean years	20.39	20.27	19.48	21.04	20.14	21.09	17.00	16.78
	(13.26)	(13.50)	(13.94)	(14.44)	(14.20)	(14.14)	(14.90)	(14.88)
Married=1 Else =0			0.59	0.62	0.58	0.59	0.55	0.55
			(0.49)	(0.49)	(0.49)	(0.49)	(0.50)	(0.50)
Migrant=1 Else=0	8.2	6.8	7.1	7.4				
	(0.27)	(0.25)	(0.26)	(0.26)				
Informal worker =1	45.1	43.1	43.8	51.4	55.2	53.3	61.7	60.5
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.49)	(0.49)
Family size mean	4.07	3.60	5.33	5.17	5.50	5.22	5.13	4.92
	(1.70)	(1.43)	(2.44)	(2.45)	(2.48)	(2.42)	(2.15)	(2.23)
# children 6-18 mean	1.07	0.79	1.35	1.30	1.08	1.00	1.68	1.60
	(1.26)	(1.04)	(1.47)	(1.51)	(1.30)	(1.20)	(1.53)	(1.56)
# children 0-5 mean	0.34	0.26	0.50	0.48	0.30	0.24	0.56	0.60
	(0.63)	(0.55)	(0.82)	(0.78)	(0.58)	(0.53)	(0.78)	(0.83)
Hrs. work per week mean	43.72	42.81	51.08	45.55	49.67	48.75	50.67	51.32
	(13.76)	(13.40)	(21.37)	(19.40)	(22.50)	(22.27)	(24.45)	(23.29)
Indigenous	6.6	7.5	12.1	13.9	23.8	23.4	21.6	18.3
	(0.25)	(0.26)	(0.33)	(0.35)	(0.45)	(0.34)	(0.41)	(0.39)

Notes:Experience was estimated using mincerian formula exp=age-schooling-6. Migration takes the value of 1 when the individual was born in other region. Family size, includes the total number of members in the household.

As Table 1 shows, the working populations in the sample present similar mean ages across countries, with slight changes over time. Peru presents the highest mean age for the working population at 37.23 years. On the other hand, Bolivia has the youngest workers with the average being 33 years old. The populations differ by sex; on average, 58% of Brazilian workers are males, while only 52% of workers in Bolivia are males. It is possible to identify some positive trends when looking at variables such as schooling and experience. In all of the country samples there is an increase in the average years of schooling. In 2006, mean schooling ranged from 6.98 years in Brazil to 10.24 in Bolivia.

Table 2: Wage Ratios by Country

	Informal Indigenous			Informal Non-Indigenous			Formal Indigenous			Formal Non-Indigenous			Informal W_i/W_ni	Formal W_i/W_ni
	CV wage	**p90/ p50**	**p50/ p10**	**CV wage**	**p90/ p50**	**p50/ p10**	**CV wage**	**p90/ p50**	**p50/ p10**	**CV wage**	**p90/ p50**	**p50/ p10**		
Guatemala														
t=0	1.61	2.80	8.87	1.32	2.96	4.34	1.06	3.30	2.72	1.06	3.43	2.77	0.63	0.70
t=1	1.11	2.79	3.44	0.91	2.63	3.10	0.77	2.68	2.63	0.80	2.87	2.17	0.74	0.77
Dif	-0.50	6.07	-4.53	-0.41	-0.33	-1.24	-0.28	-0.62	-0.09	-0.26	-0.56	-0.59	0.11	0.07
Bolivia														
t=0	1.25	3.08	5.25	1.17	3.20	3.65	0.83	3.32	2.71	0.88	3.03	2.89	0.71	0.58
t=1	1.44	3.06	3.13	1.29	3.69	2.84	0.94	4.04	2.49	0.93	3.36	2.63	0.77	0.70
Dif	0.19	2.17	-1.60	0.12	0.49	-0.80	0.10	0.72	-0.22	0.05	0.33	-0.26	0.06	0.12
Brazil														
t=0	1.09	3.06	2.34	1.16	3.57	2.50	1.03	3.09	2.43	1.00	3.75	2.77	0.75	0.67
t=1	0.99	2.59	2.40	1.04	2.88	2.50	0.90	2.80	1.83	0.92	3.36	2.09	0.86	0.78
Dif	-0.10	-0.72	0.16	-0.12	-0.69	0.00	-0.12	-0.29	-0.60	-0.08	-0.39	-0.68	0.11	0.11
Peru														
t=0	0.88	2.56	2.95	0.80	2.45	2.81	0.69	2.31	2.10	0.73	2.54	2.46	1.01	0.90
t=1	0.96	2.57	3.52	0.89	2.61	2.96	0.85	2.58	2.61	0.79	2.66	2.52	0.88	0.85
Dif	0.08	0.39	-0.14	0.10	0.16	0.15	0.16	0.27	0.51	0.07	0.12	0.05	-0.13	-0.04

Notes: Differences measure the change in the wage gap between indigenous and non-indigenous populations. Decomposition 1 corresponds to the decomposition presented in equation 6. Decomposition 2 corresponds to the decomposition presented in equation 7. Column 1 shows the contributions of changes in the endowments of non-indigenous workers; column 2 shows the contributions of changes in the valuation of the endowments of non-indigenous workers. Similarly, column 3 shows the contributions of changes in the endowments of indigenous workers; column 4 shows the contributions of changes in the valuation of the endowments of indigenous workers.

Turning to wages, they vary widely across the four countries, though there are some commonalities across the sample. Indigenous people earn less than their non-indigenous peers in formal and informal sectors. In Guatemala, the indigenous earn 63% of what the non-indigenous earn in the informal sector, while in the formal sector they earn 70% of this amount. In Bolivia, the differences are even larger. In the informal sector, indigenous populations earn 77% of what non-indigenous populations earn. In the formal sector, this percentage reaches only 70%. As Table 2 shows, there has been a reduction in the ethnic wage gap across the region. The variance of wages is higher in the informal labor markets for both indigenous and non-indigenous populations.As Graph 1 of the Appendix shows, ethnic wage gap in informal employment is visible mainly at the bottom of the distribution. It converges in the group with middle earnings. Therefore, we do not observe a distinctive glass ceiling. When comparing the wage gap in the informal economy to the formal one, we can see that the earnings gap is slightly larger along the center of the distribution, but is somewhat bigger at the two tails of the distribution (for very low earnings and very high earnings). This lower gap in the formal labor market may be due to "stickiness" due to minimum wage legislation. We may also expect that in the informal labor market, those agreeing to relatively low earnings also have lower bargaining power, and indigenous populations seem to be the more disadvantaged group.

In addition, Graph 1 of the Appendix shows that there has been a reduction in the ethnic wage gap along the wage distribution for all countries, especially at the top part of the distribution. This trend seems clearer in the case of Bolivia, and less pronounced in the case of Guatemala. This last case is very interesting, since it seems to show changes in the top and the lower parts of the wage distribution in the informal sector, while not showing any significant changes in the middle part of the distribution. It's also important to highlight the reduction of the ethnic wage gap in the Bolivian formal labor market, especially in the top part of the distribution.

Examining the wage gap

Table 3 shows the empirical results for the OLS wage estimations described in the methodological section, and the gaps for indigenous and non-indigenous for formal and informal labor market specifications. These wage equations are estimated for each country, first omitting all the controls (Column 1) and later including the controls (Column 2). Given the potential selection bias that could be occurring, we also correct using the Heckman methodology (Columns 3 and 4 respectively).

As can be seen in Table 3, the inclusion of the controls reduces the effect of the dummies but these remain highly significant, both for the corrected and non-corrected sections. The controls behave as expected,[15] with education variables as the most important way of explaining wages in all of the countries and the positive sign of married indicating positive externalities from being married. The dummies corresponding to the type of employment sector (formal and informal and indigenous conditions) all present positive effects.
The regressions show that there is a higher premium for formal non-indigenous and significant differences for the indigenous and non-indigenous inside each employment sector (i.e., for Bolivia the wage gap inside the informal sector is 0.154 while in the formal sector it is 0.113. In Guatemala it is 0.193 and 0.06 respectively). The premiums paid for the non-indigenous are higher for countries that have more indigenous populations, like Bolivia and Guatemala, and smaller for the other two countries.[16] The results of Table 3 also show that there is a significant unexplained gap. This unexplained gap is attributed sometimes to discrimination as in Oaxaca (1973).[17]

[15] The full table can be found in the appendix table A3.

[16] I test different definitions of informality for the case of Bolivia and the results do not differ significantly. Table 2 shows these results.

[17] Note thatNeumark (1990) argues this component does not necessarily reflect discrimination in the labor market but could reflect omitted variables

Table 3
OLS wage gap estimation

	Bolivia							
	t=0				t=1			
VARIABLES	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
D_Informal	0.438	0.139	0.343	0.154	0.317	-0.00476	0.195	0.0231
D_Formal	0.572	0.104	0.505	0.113	0.412	0.163	0.329	0.178
	Brazil							
	t=0				t=1			
VARIABLES	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
D_Informal	0.219	0.0578	0.179	0.0585	0.112	0.0199	0.0851	0.0207
D_Formal	0.422	0.2425	0.339	0.2417	0.25	0.139	0.217	0.139
	Guatemala							
	t=0				t=1			
VARIABLES	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
D_Informal	0.555	0.189	0.401	0.193	0.185	-0.0404	0.108	-0.041
D_Formal	0.424	0.054	0.222	0.063	0.299	0.077	0.202	0.072
	Peru							
	t=0				t=1			
VARIABLES	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
D_Informal	-0.00766	0.00243	-0.0154	0.00224	0.181	-0.00526	0.0415	-0.00436
D_Formal	0.078	0.005	-0.042	0.005	0.275	0.105	0.132	0.103

Notes: column (1) wage equation without controls; column (2) wage equation with controls; column (3) Heckman wage equation without controls; column (4) Heckman wage equation with controls. D_informal measures the difference of the coefficients of a dummy of indigenous and non-indigenous in the informal sector. D_Formal measures the difference of the coefficients of a dummy of indigenous and a dummy of non-indigenous in the formal sector. t=0 represents the initial period according to each country. t=1 corresponds to the second period according to each country.

Intertemporal Changes

Given that one of the objectives of the article is to tackle the inter-temporal changes in the wage gaps, we apply the methodologies described in the previous section. As table 4 shows, overtime wage gaps reductions exist for all the countries led by Brazil (0.19) and followed by Bolivia (0.15) Guatemala (0.11), and finally Peru presents a smaller and opposite effect (-0.1).[18] Nevertheless considering the temporality of the decomposition one could asses

[18]Due to size of the document, the complete set table of decompositions, including the contributions per variable, is available from the author upon request.

that the reduction has been faster in countries with higher levels of indigenous populations. Looking at the different labor markets, the inter-temporal reduction has been bigger in the formal sector especially in Bolivia (0.21) and followed by Guatemala (0.19) and Brazil (0.13). Informal labor market reductions have been smaller. These results, along with the ones found in table 3, not only show the dissimilarities that exist between informal and formal labor markets but also the size of wage gap adjustment of these markets. Notably formal labor market reduction of the wage gap is higher compared to the informal one; this is in line with the political economy argument that increases in political (and social) power of minorities will lead to reduction on labor market disparities in well-functioning markets with strong institutions.

The components of the inter-temporal decompositions give insights on the sources of these reductions and push and pull factors that influenced the changes. We find that in Brazil and Bolivia, most of the total wage gap changes are explained by the non-indigenous endowments and how these endowments translate into wages (non-indigenous endowment component of the first decomposition[19]). One interesting effect is the downward pressure given the negative valuation of the endowments both for indigenous and non-indigenous for Brazil and the indigenous in Bolivia. Even if both components present a small effect they act in the opposite direction of the endowments components pushing the wage gap to increase. Nevertheless these effects are small and not significant.

On the contrary, in the case of Guatemala and Peru, most of the changes in the wage gaps can be explained through changes in the endowments of the indigenous population (component 2 of the first decomposition) and, to a lesser extent, through changes in the value placed by the labor market on their endowments (the coefficient component 4). This would imply that non-indigenous populations are increasing their wage-enhancing characteristics by a larger amount compared to indigenous ones.

However, the wage gaps and its components are different when comparing formal and

[19] Component 1 of the first decomposition

informal labor markets. As shown before, the reduction in the wage gaps has been bigger in formal labor markets for all countries. In all the countries the increase on the endowments of indigenous populations responds to the reduction of the wage gaps both in the formal and the informal sector. As with the full sample, the valuation of the endowments has a negative effect (pushes downwards) the wage gaps.

Some differences could be found when examining the sources of changes. The degree to which informal labor markets were valuing those characteristics' (coefficient effects) was declining both for indigenous and non-indigenous, which also puts opposing pressures on the wage gaps. This pressure is higher for indigenous populations especially in the informal labor market. Bolivia and Guatemala, countries with high indigenous populations, show a high concentration of the effects on the changes in the endowments of the indigenous populations, in proportion these changes are higher compared to Brazil and Peru (which have smaller indigenous populations) especially in the formal labor market.

Table 4

Inter-temporal decomposition

Total	Difference	(1)	(2)	(3)	(4)
Brazil					
Decomposition 1	0.194	0.152	0.521	-0.119	-0.360
	(0.043)	(0.009)	(0.027)	(0.003)	(0.004)
Decomposition 2	0.194	0.053	0.153	-0.020	0.008
	(0.043)	(0.008)	(0.029)	(0.004)	(0.009)
Bolivia					
Decomposition 1	0.151	0.049	0.137	0.000	-0.035
	(0.147)	(0.036)	(0.075)	(0.019)	(0.017)
Decomposition 2	0.151	0.035	-0.016	0.014	0.118
	(0.147)	(0.043)	(0.121)	(0.023)	(0.133)
Guatemala					
Decomposition 1	0.110	-0.058	0.088	0.168	-0.088
	(0.493)	(0.027)	(0.355)	(0.012)	(0.099)
Decomposition 2	0.110	0.036	-0.082	0.074	0.082
	(0.493)	(0.039)	(0.303)	(0.040)	(0.164)
Peru					
Decomposition 1	-0.100	0.041	-0.048	-0.038	-0.056
	(0.000)	(0.817)	(0.819)	(0.191)	0.000
Decomposition 2	-0.100	-0.136	-0.098	0.139	-0.006
	(0.000)	(0.026)	(0.843)	(0.839)	(0.025)
Formal					
Brazil					
Decomposition 1	0.137	0.179	0.495	-0.151	-0.385
	(0.000)	(0.020)	(0.022)	(0.006)	0.000
Decomposition 2	0.137	0.060	0.089	-0.033	0.021
	(0.000)	(0.013)	(0.019)	(0.011)	(0.015)
Bolivia					
Decomposition 1	0.210	0.002	0.351	-0.001	-0.142
	(0.001)	(0.108)	(0.110)	(0.028)	0.000
Decomposition 2	0.210	0.025	0.238	-0.024	-0.029
	(0.001)	(0.103)	(0.145)	(0.043)	(0.184)
Guatemala					
Decomposition 1	0.194	-0.008	0.422	0.112	-0.331
	(0.140)	(0.045)	(0.069)	(0.015)	(0.011)
Decomposition 2	0.194	0.047	-0.059	0.057	0.150
	(0.140)	(0.064)	(0.143)	(0.059)	(0.173)
Peru					
Decomposition 1	-0.121	-0.059	0.000	-0.015	-0.047
	(0.001)	(0.786)	(0.787)	(0.266)	0.000
Decomposition 2	-0.121	-0.025	-0.044	-0.048	-0.004
	(0.001)	(0.042)	(0.832)	(0.831)	(0.044)
Informal					
Brazil					
Decomposition 1	0.088	0.080	0.471	-0.062	-0.401
	(0.032)	(0.010)	(0.017)	(0.003)	(0.001)
Decomposition 2	0.088	0.024	0.062	-0.006	0.008
	(0.032)	(0.009)	(0.019)	(0.006)	(0.014)
Bolivia					
Decomposition 1	0.172	0.044	0.165	-0.016	-0.020
	(0.143)	(0.039)	(0.073)	(0.020)	(0.011)
Decomposition 2	0.172	0.048	-0.065	-0.021	0.210
	(0.143)	(0.051)	(0.146)	(0.035)	(0.177)
Guatemala					
Decomposition 1	0.169	-0.040	0.560	0.087	-0.437
	(0.131)	(0.034)	(0.061)	(0.019)	(0.018)
Decomposition 2	0.169	0.041	-0.027	0.006	0.149
	(0.131)	(0.041)	(0.110)	(0.056)	(0.113)
Peru					
Decomposition 1	-0.134	-0.068	-0.064	0.094	-0.096
	(0.000)	(0.029)	(0.049)	(0.256)	0.000
Decomposition 2	-0.134	-0.125	-0.147	0.151	-0.013
	(0.000)	(0.031)	(0.262)	(0.256)	(0.033)

Notes: Differences measure the change in the wage gap between indigenous and non-indigenous populations. Decomposition 1 corresponds to the decomposition presented in equation 6. Decomposition 2 corresponds to the decomposition presented in equation 7. Column 1 shows the contributions of changes in the endowments of non-indigenous workers; column 2 shows the contributions of changes in the valuation of the endowments of non-indigenous workers. Similarly, column 3 shows the contributions of changes in the endowments of indigenous workers; column 4 shows the contributions of changes in the valuation of the endowments of indigenous workers.

Both of the interaction terms of the second decomposition (Smith and Welch (1989), are positive for Bolivia and Guatemala. The first interaction term shows that most of the increase in indigenous endowments over time has been in areas where non-indigenous groups have an advantage in terms of the payoffs received. The second interaction term indicates an increase of the non-indigenous coefficients overtime in areas where they have advantage in endowments. This reduces the advantage they have over indigenous. The results of the interaction terms, although small, reinforce the improvement in indigenous population endowments.

As was expected the differences between formal and informal labor markets remain in the interaction terms. The effects tend to be negative for both terms in the formal labor market while they are positive for the informal labor market. The negative effect in the first interaction term shows that the decline in indigenous endowments, in formal labor market, has been in areas where non-indigenous have an advantage. Nevertheless both effects are small and not significant.

On the source of changes and the distributional effect

The main contributors to a reduction on the ethnic wage gaps are related to institutional variables.[20] The sector in which workers perform their activities constitutes the main contributor to the endowments portion of the wage gaps. Most notably, public sector industry constitutes one of the main factors reducing ethnic wage gaps, both on the endowments part but mostly on the price of endowments part of the decomposition. Nevertheless, these institutional factors push downward the wage gaps in the formal sector while their effect in the informal sector is not as notable, especially for Brazil. In Bolivia and Guatemala the contribution of the institutional factors constitute the most important wage-gap reducer in the formal sector.

A second channel that works in reducing the ethnic wage gaps is the human capital

[20] The relative contributions of different components to each of the components of the inter-temporal wage gap change is found in the tables of the appendix

valuation, reflected through education and experience. In Bolivia and Guatemala, the contribution of human capital factors have a positive effect on the endowment portion of the wage gap changes for the non-indigenous populations, while it acts negatively on the similar portion of the indigenous populations. A different effect is found for the contribution of human capital factors to the valuation of the endowments, while it's positive for the indigenous populations is small and negative for the non-indigenous populations. In sum, the effect of human capital factors is positive in terms of wage gap reduction. The effects differ slightly between formal and informal sectors; while in the formal sector human capital factors play a key role reducing the wage gap, in the informal sector they do not seem to matter much; moreover they tend to put contrary pressure on the wage gaps reduction.

Finally, the distribution decomposition shows changes in the components of the wage gap across countries and between markets using the quintile counterfactual decomposition explained in the methodological section. The results for the decompositions show that the ethnic gaps have been narrowing overtime in most of the countries along the distribution, especially in Bolivia and Guatemala. The biggest changes exist in the extreme parts of the distribution, while the medium part of the distribution remains, relatively, constant (see graph 2a of the appendix). In Bolivia the volatility of the ethnic wage gap reduced over time along with the size of the wage gap; this resembles a reduction of disparities along the distribution. In addition, for all the countries the gender gap decreases as we move up the wage distribution.

Formal vs. informal differences are clear along the distribution. Ethnic wage gaps volatility, along the distribution, is higher for the initial period in the formal labor markets while it diminishes over time. Focusing on the changes in the residuals over time (sometimes attributed to discrimination), Bolivia and Brazil shows a reduction on the wage gap between indigenous and non-indigenous, especially at the top of the distribution in the formal sector (see graph 2b in the appendix). Even the informal sector also shows improvements at the top of the distribution (better paid workers); the reduction on the residuals is smaller compared to the formal sector. Guatemala presents a similar trend to that of Bolivia for the formal sector, nevertheless its behavior on the informal sector changes dramatically up to the point that the wage gap between indigenous and non-indigenous switch places, reflecting a positive wage gap at the lowest levels of the distribution, but negative gaps at the top of the distribution. Brazil presents similar behavior to Bolivia and Guatemala.

As the ethnic pay gap has diminished substantially in the informal labor market especially in the top part of the distribution, this might suggest that indigenous who receive very low wages, might suffer from larger discrimination in the absence of legal regulations because they have lower bargaining power in the informal sector than non-indigenous. As suggested in the case of women by Fields (2005), minorities belong to a "lower tier," which consists of individuals who cannot afford to be unemployed, and are rather "involuntary employees" in the informal sector. This effect of higher ethnic gap at the bottom of the wage distribution is often called the "sticky floor."

When looking at the formal sector changes, we find that the ethnic wage gap increased as we follow the wage distributions, and in fact a glass ceiling effect can be reported for the initial period. Nevertheless, this effect disappeared overtime even changing at the very top part of the distribution in Bolivia. This results along with the ones found in the inter-temporal decompositions show that the social inclusion of indigenous populations has had an effect at the top part of wage earnings. This could be a reflection of access to better jobs for the indigenous populations, especially in the formal sector.

Conclusions

In this paper we used a set of cross sectional data on both formal and informal labor markets for countries with high indigenous populations. we examine the periods pre2000 and post 2006 to check if the ethnic wage gaps are similar between informal and formal labor markets, the sources of change, and differences along the wage gap distribution. Various methodological approaches are used, starting from measures of dispersion in wages for indigenous and non-indigenous in both labor markets, then we decompose the changes in ethnic pay gaps inter-temporally using methodologies close to the ones presented by Wellington (1989) , Hotchkiss and Shiferaw (2010), and Smith and Welch (1989). Finally we present a counterfactual distributional analysis following the work developed by Melly (2005) and Chernuchov, Fernandez-Val and Melly (2010).

As expected, we confirm the findings by Perry et. al. (2007), Arias (2009) and others that informality is a very serious problem that Latin American labor markets face (on average 50% of labor markets are informal), with small changes over time. Even while wages vary widely across different countries, we find that indigenous people earn less than their non-indigenous peers in both, formal and informal sectors. However, we find significant reductions on the wage ratios over time, especially in countries with the higher proportion of indigenous workers such as Bolivia and Guatemala. Regarding the distribution of wage gaps, the ethnic wage gap in informal employment is visible mainly at the bottom of the distribution. It converges in the group with middle wages. Therefore, we do not observe a distinctive glass ceiling in the informal labor markets. In sum, my results confirm the existence of ethnic pay gap in both formal and informal (unregistered) employment in Latin America. However the size and characteristics differ depending on the level of wages. The inequality of wages between informal indigenous and non-indigenous populations is more pronounced at the extremes of the distributions.

The OLS wage estimations shows that a higher premium for formal non-indigenous and significant differences for the indigenous and non-indigenous inside each employment sector, resembling the existence of an unexplained gap is attributed sometimes to discrimination as in Oaxaca (1973). The inter-temporal decompositions show the existence of overtime wage gaps reductions exist for all the countries leaded by Brazil and followed by Bolivia and Guatemala. Nevertheless considering the temporality of the decomposition one could asses that the reduction has been faster in countries with higher levels of indigenous populations. The speed of reduction is has been faster in the formal sector in countries with high levels of indigenous population.

In addition, we find that most of the total wage gap changes are explained by the non-indigenous endowments and how these endowments translate into wages with a downward pressure given by the valuation of the endowments both for indigenous and non-indigenous. However, the wage gaps and its components are different when comparing formal and informal labor markets. As shown before, the reduction in the wage gaps has been bigger in formal labor markets for all countries. In all the countries the increase on the endowments of indigenous populations responds to the reduction of the wage gaps both in the formal and the informal sector. As with the full sample, the valuation of the endowments has a negative effect (pushes downwards) the wage gaps.

We find that the degree to which informal labor markets were valuing characteristics' (coefficient effects) was declining both for indigenous and non-indigenous, being higher for indigenous populations especially in the informal labor market. In addition we find that most of the increase in indigenous endowments over time has been in areas where non-indigenous have an advantage in terms of the payoffs received. The second interaction term indicates an increase of the non-indigenous coefficients overtime in areas where they have advantage in endowments. This reduces the advantage they have over indigenous. The results of the interaction terms, although small, reinforce the improvement in indigenous populations endowments.

The main sources of change in the ethnic wage gaps consist on institutional and human capital factors. The sector in which workers perform their activities constitutes the main contributor to the endowments portion of the wage gaps. Most notably, employment in the public sector constitutes one of the main factors that contribute to the reduction of ethnic wage gaps. This factor affects especially price of endowments of the wage gap in the formal labor market. Human capital valuation is the second most important channel to reduce ethnic wage gaps, and slightly between formal and informal sectors. While in the formal sector human capital factors play a key role in reducing the wage gap, in the informal sector they do not seem to matter much. Moreover they tend to put counteracting pressure on the wage gaps reduction. Turning to the residuals of the distribution (often called discrimination component), we find a reduction on the wage gap between indigenous and non-indigenous, especially at the top of the distribution in the formal sector. Following Fields (2005) minorities belong to a "lower tier," which consists of individuals who cannot afford to be unemployed, and are rather "involuntary employees" in the informal sector. This effect of higher ethnic gap at the bottom of the wage distribution is often called "sticky floor." This is confirmed for ethnic wage gaps given that the ethnic pay gap has reduced highly in the informal labor market especially in the top part of the distribution. When looking at the formal sector changes, we find that the ethnic wage gap increased as we follow the wage distributions, and in fact a glass ceiling effect can be reported for the initial period. Nevertheless, this effect disappeared overtime even reversed itself at the very top part of the distribution in Bolivia. This results along with the ones found in the inter-temporal decompositions show that the social inclusion of indigenous populations has had an effect at the top part of wage earnings. This could be a reflection of access to better jobs for the indigenous populations, especially in the formal sector.

The policy implications of the results point toward the control or elimination of discrimination involving different policies that could be applied, such as controls over contracts, penalties or law enforcement, where the laws are already established. Finally, as the topic of ethnic pay gap in segmented labor markets has not been examined in the literature, there is a lot of potential for further studies. The use of longitudinal data might give an interesting insight into the dynamics of the informal market and especially gender specific aspects.

3 REEXAMINING THE DETERMINANTS OF FISCAL DECENTRALIZATION: WHAT IS THE ROLE OF GEOGRAPHY?

Introduction

For several decades there has been an increasing interest in the vertical organization of government in developed and developing countries. The main question asked is whether it is advantageous to give sub-national governments more authority and autonomy in revenue and expenditure decisions, or whether it is better to make those decisions at the central level of government. Many scholars and policy makers have sought to understand the consequences of fiscal decentralization.[21] Far less effort, however, has gone into discerning the causes of fiscal decentralization. Variation in the degree to which countries have devolved fiscal resources and expenditure responsibilities to local and regional governments presents researchers with a puzzle. Some authors such as Treisman (2006), Arzaghi and Henderson (2002), Panizza (1999), Oates (1972), among others, have proposed plausible models for the determinants of fiscal decentralization. The origins of fiscal federalism, they argue, are the outcome of a myriad assortment of factors: history, culture, politics, and even physical geography. There is also a long empirical literature examining the determinants of fiscal decentralization across countries and over time such as Bahl and Linn (1992), Wasylenko (1987), Panizza (1999), and Letelier (2005) among others. However, none have really examined the role that geography has on fiscal decentralization. Despite these past studies, we still have limited knowledge on the role that geography plays as a determinant of decentralization; this includes the modeling of geography in the theory of decentralization and what empirical role geography actually plays. Papers such as Panizza (1999) and Arzaghi and Henderson (2005) examine theoretically and empirically the effects of country size on fiscal decentralization, while others such as Letelier (2005)

[21] In fact, there is an extensive literature that examines the relationship between fiscal decentralization and its effects on growth, income distribution and poverty, corruption and so on. See, for example, Martinez-Vazquez and McNab, (2001) and the articles in the special issue of Environment and Planning: C (2009) issue 2.

and Triesman (2006) test empirically the same relationship. Though, to our understanding there is no study that takes a look, in depth, to the relationship between geography and fiscal decentralization.

Understanding the determinants of fiscal decentralization has become increasingly important for many areas of economic research. Given the pervasiveness of decentralized institutions and decision making in many areas of economic policy including economic growth, income redistribution, poverty and welfare, anticorruption, and others, it has become a necessity in empirical studies to control for the role and impact of fiscal decentralization on those policies. A common problem shared by all those empirical studies has been the inability to properly address the potential for endogeneity of decentralization and the dependent variables of interest. Generally speaking there has been a lack a proper external instrument when assessing the relationship between decentralization and economic outcomes. Often, remedies for the endogenous nature of fiscal decentralization have been sought in the use of new econometric techniques such as difference or system dynamic panel estimation, while there has been very limited use of valid external instruments. Geography has clear exogeneity credentials, since economic outcomes do not cause geography.[22] Some elements of geography have been used in some past empirical studies as an instrument for decentralization.[23] But thus far there has not been a systematic exploration in the literature of what elements of geography may be most important. However, it needs to be recognized from the outset that the use of geography as an instrument for decentralization is limited by the type of estimation approach being used; what makes geography a good external instrument, that is fixed by nature, largely rules out its use in certain econometric approaches such as panel estimation using fixed effects. The main objective of this paper is to motivate theoretically the role of geography, and explore in depth its empirical relevance as a determinant of decentralization. The

[22] Even if the economy may affect the access to markets and urban centers, especially in rich countries, economic outcomes cannot affect directly geographical factors such as elevation or climate among others.

[23] Treisman (2006), Panizza (1999) use land area as proxy for geographical measures.

additional value added of this strategy is that geography may be used as an instrument for decentralization in future econometric estimations, where decentralization is used as an explanatory variable but it may be suspected to be endogenous to the economic process being studied (economic growth, political instability, macroeconomic stability, income distribution, etc.).

The theoretical model in the paper builds on the work by Arzaghi and Henderson (2002) and Panizza (1999). For the empirical estimation we use a panel data set for approximately 91 countries for the period 1960-2005. Physical geography is measured along several dimensions including elevation, land area, and climate.

The relationship between decentralization and geography is based on the logic that more geographically diverse countries show greater heterogeneity among their citizens, including their preferences and needs for public goods and services provision. Communications and physical distance are also a very important issue and play a key role on the effect of geography over time. As Lora et. al. (2003) argue geography plays a key role on the economic and social development, as well as on the institutional design of the countries; yet, this effect could be enhanced (or diminished) in the presence of better physical infrastructure or communications. Indeed, we find that there is a strong correlation between geographical factors and fiscal decentralization. We also find that while the development of infrastructure (in transportation, communications, etc.) tends to reduce the effect of geography on decentralization, this effect is rather small and mostly statistically insignificant, meaning that the impact of geography survives over time.

The reminder of the paper is organized as follows. Section 2 briefly reviews the literature on the main determinants of decentralization and describes the arguments for the relationship between decentralization and geography. Section 3 develops the theoretical model and discusses the main hypothesis. Section 4 presents the data used and the empirical estimation. Section 5 discusses the results and the robustness estimations. Finally, Section 6 concludes.

Literature Review

The literature on fiscal decentralization is very large and growing at a fast pace. Without trying to be exhaustive our interest in this review is focused on two main issues. First, we examine how the existing theoretical models explaining decentralization (Oates, 1972; Panizza, 1999; and Arzaghi & Henderson, 2005) could be reinterpreted in the light of the role that physical geography may play on how decentralized different countries may become. Second, we review to what extent past empirical studies of fiscal decentralization have used variables that could be associated with different aspects of geography, and identify as well what other determinants of fiscal decentralization have been found to be significant.

But before we do this, some general observations about the role of geography in modern economic thought and the new economic geography are relevant to understanding the potential role of geography in decentralization. Historians, such as Jones (1981) and Crosby (1986), have examined the economic success of Europe and find that geography and climate to be of central importance. Jones (1981) stresses Europe's great advantages in coastal trade, navigable rivers, temperate climate, and suitable disease patterns as fundamental conditions for European takeoff and eventual domination of the Americas and Africa. Crosby (1986) details the advantages of the temperate zones in climate, disease ecology, and agricultural productivity and its effects on the organization of governments.

In the work on geography by Krugman and Venables (1995), the "new geography" follows the "new trade theory" in showing how increasing returns to scale, agglomeration economies, transport costs, and product differentiation can lead to a highly differentiated spatial organization of economic activity, the creation of stable institutions and governments, even when the underlying physical geography is not fully undifferentiated. These models illustrate the possibility of self-organizing spatial patterns of production based on agglomeration effects, rather than differences in climate, transport costs, ecology, etc.

Our starting point is that highly differentiated physical geography can have large effect on economic and institutional development. For example, a pattern of cities might originally emerge because of cost advantages arising from differentiated geography, and therefore the advantages of having a decentralized system would be justified on the arguments of the decentralization theorem (Oates, 1972). However, these cities then continue to thrive as a result of agglomeration economies even when the cost advantages have disappeared. Oates (1972) argues that economic efficiency can be enhanced across population groups with different preferences and needs through decentralization. We borrow this argument to argue that geographical factors can follow this logic as well. Preferences for public goods and services are likely to vary across geographically differentiated regions. If this is so, greater utility will result if different baskets of public goods and services are provided to different, homogeneous sub regions. For example, if education policy is made at the regional rather than the central level, then local residents can set syllabi and levels of education financing in their home regions to best suit their tastes. Greater efficiency can be achieved through the mobility and sorting of the population in decentralized governments (Tiebout, 1956). On the face of it, any decentralized expenditure scheme could also be implemented by a centralized government, so the efficiency argument requires some additional assumption. A common one is that local governments are either more efficient at collecting information about tastes or better able to get local constituents to reveal such information (Tanzi, 2000). Other supporting authors, argue that accountability plays a key role since decentralization may be the best way to create incentives for politicians to differentiate adequately between the needs of different groups of their citizens and therefore optimize the provision of public goods (Seabright, 1996). Politicians would be willing to modify their objectives to satisfy preferences of their incumbents at local level, since that would help them in re-elections.

The examination of the determinants of decentralization can be split between theoretical and empirical evidence. On the theoretical side, beyond Oates (1972) classical paper presenting the decentralization theorem, important more recent contributions are those by

Panizza (1999) and Arzaghi and Henderson (2005). Panizza (1999) bases his analysis on the fact that if the magnitude of welfare gains has any explanatory power, then we would observe a greater role for sub-national government in countries with greater cultural heterogeneity (provided that the variance in tastes is larger between jurisdictions than within them). This prediction is reinforced by, but by no means wholly dependent on, a population with a high degree of mobility. He links the size of the public sector to taxpayers' satisfaction with the type of public goods provided. Thus, a budget-maximizing central government faces a trade-off between its share in the public sector and the total size of the public sector. A gain in the total size of the public sector can result from mobility making the public goods provided closer to the preferences of the individual (in terms of physical and social distance) , thus making them demand more of the public good whose type better matches their preferences. Moreover, with an increasing level of democracy, governments are dependent on the residents' satisfaction with public goods. This model suggests that the equilibrium level of decentralization should be positively correlated with the heterogeneity of tastes for public goods among residents with the level of democracy and with the country size. Panizza (1999) argues that size of the countries have close relation with the level of heterogeneity of preferences and therefore an increase in the size of the country will decrease the amount of public good and the marginal benefits from centralization. However, he does not really consider that geographical differences would accentuate the effects that country size may have.

On the other hand, Arzaghi and Henderson (2005) model the creation of sub-national governments (under restricted mobility) as being determined by balancing fixed costs of sub-national administration with the "spatial decay" of goods provided from the center. For a benevolent government, their model predicts that adoption of decentralized structures is promoted by (1) larger income, (2) larger population, (3) higher spatial decay of local public services provided to the hinterland by the central government, (4) higher relative income in the hinterland region, (5) larger population share of the hinterland, and (6) lower

fixed costs of government for the hinterland region. For a partially leviathan government, their model has the same predictions as above and also that adoption of decentralized structures is promoted by there being a greater relative degree of local democratic culture when compared to the national level. In other words, sub-national governments are thought to be more responsive to the local constituencies than the central government. Even though Arzaghi and Henderson (2005) do not explicitly model the role of geography it is quite intuitive that special decay in the provision of public goods can be related to geography.
Empirically, the causes of decentralization have received a lot more attention. In some of the earliest work, Pryor (1967), Oates (1972), and Pommerehne (1977) test some basic hypotheses on the causes of fiscal decentralization. The effect of factors associated with geography such as population size of the country as a whole appears to be significant and positively related to fiscal decentralization. In a later study, Kee (1977) measures the impact of urbanization and other variables on fiscal decentralization. The urbanization variable, which Kee claims is used as a geographical control, appears to be positively related to fiscal decentralization. In addition, Wasylenko (1987) finds that there are non-linear effects of urbanization on fiscal decentralization.
Ethnic fractionalization, a variable that has been frequently used as a control in empirical studies of decentralization, could also be related to geographical factors, because geographical diversity is likely to lead to ethnic fractionalization and heterogeneous preferences for different population groups. In this line, Panizzas' (1999) empirical results show a positive effect of ethnic fractionalization and country area on fiscal decentralization. More recently, Letelier (2005) and Freikman (2005) find a similar result for the ethnic fractionalization variable using broader definitions of fiscal decentralization. Perhaps one of the most important geographical measures that have been used on the analysis of fiscal decentralization is the country size. Triesman (2006) and Martinez-Vazquez and Timofeev (2009) find that fiscal decentralization tends to be greater in territorially larger countries,

given the use of other control variables.[24] As Panizza's (1999) argues larger countries are likely to have greater heterogeneity and dispersion on tastes and therefore greater efficiency gains to realize from decentralization.

On the other hand, Lora et. al. (2003) pointed out geographical fragmentation is a concept usually neglected by economists and even by political scientists. Without getting into an analysis of how justified that observation may be, we would argue that many social and economic cleavages have a variety of geographical underpinnings. Culture usually differs widely among inhabitants of different ecozones (reflected either by altitude or climate zone); thus, for example, the contrast between outgoing and vocal lowlanders and timid and taciturn highlanders has become one of the most verified cliches around the world (Gallup & Sachs, 1998). The composition of economic activity can differ widely among ecozones; for example, crops, mineral deposits, or proximity to the ocean are in general different from one zone to another.[25] These factors have a direct impact on the value of exploiting or not some resources such as gas or minerals, through different channels such as access to markets which. In summary, geographical fragmentation is a dimension of social diversity and as such can play a pivotal role in the organization of politics and the economy. In the following two sections we make the theoretical and empirical arguments for how geographical fragmentation becomes an important determinant of decentralization.

Theoretical Framework

Our model builds on Arzaghi and Henderson (2002) in combination with some features from Panizza (1999) with the goal of including explicitly geographical fragmentation in the

[24] Triesman (2006) argues that although the relationship between country size and fiscal decentralization emerges strongly from the data, we do not have a compelling theory to explain why this should be the case. He points out that most theoretical analysis of this question has been normative and showing that in larger countries greater fiscal decentralization is likely to be more efficient. But since decisions to decentralize result from bargaining between self-interested central and local politicians (and their constituencies), it is not clear why efficiency argument would tend to win the day.

[25] Mellinger et. al. (2000), along with Gallup and Sachs (1998), show compelling evidence that different ecozones have different economic structure. For example, the density of economic activity measured as GDP per km2 is high in lower altitude and temperate ecozones and in regions proximate to the sea (within 100 km of the ocean or a sea-navigable waterway).

theoretical decentralization framework. Our aim is to add to our understanding why countries would work on a centralized system versus decentralized system. We assume that people have similar preferences, however they differ in their tastes for public goods, this assumption is plausible if we think that preferences for public goods can differ along the territory. Education is an example of publicly provided services which have differences on preferences across regions; some regions would prefer schooling to be provided in a different language, or in a bilingual way, however others may prefer keeping a single other language. Also, the organization of health institutions in congested urban areas may not fit the need of sparsely populated rural areas; this would call for differences in the provision of public goods in different areas.

For simplification, using factors from Fujita, Krugman and Venables (1999) and Panizza (1999), we argue that preferences are directly affected through differences in geography (geographical fragmentation), and social-cultural factors (such as ethnic fractionalization). While these two factors are related, they differ in a subtle way, ethnic fractionalization will affect the preferences directly through taste differences, while geographical fragmentation will not only affect tastes but also will affect provision of public goods as a special decay factor applied to centrally provided public goods. Geographical differences will have an effect on both (preferences and public goods provision); however, in line with Gallup and Sachs(1998) and Fujita and Mori (2005) , we claim that differences in needs brought about by the environment as well as economic costs of provision will be directly affected by geographical disparities.

Under these considerations, the spatial decay component, δ, is assumed to be of two parts, one that aims to capturing straight geographical fragmentation η and the other that aims to capturing differences in tastes γ. Therefore $\delta = \delta(\gamma, \eta)$. The relation between geographical fragmentation and spatial decay should be necessarily positive, as highly fragmented countries will not only have more difficulties in the provision of public goods but also will have more fragmented population. Thus, we would expect a positive relation between geographical fragmentation and spatial decay $\frac{\partial\delta(\gamma,\eta)}{\partial\eta} > 0$. On the preferences side γ, a highly ethnically fragmented country would lead to higher spatial decay, as less homogenous voters will have a wider spectrum of demands when it comes to local preference for public goods. The model assumes the provision of fully congestible public good, and two "states" for a region, state 1 when the regions act in a centralized system and state 2 when the regions act in a decentralized system.[26] We assume that the population for the country is given by the sum of populations of all the different regions $L = \sum_{i=1}^{n} L_i$and the national income is given by Y which is the sum of the regions $Y = \sum_{i=1}^{n} y_i$

As Arzaghi and Henderson (2002), we assume a representative agent whose preferences are represented by a simple Cobb-Douglas utility function of the type:

$$u = x^{\alpha} g^{\beta}$$

where x is the private good consumed and the public good. We assume that the income of the region is $y_{i,}$,$\alpha + \beta = 1$, and public goods are financed with a proportional tax on income at a rate t_i.Consequently, , and the utility function becomes:

$$u_i = y_i^{\alpha} (1 - t_i)^{\alpha} g_i^{\beta}$$

Under a centralized system (state 1), the costs of maintaining the government is fixed and set at F and using the price of public goods as a numeraire for ,then the budget constraint is given by:

$$Y_t = F + \left(\sum_{i=1}^{N} L_i \right) g \text{ and } Y = \sum_{i=1}^{N} L_i y_i$$

[26] For simplification we abstain from including other factors that affect fiscal decentralization such as expenditure needs, fiscal capacity or borrowing constraints.

This budget constraint can be rewritten as:

$$t = \frac{(F + gL)}{Y}$$

Under this institutional structure, a dollar spent on a public good will not necessarily provide a dollar of public goods due to the existence of a geographical decay function $\delta = \delta(\gamma, \eta)$ described before.

Therefore, the utility of the representative individual in state 1 (centralized system) would be given by:

$$u_i = y_i^{\alpha} \left(1 - \frac{F}{Y} - \frac{gL}{Y}\right)^{\alpha} g^{\beta} \left[1 - \delta(\gamma, \eta)\right]^{\beta}$$

Then, we calculate the value of that maximizes the utilities under a centralized system. The maximization problem results in:

$$g = \beta \left(\frac{Y - F}{L}\right)$$

and the utility is:

$$u_i = \alpha^{\alpha} \beta^{\beta} y_i \left(1 - \frac{F}{y_i}\right) \left(\frac{1}{L}\right)^{\beta} \left[1 - \delta(\gamma, \eta)\right]^{\beta}$$

From this equation, it is possible to derive the following proposition in relation with geographical complexity: the utility in a centralized system is decreasing in the level of taste differentiation, income per capita $\frac{\partial u_i}{\partial y} < 0$ and the level of geographical fragmentation $\frac{\partial u_i}{\partial \eta} < 0$ since $\frac{\partial \delta(\gamma, \eta)}{\partial \eta} > 0$.

The interpretation is straightforward. Higher geographical complexity is associated with faster spatial decay and therefore lower utility under a centralized system leading to the conclusion that highly fragmented countries will have higher levels of fiscal decentralization. Under a decentralized system (state 2) each region operates autonomously and the costs of running a government (F_i) are different for each region. Under this condition the budget constraint is in each region given by

$$t_i L_i y_i = F_i + g_i L_i \text{ and the tax rate is given by, } t_i = \frac{F_i}{L_i y_i} + \frac{g_i}{y_i}$$

The levels of public goods may vary. Given this conditions the utility in state 2 will be such that

$$u_i = \left(y_i - \frac{F_i}{L_i} - g_i \right)^{\alpha} g_i^{\beta}$$

which maximized with respect to results in $g_i = \beta \left(y_i - \frac{F_i}{L_i} \right)$ and

$$u_i = \alpha^{\alpha} \beta^{\beta} \left(y_i - \frac{F_i}{L_i} \right)$$

Finally, we can also examine the decentralization process in a decision framework evaluating the costs and benefits from being in a centralized versus a decentralized structure. A region will push for decentralization as long as the utility under state 2 (decentralized system) is larger than the utility obtained in state 1 (centralized). In other words, the centralized system will prevail as long as:

$$1 - \frac{F_i}{y_i L_i} \leq \left(1 - \frac{F}{Y} \right) \left(\frac{Y}{y_i L} \right)^{\beta} \left[1 - \delta \left(\gamma, \eta \right) \right]^{\beta}$$

A second proposition arises from the above equation: the higher the level of geographical complexity η, the higher the spatial decay δ and the higher de relative gain from moving to a decentralized system. There should be a greater tendency toward decentralization with higher geographic disparity and ethnic diversity. Also, the framework shows that countries with higher geographical differences ($\gamma \rightarrow 1$) have higher incentives for decentralization. However, as was argued by Lora et. al. (2003), geography plays a key role in the economic and social development, as well as in the institutional design of the countries; yet, this effect could be enhanced (or diminished) in the presence of better physical infrastructure or communications. Therefore, if $\eta = f\left(p\right)$ where $p = infrastructure$ therefore $\frac{\partial \delta(\gamma,\eta)}{\partial \eta} > 0$and

$\frac{\partial^2\delta(\gamma,\eta)}{\partial\eta\partial p} < 0$.Other conclusions could be derived from the equation; decentralization is promoted by income growth (Y), population growth (L), and the costs of having a centralized system.

Data and Methods

In this section of the paper we re-visit, empirically, the explanatory power of the different factors that may be affecting the decentralization process with a high emphasis on our geographical measures. To conduct this analysis, we have put together an unbalanced panel dataset for 91 countries for the period 1960-2007. Due to missing observations on some variables, the sample size actually varies across estimations. We averaged the values for 5 year periods in order to smooth the data over the macro-economic cycle and also to allow us to focus on the long run effects. Next, we discuss the variables and the empirical strategy we used in our estimations.

As discussed by Panizza (1999) and Oates (1972), among many others, the main problem when empirically examining decentralization is finding a method to quantify the activity of local governments that results from autonomous decision making in expenditure decisions and revenues raising through own taxes. In practice the data available do not allow us to measure true levels of autonomy, especially at the cross country level. In the estimations we use the typical measures of fiscal decentralization (following Pryor (1968), Oates (1972), Panizza (1999), Martinez-Vazquez & Timofeev (2009) among many others). We define decentralization ratios as the percentage of revenues and expenditures of the sub national governments with respect to the total revenues and expenditures of the public sector from 1960 to 2007.[27]

We incorporate other determinants of fiscal decentralization that have been found

[27] The most commonly used source for measuring fiscal decentralization is the Government Financial Statistics publication by the International Monetary Fund. It should be noted that as Letelier (2005) argues, while there are some missing values on the Fiscal Decentralization information from GFS, there is no evidence of a systematic measurement error across countries. Therefore, regression results should not be affected as long as the sample is large enough, which is our case.

consistently in the previous literature to play a significant role. Several studies have examined the main determinants of fiscal decentralization, using a fairly consistent set of variables. One of the commonly used variable is a proxy for the level of development. Decentralization may itself be a superior good, the demand for which is likely to grow with per capita income (Bahl and Linn, 1992). As people become richer, more educated, and more urbanized, they may have more time and a greater motivation to participate in making local political decisions. They may also become more skilled at organizing to pressure the central government to devolve authority and fiscal resources. Also, increases in development may induce a shift in tastes towards public goods and services that are most efficiently provided locally. Bahl and Nath (1986), Letelier (2005), Martinez-Vazquez and Timofeev (2009) and Freikman (2005) find a positive relation between economic development and fiscal decentralization. However, this result is not conclusive, Oates (1972) find a negative relation between economic development and fiscal decentralization and Panizza (1999), finds that the effect differs when outliers are excluded from the analysis. This calls for the inclusion of proxies for economic development in our analysis; therefore we include GDP per capita and infant mortality in the controls.

As Alesina and Spalaore (1997), along with Triesman (2006) and Martinez-Vazquez and Timofeev (2009) argue, institutional variables play a key role in the design of the state; thus some empirical studies of the determinants of decentralization also include the extent of democracy as control variables but results tend to be ambiguous. We include controls such as a political rights and corruption index in the analysis in order to control for institutional support of the state. Some studies have suggested that there is a natural affinity between political rights and decentralization; political participation at the local level might educate citizens in democratic practices and lead them to push for higher levels of political rights. At the same time, strong local governments might serve as a check on abusive central authorities and would push for better social controls. In this sense, less corrupt countries would push for stronger local governments, implying higher levels of fiscal decentralization. For example, across Eastern Europe, the collapse of regimes in which power was centralized in the communist party prompted a strong demand for autonomous local self-government (World Bank, 2001).

As presented in the theoretical framework, preferences play a key role on any decentralization process. Panizza (1999), Letelier (2005) and Martinez-Vazquez and Timofeev (2009) argue that ethnic fractionalization may capture differences in preferences of individuals, which is basically an economic efficiency argument since tastes for public goods and services are likely to vary across ethnic groups. Triesman (2006) states an additional argument towards the inclusion of ethnic variables based on practical politics. He argues that where ethnic divisions are politicized (and ethnic groups are territorially compact), decentralizing authority over such contentious policy issues as education and culture may help to restrain communal violence or even prevent civil war. To be credible, policy decentralization must have some fiscal component. Thus, to preserve stability, central elites in more ethnically divided societies may choose a higher level of fiscal decentralization. Of course, they also may not. Central leaders may care more about other goals retaining fiscal resources at the center, for instance than about avoiding communal violence.

In sum, in addition to geographical diversity as discussed below, we employ the following set of control variables: GDP per capita, ethnic fractionalization, institutional variables such as corruption index and democracy, and infant mortality.

Measuring the role of Geography

In order to control for the role of geography we considered a variety of measures.[28] Following the empirical approaches in Sachs (2000), Krugman (1995), from the economic geography literature, and Triesman and Martinez-Vazquez and Timofeev (2009), from the

[28] For example, we tested for the role of ÅginsularityÅh using the distance to nearest port variable; but this and other potential variables proved to be not significant and where not included in the final regressions.

fiscal decentralization one, we test the effect of country size (area[29]). The expected relationship behind the inclusion of this variable is that fiscal decentralization tends to be greater in territorially larger countries; preferences and access to markets may be more difficult in larger countries leading to higher decentralization levels.

As Gallup and Sachs (1999), Lora et.al. (2003) and Mellinger et.al. (2000) show, land elevation and ecozones differences are geographical factors that directly affect preferences and countries institutional design. A highly geographically diverse country would be expected to have different public good provision needs due to the environment; these needs will be reflected in difference in preferences. At the same time a geographically fragmented country will have problems with access and provision of public goods for its citizens which will directly affect the institutional design that governments should have. In this sense, we use the distribution of population per elevation, and the distribution of climate area to control for in-country geographical asymmetries.[30]

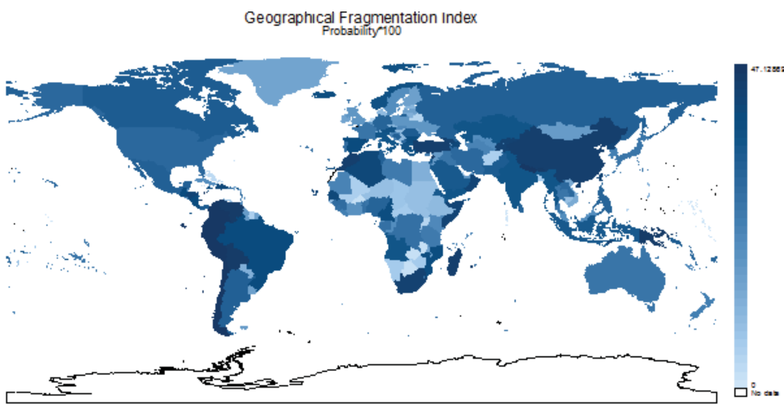
Geographical diversity of some countries has led to severe geographical fragmentation, as reflected in patterns of population settlements, at times with dire political consequences. In order to capture these differences, we construct the geographical fragmentation index to capture within country differences on geography. To create this index we calculate the weighted probability that two individuals taken at random do not live in similar altitude zones. The weight matrix are calculated as the average distance between altitudes. The index is simply calculated as $1 - \sum_{j=1}^{J} \sum_{i=1}^{N} \left(w_{ij} \frac{n_i}{N} \right)^2$. Where $\frac{n_i}{N}$ is the share of population by elevation and w_{ij} measures the distance between altitude i and altitude j. This measure goes from zero, which corresponds to a case where all the population is settled in the same altitude zone, to one which corresponds to the implausible case where each individual lives in different altitudes. In general, geographical fragmentation will increase with the number

[29] Given that there is a correlation between the geographical variables and the area variable we regress the geographical variables on area and use the residuals of these in the regressions.

[30] This is based on the Koppen-Geiger temperature index. These data were kindly provided by CIESIN at Columbia University.

of altitude-zones and the weight for each group equalizes.[31] It can also be the case that geographical fragmentation is accentuated the bigger the country is due to size effects, therefore we interact this index with the area of the country. Figure 1 shows the geographical fragmentation index ranked from countries that are less fragmented (i.e., Belarus, Paraguay) to countries that show high levels of geographical fragmentation (i.e., Colombia, China). The results that our geographical fragmentation index produces go in line with the ones found by Lora et. al. (1993) for Latin America.

Figure 1: Map of geographical fragmentation index



Source: Authors estimations

In addition to the geographical fragmentation index, and in order to get more robust results, we construct Gini distribution indexes for in-country elevation and climate. A lower Gini index would show that the country is geographically homogenous in the sense that all have the same climate zone or elevation. We also estimate the variation (standard deviation) of the in-country elevation; for example, higher variance on elevation would indicate that the country has a non-homogenous topography. In addition, we include the interaction between our geographical fragmentation index and the size of the country in order to control for geographical differences weighted by size of the countries.

In sum, and according to our theoretical predictions, countries with higher geographical

[31] The methodology applied for the index is similar to the one applied by Lora et. al. (2003) for geography, and Hudson (1972) for population.

fragmentation would have more polarized preferences for public goods and therefore be more decentralized than countries with more homogeneous preferences. Hence, we would expect a positive correlation between the geographical fragmentation index (where higher values represent higher geographical fragmentation) and our fiscal decentralization measures. In addition, from the theoretical framework we can assert that bigger countries would have higher decentralization levels.

Empirical Approach

For the empirical methodology we use first, straight forward pooled OLS estimation as in Oates (1972) and Panizza (1999), and second, panel data estimation, as in Arzaghi and Henderson (2002), Triesman (1998) and Letelier (2005) on an unbalanced panel. We recognize that OLS regressions can have various flaws; however we present them in order to be able to compare our results with those in previous work. In the estimation, we also allow for the potential endogeneity of GDP used as a control variable due to the possibility of some contagion effect of this variable that could lead to bias on the coefficients of the other variables.[32] Not considering this problem, would result in inconsistent parameters. Therefore, we employ the Hausman-Taylor procedure.[33] This estimator is an IV estimator that additionally enables the coefficients of time-invariant regressors to be estimated, and given the data availability and the nature of our geographical fragmentation index (time-invariance), Hausman-Taylor is a good alternative to estimate the model. It does so by making the assumption that some regressors are uncorrelated with the fixed effect, which is plausible to be the case of the geographical fragmentation index.

[32] See, for example, Martinez-Vazquez and Mcnab (2007).

[33] Hausman-Taylor helps correcting endogeneity problems when fixed effects are present. This methodology is useful when itÅfs not possible to find a good instrumental variable and one needs to study the effect of time-invariant variables.

We begin with the following empirical specification:[34]

$$FD_{it} = \alpha_0 + \beta_1 X_{it} + \beta_2 Z_i + \beta_3 W_t + \varepsilon_{it}$$

Where FD_{it} represents the fiscal decentralization measures (revenues and expenditures) as defined in the previous section, X_{it} is the set of control variables described before, Z_i the set of country specific variables including the geographical factors and W_t the time variant variables.

Results

Primary Results

This section uses the results for the OLS, panel and Hausman-Taylor estimation presented in table 2. As discussed in the previous sections, we use subnational expenditure as a percentage of total expenditure and subnational revenue as a percentage of total revenue as dependent variables, and examine the effect of the log of GDP per capita, an infant mortality index,[35] indexes of ethnic fractionalization, log of distance to ports, indexes of rule of law and corruption, the log of area and our constructed indexes of geographical fragmentation.

Regarding our variables of interest, geography, as the theoretical framework predicted we find positive effects for the most part. As found in the previous literature, larger countries (proxied by area size), tend to be more fiscally decentralized. This result is strong and unambiguously positive across all specifications, whether fiscal decentralization is measured by a subnational expenditure or revenue share, and its coefficient does not change significantly when using different econometric methodologies. In fact the size of their

[34] This is substantially the estimating equation used in Panizza (1999), Arzaghi and Henderson (2005), and others.

[35] Number of children death per 1000.

effects does not differ by much suggesting that while larger countries tend to decentralize more, there are no significant differences between revenue and expenditure decentralization. Our constructed index of geographical fragmentation presents a positive and significant effect, especially when looking at the sub-national expenditure measure. As the probability of randomly picking two individuals belonging to the same geographical region increases, the sub national expenditure decentralization measure. Columns (1), (5) and (9) from table 6 show that this effect is consistent across different empirical methodologies. Even though the effect is slightly reduced, in size and significance when controlling for the GDP endogeneity, it still remains significant. The results for the sub national revenue measure are not as strong as the ones found for the sub-national expenditure, which is not surprising as heterogeneity of preferences for taxation are usually less than for expenditures. While a good system of fiscal decentralization will start by a good definition of expenditure needs followed by revenue decentralization , the first one responds better to different preferences of individuals and these differences.

The results confirm the importance of geography when examining fiscal decentralization since geographical divisions imply that different groups of a society may face different conditions that affect their economic possibilities and may have different economic interests and social problems, leading to the need for higher fiscal decentralization in order to improve efficiency in the allocation of resources.

The variables obtained from the interaction between our geographical fragmentation index and the size of the country are more significant than the variables constructed using the index alone, yet smaller in size. Once again, this result confirms the hypothesis that higher levels of geographical fragmentation and the bigger the country is will have a positive effect on decentralization levels.

Table 5: Fiscal decentralization determinants

	OLS				Panel				HT			
	Sub Expenditure		Sub Revenue		Sub Expenditure		Sub Revenue		Sub Expenditure		Sub Revenue	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GDP per capita	0.0697	0.0686	0.0414	0.041	0.0698*	0.0696*	0.0587*	0.0589*	0.0959**	0.0958**	0.1103*	0.1102
	(0.0423)	(0.0416)	(0.049)	(0.0488)	(0.0400)	(0.0397)	(0.0348)	(0.0348)	(0.0456)	(0.0457)	(0.0672)	(0.0672)
Infant mortality	-0.0001	-0.0002	-0.0006	-0.0007	-0.0008	-0.0009	-0.0011	-0.0012	-0.0005	-0.0006	-0.0004	-0.0004
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0014)	(0.0014)	(0.0014)	(0.0015)
polright	-0.0283*	-0.0281*	-0.0275**	-0.0269*	-0.0255*	-0.0254*	-0.0248*	-0.0244*	-0.025*	-0.0253*	-0.0229*	-0.0228*
	(0.0162)	(0.0158)	(0.0121)	(0.0158)	(0.0133)	(0.0131)	(0.0150)	(0.0148)	(0.0149)	(0.0150)	(0.0126)	(0.0120)
Ethnic Fractionalization	0.0534**	0.0489**	0.0963	0.0966	0.0831	0.0787	0.1074*	0.1085*	0.0446**	0.0341*	0.0806	0.0772
	(0.0270)	(0.0240)	(0.1129)	(0.1147)	(0.1263)	(0.1282)	(0.0610)	(0.0587)	(0.0213)	(0.0200)	(0.1346)	(0.1355)
Distance to Ports	-0.0416*	-0.0399*	-0.0276**	-0.026**	-0.0415*	-0.0394*	-0.0254	-0.0234	-0.0629*	-0.05627	-0.0405	-0.0399
	(0.0215)	(0.0217)	(0.0136)	(0.0124)	(0.0220)	(0.0220)	(0.0247)	(0.0254)	(0.0383)	(0.0385)	(0.0381)	(0.0384)
Area	0.0713***	0.05***	0.0697***	0.0545***	0.0742***	0.0514***	0.0767***	0.0606***	0.0648***	0.0475***	0.0673***	0.0553***
	(0.0184)	(0.0170)	(0.0206)	(0.0202)	(0.0211)	(0.0193)	(0.0240)	(0.0234)	(0.0173)	(0.0114)	(0.0176)	(0.0123)
Corruption	-0.0046**	-0.0056**	-0.0152*	-0.0157	-0.0161*	-0.0169*	-0.0232	-0.0236	-0.0217**	-0.0227***	-0.0289*	-0.0295*
	(0.0022)	(0.0028)	(0.0081)	(0.0343)	(0.0091)	(0.0090)	(0.0312)	(0.0311)	(0.0093)	(0.0012)	(0.0170)	(0.0160)
Geographical Fragmentation	0.0143***		0.0101**		0.0157***		0.0107**		0.0127**		0.0083	
	(0.0040)		(0.0045)		(0.0041)		(0.0046)		(0.0061)		(0.0052)	
Geo.Frag*Area		0.0062***		0.0049**		0.0062***		0.004**		0.0061***		0.0038
		(0.0022)		(0.002)		(0.0021)		(0.0028)		(0.002)		(0.0025)
Constant	-0.4278	-0.1629	-0.1546	0.0339	-0.4375	-0.1602	-0.2984	-0.1042	-0.2847	-0.0694	-0.4964	-0.3476
	(0.4417)	(0.4577)	(0.5226)	(0.5274)	(0.3402)	(0.3578)	(0.4245)	(0.4295)	(0.7758)	(0.7536)	(0.8112)	(0.7962)
Region and time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N. of cases	338	338	335	335	338	338	335	335	338	338	335	335

As was found in previous literature (Wheare, 1953; Bahl & Linn, 1992; Panizza, 1999; Arzaghi & Henderson, 2005; Triesman, 2006; Martinez-Vazquez & Timofeev, 2009), and predicted by the theoretical framework, the positive sign of the log of GDP per capita shows that countries with higher levels of income would tend to be more decentralized. However, the results vary across specifications and the changes tend to be quite dramatic. Contrary to Oates (1972) and Bahl and Linn (1992) in the simple OLS model, we do not find a significant relation between GDP and our fiscal decentralization measures. Though, we do find a stronger and significant relation of GDP with our expenditure decentralization measure when we impose a panel structure and correct for the potential endogeneity. The estimated relationship with revenue decentralization is weaker and slightly less significant for most of our specifications. Our infant mortality variable included aims to capture human well-being and health conditions does not show significant results. We do not find significant effects of the political rights measure (measuring decentralization at both, expenditure and revenue levels), while we do find a weak negative effect of the corruption one. As this last variable aims to capture the institutional structure of the country, we argue that less corrupt countries (with better institutions) will have higher levels of fiscal decentralization.[36]

The positive result of the ethnic fractionalization variable is in line with the findings of Panizza (1999), Letelier (2005) and, to a less extent, Triesman (2006). The greater the share of the population that did not speak the official language, the higher the decentralization levels. However, this effect holds only for the sub-national expenditure specification and is stronger when controlling for potential endogeneity, while it is not significant for the sub-national revenue measure.

A plausible interpretation of this result is that greater ethnic division would be reflected on different expenditure needs of the people, and therefore this would affect the degree of sub-national expenditure decentralization measure in a more significant way compared to

[36] We also estimated the models without the inclusion of the political rights variables and the results do not change significantly

the revenue side.

Testing the effect of infrastructure

The effect of geography on fiscal decentralization is attenuated due to changes in physical infrastructure. Improvements in physical infrastructure would lead to reduce distances and therefore shrink differences between regions and therefore would reduce the impact of geography. Lora et. al. (2003) argues that public good provision is better served as physical infrastructure increases in a country. In the framework of our theoretical model, an increase in public infrastructure would lead to a reduction of the effect of spatial decay. This effect would go through our geography component.

We aim to capture the influence of changes in the access to markets and geographical fragmentation through the inclusion of variables of physical infrastructure interacted with the geographical fragmentation index. A priori, one would expect that the impact of the geographical fragmentation effect would be reduced as better infrastructure is available, under the assumption that better infrastructure would shorten the distances and improve interaction between regions, therefore we would expect the sign of the geographical fragmentation index to be positive (and significant), while the interaction between the infrastructure variables and the index to be negative (and significant).

Table 6: Examining the effect of infrastructure

	Subnational Revenue/GDP					
	(1)	(2)	(3)	(4)	(5)	(6)
Frag. Ind.	0.0198***	0.0172***	0.0137**			
	(0.0041)	(0.0043)	(0.0060)			
RPV*Frag.Ind	-0.00001**					
	(0.00001)					
RTKM* Frag.Ind		0.0002				
		(0.0008)				
TRAK* Frag.Ind			-0.0223*			
			(0.0201)			
Frag. Ind.*Area				0.0008***	0.0007***	0.0007***
				(0.0002)	(0.0002)	(0.0002)
RPV*Frag.Ind*Area				-0.0001**		
				(0.0000)		
RTKM* Frag.Ind*Area					0.000001	
					(0.0000)	
TRAK* Frag.Ind*Area						-0.0016*
						(0.0010)
Controls	YES	YES	YES	YES	YES	YES
N. of cases	165	172	215	165	172	215
	Subnational Expenditure/GDP					
	(7)	(8)	(9)	(10)	(11)	(12)
Frag. Ind.	0.0128***	0.0124***	0.01*			
	(0.0040)	(0.0041)	(0.0060)			
RPV*Frag.Ind	-0.00001**					
	(0.00001)					
RTKM* Frag.Ind		0.0007				
		(0.0006)				
TRAK* Frag.Ind			-0.0242*			
			(0.0202)			
Frag. Ind.*Area				0.0006***	0.0005***	0.0005***
				(0.0002)	(0.0002)	(0.0002)
RPV*Frag.Ind*Area				-0.00001**		
				(0.0000)		
RTKM* Frag.Ind*Area					0.000001	
					(0.0000)	
TRAK* Frag.Ind*Area						-0.0018*
						(0.0010)
Controls	YES	YES	YES	YES	YES	YES
N. of cases	162	169	215	162	169	215

Notes: The table shows the Hausman-Taylor preferred estimations. While we show the effects of infrastructure we employ the same controls as before.

Notes: The table shows the Hausman-Taylor preferred estimations. While we show the effects of infrastructure we employ the same controls as before.

Table 7, show the estimation of the effect geographical fragmentation and land area interacted with the percentage of paved roads(RFV), the log of total kilometers of roads(RTKM) and size of rail tracks by country(TRAK)[37]. The results of our estimations show that to some extend better infrastructure reduces the effect of geography on fiscal decentralization. However, this result only holds for the log of kilometers of paved roads and the log of kilometers of rail tracks in the country. Once we are controlling for size of

[37] Tables 20 and 21 of the appendix show the full results

the country, the negative and slightly significant sign of the interaction of length of roads and the geographical fragmentation index seems to confirm the hypothesis that higher levels of infrastructure would reduce the effect of geography on decentralization.
Since the coefficients that we find are very small in size, and often not significant, we could argue that while infrastructure plays a role on reducing distances and affects the impact of geography on fiscal decentralization, they do not seem to play a significant role on this.

Robustness

To ensure that our results are no an artifact resulting from the construction of the geographical fragmentation index, we conduct a series of estimation with less sophisticated -yet adequate- variables for geography. Thus we calculate the coefficient of variation of population distributed by elevation, the standard deviation of population distributed by elevation and distribution Gini indexes for the same variable as well as a Gini distribution coefficient for climate variables and perform the same models as with the index of geographical fragmentation. Table 8 shows a summary of the results for these estimations.
In our primary econometric specification we used the geographical fragmentation index. Although we find strong conclusions based on the use of the geographical fragmentation index, the construction of these type of indexes usually suffer from critiques such as the use of weights.. Therefore, we estimate the same specification with a much simpler geographical disparities indicators. Columns (1) and (2) in table 8 show the effect the coefficient of variation of population distributed by elevation and the standard deviation of population distributed by elevation. While the results for the coefficient of variation are not significant using panel estimation nor correcting for endogeneity with Hausman-Taylor methodology, the direction of the signs are positive showing that higher variation in the distribution of the population by elevation is positively correlated with fiscal decentralization levels.
The standard deviation of the elevation also shows a positive correlation with both fiscal

decentralization indicators and is significant. Higher standard deviation of the distribution of population by elevation is positively, correlated with higher levels of fiscal decentralization confirming our hypothesis. The results obtained with the standard deviation are smaller than the ones obtained from the index; this is expected due to the construction of our geographical fragmentation index which captures more fully the in-country geographical differences.

Table 7: Panel Robustness tests

	Subnational Expenditures/ GDP				Subnational Revenues / GDP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CV_Elevation	0.0477				0.0275			
	(0.0524)				(0.0551)			
SD_Elevation		0.0002**				0.0002**		
		(0.0001)				(0.0001)		
Gini_Climate			0.2361				0.0974	
			(0.1687)				(0.1519)	
Gini_Elevation				0.1554**				-0.0148
				(0.0717)				(0.1661)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
N. of cases	338	338	316	338	335	335	313	335

Notes: Panel estimation based on random effects

We also calculate Gini coefficients for the distribution of population by altitude and by climate ecozone within countries and regress these with our fiscal decentralization measures. These indexes are less precise than our geographical fragmentation index; however they should capture concentration in certain regions. A lower Gini index would show that the country is geographically homogenous in the sense that all have the same climate zone or elevation, conversely a higher Gini would show that higher in-country disparities.
Although there is slightly greater heterogeneity in the values of these indexes, the central results from these specifications are 1) there is a positive correlation between higher concentration of population in a region and higher levels of fiscal decentralization, and 2) the results hold for both, elevation and climate ecozone estimations.
We run the same estimations using the Hausman-Taylor methodology to ensure that our results are not biased due to endogeneity caused by the GDP. Table 9 shows that these

results do not differ significantly from previous ones; we find positive and fairly significant correlation between geographical disparity and fiscal decentralization measured with expenditure and revenue levels.

Table 8: Hausman Taylor Robustness estimation

	Subnational Expenditures/ GDP				Subnational Revenues / GDP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CV_Elevation	0.0317				0.0149			
	(0.0536)				(0.0538)			
SD_Elevation		0.0002**				0.0002**		
		(0.0001)				(0.0001)		
Gini_Climate			0.1121				0.0052	
			(0.2108)				(0.2093)	
Gini_Elevation				0.1336*				0.0056
				(0.0725)				(0.2510)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
N. of cases	338	338	316	338	335	335	313	335

Notes: The Hausman estimation includes the same controls as presented in previous estimations. Table 25 in the appendix shows the full estimation.

In sum, table 8 and 9 show that the results for the relation between geography and fiscal decentralization are relatively robust to the definition used for fiscal decentralization (measured at expenditure or revenue level), as well as other indicators of geographical disparities. Countries which are more geographically different tend to decentralize more, while more homogenous countries show lower decentralization levels. We find a positive, and fairly significant effect of the standard deviation and the Gini of elevation, and a less significant effect of the Gini of climate and coefficient of variation. As was the case with our geographical fragmentation index, we find a bigger effect on the sub-national expenditure measure compared to the sub-national revenue one.

Conclusion

In this paper we re-examine the determinants of fiscal decentralization and test in more depth the effect of geography. Theoretically, we draw on the Arzaghi and Henderson model in order to motivate the main determinants of decentralization with a special interest in the role of geography. The theoretical model predicts that countries with higher geographic dissimilarities will be more decentralized. We use a rich dataset, and multiple econometric specifications to empirically examine the determinants of fiscal decentralization with special focus on geography. Empirically, we follow the mainstream of fiscal decentralization determinants and test the effect of development variables such as GDP, along with institutional and ethnic variables such as rule of law, corruption, political rights and ethno linguistic fractionalization.

Following Lora et al (2003) and Hudson (1972), we construct a geographical fragmentation index that aims to capture the probability that two individuals taken at random do not live in similar zones. We employ two different measures of fiscal decentralization, sub-national expenditure as percentage of GDP and revenue as percentage of GDP. Although our overarching results on the determinants of fiscal decentralization are similar to previous studies, we find a clear positive effect of geographical variables on fiscal decentralization. Higher levels of geographical fragmentation are highly associated with higher levels of fiscal decentralization, measured both on the expenditure and on the revenue side. These results are robust to different econometric methodologies and also to different geographical measures.

The implications of this result are twofold: First, our results add to the existent body of literature on fiscal decentralization by considering a very important measure that aims to capture geographical differences. More importantly our findings add to the evidence that geography matters in a development process. Second, the correlation found between geographical variables and fiscal decentralization could be used for correcting endogeneity problems in future works, where fiscal decentralization is endogenous.

4 Conclusion

This dissertation consists of two essays. The first essay examines ethnic wage gaps in informal and formal labor markets in Latin America using a set of cross-sectional data for countries with high indigenous populations. I examine changes in ethnic wage gaps between informal and formal labor markets, the sources of change, and differences along the wage gap distribution. Various methodological approaches are used, starting with measures of dispersion in wages for indigenous and non-indigenous in both labor markets. I then decompose the changes in ethnic pay gaps inter-temporally using methodologies close to the ones presented by Wellington (1989) , Hotchkiss and Shiferaw (2010), and Smith and Welch (1989).

Finally, I present a counterfactual distributional analysis following the work developed by Melly (2005) and Chernuchov, Fernandez-Val, and Melly (2010). As expected, I confirm the findings by Perry et. al. (2007), Arias (2009), and others that informality is a very serious problem faced by Latin American labor markets. (On average, 50 percent of labor markets are informal, with small changes over time). Even while wages vary widely across different countries, I found that indigenous people earn less than their nonindigenous peers in both formal and informal sectors. However, I found significant reductions in the wage ratios over time, especially in countries with a higher proportion of indigenous workers, such as Bolivia and Guatemala. Regarding the distribution of wage gaps, the ethnic wage gap in informal employment is visible mainly at the bottom of the distribution. It converges in the group with middle wages. Therefore, I did not observe a distinctive glass ceiling in the informal labor markets. In summary, my results confirm the existence of ethnic pay gaps in both formal and informal (unregistered) employment in Latin America; however, the size and characteristics differ depending on the level of wages. The inequality of wages between informal indigenous and nonindigenous populations is more pronounced at the extremes of the distributions.

The OLS wage estimations show a higher premium for formal non-indigenous and significant differences for indigenous and nonindigenous inside each employment sector, resembling the existence of an unexplained gap, which is sometimes attributed to discrimination, as in Oaxaca (1973). The intertemporal decompositions show that the existence of overtime wage gap reductions exist for all the countries and are led by Brazil and followed by Bolivia and Guatemala. Nevertheless, considering the temporality of the decomposition, I could assess that the reduction has been faster in countries with higher levels of indigenous populations.

The speed of reduction has been faster in the formal sector in countries with high levels of indigenous populations. In addition, I find that most of the total wage gap changes are explained by nonindigenous endowments and how these endowments translate into wages with a downward pressure given by the valuation of the endowments both for indigenous and nonindigenous. However, the wage gaps and their components are different when comparing formal and informal labor markets. As previously shown, the reduction in the wage gaps has been greater in formal labor markets for all countries. In all of the countries, the increase of the endowments of indigenous populations corresponds to the reduction of the wage gaps both in the formal and informal sectors. As with the full sample, the valuation of the endowments has a negative effect (pushes downward) on the wage gaps.

I find that the degree to which informal labor markets were valuing characteristics (coefficient effects) was declining for both indigenous and nonindigenous, although higher for indigenous populations, especially in the informal labor market. In addition, I find that most of the increase in indigenous endowments over time has been in areas where nonindigenous has an advantage in terms of the payoffs received. The second interaction term indicates an increase of the nonindigenous coefficients over time in areas where they have an advantage in endowments. This reduces the advantage they have over indigenous. The results of the interaction terms, although small, reinforce the improvement in indigenous populations endowments.

The main sources of change in the ethnic wage gaps consist of institutional and human capital factors. The sector in which workers perform their activities constitutes the main contributor to the endowments portion of the wage gaps. Most notably, employment in the public sector constitutes one of the main factors that contribute to the reduction of ethnic wage gaps.

This factor particularly affects the price of endowments of the wage gap in the formal labor market. Human capital valuation is the second most important channel to reduce ethnic wage gaps and is slightly between formal and informal sectors. In the formal sector, human capital factors play a key role in reducing the wage gap; in the informal sector, they do not seem to matter much. Moreover, they tend to put counteracting pressure on the wage gaps' reduction. Turning to the residuals of the distribution (often called the discrimination component), I find a reduction of the wage gap between indigenous and nonindigenous, especially at the top of the distribution in the formal sector. Following Fields (2005), minorities belong to a "lower tier," which consists of individuals who cannot afford to be unemployed and are rather "involuntary employees" in the informal sector. This effect of a higher ethnic gap at the bottom of the wage distribution is often called a "sticky floor." This is confirmed for ethnic wage gaps, given that the ethnic pay gap is highly reduced in the informal labor market, particularly in the top part of the distribution.

When looking at the formal sector changes, I find that the ethnic wage gap increased as I followed the wage distributions, and, in fact, a glass ceiling effect can be reported for the initial period. Nevertheless, this effect disappeared over time and even reversed itself at the very top part of the distribution in Bolivia. These results, along with the ones found in the inter-temporal decompositions, show that the social inclusion of indigenous populations has had an effect on the top part of wage earnings. This could be a reflection of access to better jobs for the indigenous populations, especially in the formal sector.

The policy implications of the results point toward the control or elimination of discrimination involving different policies that could be applied, such as controls over contracts, penalties, or law enforcement, where the laws are already established.

Finally, since the topic of ethnic pay gap in segmented labor markets is not examined in the literature, there is a lot of potential for further studies. The use of longitudinal data might give an interesting insight into the dynamics of the informal market, especially gender-specific aspects.

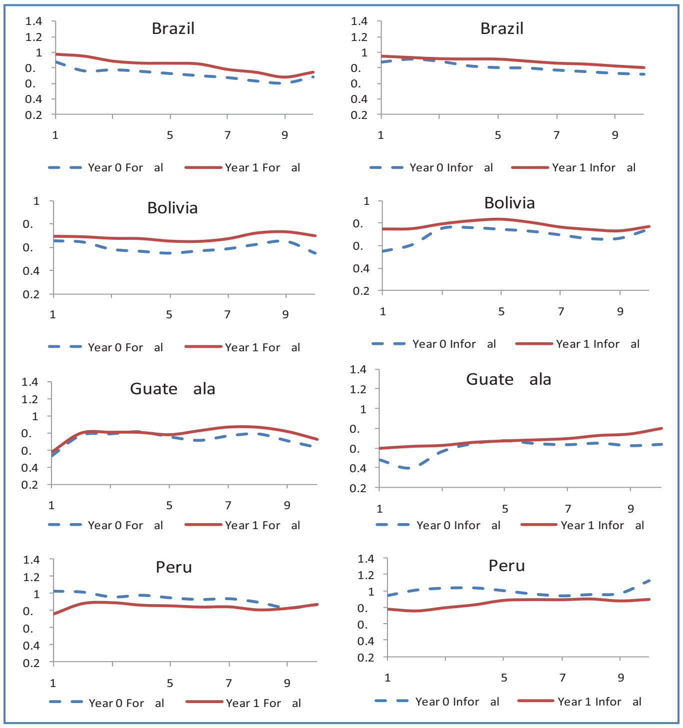
The second essay re-examines the determinants of fiscal decentralization and tests the effects of geography in more depth. Theoretically, we draw on the Arzaghi and Henderson model to motivate the main determinants of decentralization, with a special interest in the role of geography. The theoretical model predicts that countries with higher geographic dissimilarities are more decentralized. We use a rich dataset and multiple econometric specifications to empirically examine the determinants of fiscal decentralization, with a special focus on geography. Empirically, we follow the mainstream of fiscal decentralization determinants and test the effects of development variables such as GDP, along with institutional and ethnic variables such as rule of law, corruption, political rights and ethno linguistic fractionalization.

Following Lora et al (2003) and Hudson (1972), we construct a geographical fragmentation index that aims to capture the probability that two individuals taken at random do not live in similar zones. We employ two different measures of fiscal decentralization: sub-national expenditure as a percentage of GDP and revenue as a percentage of GDP. Although our overarching results on the determinants of fiscal decentralization are similar to previous studies, we find a clear positive effect of geographical variables on fiscal decentralization. Higher levels of geographical fragmentation are highly associated with higher levels of fiscal decentralization, measured both on the expenditure and revenue sides. These results are robust to different econometric methodologies and also to different geographical measures.

The implications of this result are twofold. First, our results add to the existing body of literature on fiscal decentralization by considering a very important measure that aims to capture geographical differences. More importantly, our findings add to the evidence that geography matters in a development process. Second, the correlation found between geographical variables and fiscal decentralization could be used for correcting endogeneity problems in future works where fiscal decentralization is endogenous.

Appendix 1: Ethnic gap distribution

Figure 2: Ethnic wage gap distribution



Source: Authors calculations based on household surveys

Notes: The dotted line shows the wage gaps along the wage distribution for the initial period, for the corresponding country. The full line shows the wage gaps along the wage distribution for the end period for the corresponding country. The left panel shows the results for the formal sector and the right panel shows the results for the informal sector

Appendix 2: Inter-te poral ethnic wage gap distribution

Notes for tables in appendix 2:

The following tables show the estimation for the inter-temportal ethnic wage gap decomposition for the informal and formal sector.

Decomposition 1 corresponds to the decomposition presented in equation 6.
Decomposition 2 corresponds to the decomposition presented in equation 7.

Column 1 shows the contributions of changes in the endowments of non-indigenous workers column 2 shows the contributions of changes in the valuation of the endowments of nonindigenous workers. Similarly, column 3 shows the contributions of changes in the endowments of indigenous workers; column 4 shows the contributions of changes in the valuation of the endowments of indigenous workers.

Table 9: Brazil, Inter-te poral ethnic wage gap deco position

	Total															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	-0.007	0.002	-0.004	0.020	0.007	0.001	0.008	0.006	-0.007	0.002	0.004	0.020	0.000	0.001	0.000	0.000
Education in years	0.169	0.007	-0.054	0.019	-0.132	0.002	0.122	0.007	0.169	0.006	0.053	0.026	-0.021	0.003	0.016	0.006
Experience	-0.038	0.008	-0.206	0.070	0.002	0.002	0.213	0.018	-0.038	0.008	0.029	0.065	0.000	0.000	-0.022	0.008
Experience squared	0.020	0.005	0.093	0.041	0.003	0.001	-0.096	0.010	0.020	0.005	-0.018	0.036	0.000	0.000	0.015	0.007
Married=1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HH size	0.000	0.000	0.005	0.003	0.001	0.000	-0.003	0.001	0.000	0.001	0.005	0.004	-0.001	0.000	-0.002	0.001
Children between 6 and 18	0.015	0.003	0.048	0.033	-0.011	0.001	0.001	0.011	0.015	0.001	0.047	0.033	0.000	0.002	0.002	0.002
Children younger than 5	0.003	0.002	-0.037	0.013	-0.001	0.001	0.008	0.004	0.003	0.000	-0.027	0.012	0.001	0.002	-0.002	0.001
region==2	-0.002	0.001	-0.001	0.006	0.003	0.000	0.003	0.002	-0.002	0.000	0.002	0.007	0.001	0.001	0.000	0.000
region==3	-0.014	0.002	-0.012	0.012	0.003	0.000	0.014	0.003	-0.014	0.002	0.002	0.012	0.001	0.000	-0.001	0.001
region==4	-0.019	0.003	-0.021	0.023	0.006	0.000	0.032	0.004	-0.019	0.002	0.016	0.018	0.000	0.001	-0.005	0.006
region==5	-0.001	0.001	-0.009	0.006	0.003	0.000	0.002	0.002	-0.001	0.001	-0.014	0.010	0.001	0.001	0.007	0.004
region==6	0.006	0.001	-0.002	0.004	-0.001	0.000	-0.004	0.001	0.006	0.001	-0.006	0.006	0.000	0.000	0.001	0.002
region==7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==8	-0.002	0.001	-0.012	0.002	0.003	0.000	0.002	0.001	-0.002	0.001	-0.013	0.002	0.000	0.000	0.003	0.001
sector==2	0.000	0.000	-0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	-0.011	0.004	0.000	0.000	0.001	0.001
sector==3	-0.002	0.001	-0.041	0.012	0.000	0.000	-0.002	0.002	-0.002	0.001	-0.028	0.008	0.000	0.000	-0.014	0.004
sector==4	0.001	0.001	-0.066	0.023	-0.001	0.000	0.020	0.008	0.001	0.001	-0.062	0.030	0.000	0.000	0.016	0.006
sector==5	0.000	0.000	-0.047	0.008	0.002	0.000	-0.003	0.002	0.000	0.000	-0.048	0.008	0.002	0.000	-0.002	0.002
sector==6	0.016	0.005	-0.006	0.003	-0.031	0.001	-0.021	0.002	0.016	0.002	-0.034	0.007	-0.022	0.003	0.007	0.004
sector==7	0.005	0.006	-0.014	0.024	0.001	0.001	-0.040	0.014	0.005	0.006	-0.058	0.033	0.001	0.001	0.004	0.007
sector==8	0.007	0.002	-0.029	0.017	0.008	0.001	-0.033	0.006	0.007	0.004	-0.071	0.023	0.002	0.002	0.009	0.005
sector==9	-0.003	0.005	-0.048	0.026	0.002	0.001	-0.012	0.004	-0.003	0.003	-0.038	0.015	0.001	0.002	-0.022	0.012
sector==10	0.000	0.000	-0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	-0.001	0.001
Industry==2	0.000	0.000	0.000	0.001	0.000	0.000	-0.001	0.000	0.000	0.000	-0.001	0.001	0.000	0.000	0.000	0.000
Industry==3	0.000	0.002	-0.014	0.015	-0.004	0.001	-0.011	0.005	0.000	0.002	-0.027	0.018	-0.001	0.001	0.002	0.002
Industry==4	-0.006	0.002	0.008	0.002	0.002	0.000	-0.002	0.000	-0.006	0.001	0.003	0.001	-0.001	0.001	0.003	0.001
Industry==5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==6	0.000	0.000	0.000	0.000	-0.001	0.000	-0.027	0.002	0.000	0.000	-0.027	0.002	-0.001	0.000	0.000	0.000
Industry==7	0.000	0.000	0.001	0.002	0.000	0.000	-0.005	0.001	0.000	0.000	-0.005	0.002	0.000	0.000	0.000	0.000
Industry==8	0.000	0.001	0.020	0.005	0.000	0.000	0.000	0.000	0.000	0.001	0.021	0.006	0.000	0.000	-0.002	0.001
Industry==9	0.000	0.000	-0.001	0.001	0.000	0.000	0.006	0.000	0.000	0.000	0.003	0.002	-0.001	0.000	0.001	0.001
Industry==10	0.000	0.000	0.000	0.000	0.015	0.001	0.013	0.001	0.000	0.000	0.013	0.001	0.015	0.001	0.000	0.000
Industry==11	0.002	0.005	0.010	0.023	0.000	0.000	0.022	0.014	0.002	0.006	0.034	0.032	-0.001	0.001	-0.003	0.007
Industry==12	0.002	0.001	0.004	0.003	0.000	0.000	-0.004	0.001	0.002	0.001	0.002	0.005	0.000	0.000	-0.002	0.002
Industry==13	0.000	0.000	-0.003	0.003	0.000	0.000	0.000	0.001	0.000	0.000	-0.004	0.003	0.000	0.000	0.000	0.000
Industry==14	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.000	0.001	0.000	0.001
Industry==15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==17	0.000	0.000	0.972	0.169	0.000	0.000	-0.563	0.048	0.000	0.000	0.409	0.176	0.000	0.000	0.000	0.000

Table 10: Brazil, Inter-te poral ethnic wage gap deco position for al sector

	Formal															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	-0.005	0.002	-0.062	0.022	0.006	0.001	0.034	0.005	-0.005	0.003	-0.023	0.021	0.000	0.000	-0.005	0.002
Education in years	0.203	0.010	-0.081	0.029	-0.156	0.003	0.134	0.009	0.203	0.010	0.032	0.037	-0.023	0.003	0.020	0.007
Experience	-0.051	0.010	-0.295	0.079	0.014	0.003	0.220	0.018	-0.051	0.010	-0.038	0.072	0.001	0.001	-0.037	0.010
Experience squared	0.022	0.005	0.193	0.046	-0.002	0.001	-0.116	0.011	0.022	0.005	0.039	0.038	0.000	0.000	0.038	0.010
Married=1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HH size	0.001	0.001	0.007	0.003	0.001	0.000	-0.004	0.001	0.001	0.001	0.006	0.005	0.000	0.000	-0.003	0.001
Children between 6 and 18	0.017	0.004	0.033	0.041	-0.011	0.001	-0.035	0.013	0.017	0.001	-0.003	0.041	0.002	0.003	0.002	0.002
Children younger than 5	-0.005	0.003	-0.023	0.015	0.002	0.001	0.005	0.004	-0.005	0.001	-0.017	0.015	-0.002	0.003	-0.001	0.001
region==2	-0.004	0.001	0.009	0.008	0.004	0.000	0.001	0.002	-0.004	0.001	0.010	0.008	0.001	0.001	0.001	0.001
region==3	-0.008	0.003	0.027	0.015	0.000	0.000	-0.007	0.003	-0.008	0.003	0.019	0.015	0.000	0.000	0.001	0.001
region==4	-0.017	0.004	0.026	0.032	0.005	0.000	0.024	0.005	-0.017	0.003	0.043	0.025	0.000	0.001	0.006	0.008
region==5	0.000	0.001	-0.004	0.008	0.002	0.000	0.004	0.003	0.000	0.001	-0.002	0.014	0.001	0.000	0.003	0.006
region==6	0.005	0.002	-0.002	0.006	-0.002	0.000	-0.002	0.002	0.005	0.001	-0.004	0.008	0.001	0.001	0.001	0.002
region==7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==8	0.000	0.001	0.001	0.005	0.000	0.000	-0.019	0.001	0.000	0.001	-0.018	0.006	0.000	0.000	0.000	0.001
sector==2	0.000	0.000	0.000	0.000	0.002	0.000	-0.021	0.001	0.000	0.000	-0.021	0.001	0.002	0.000	0.000	0.000
sector==3	0.004	0.003	0.002	0.027	-0.001	0.000	-0.001	0.002	0.004	0.002	0.001	0.017	0.000	0.001	0.001	0.011
sector==4	0.000	0.003	-0.008	0.060	0.009	0.001	0.006	0.009	0.000	0.006	-0.003	0.065	0.000	0.005	0.001	0.005
sector==5	-0.002	0.008	0.005	0.035	0.000	0.000	-0.016	0.004	-0.002	0.005	-0.012	0.027	-0.001	0.003	0.001	0.008
sector==6	0.011	0.021	-0.006	0.012	-0.005	0.002	0.006	0.003	0.011	0.010	-0.005	0.021	0.001	0.011	0.005	0.009
sector==7	0.000	0.000	0.000	0.000	0.000	0.000	-0.025	0.004	0.000	0.000	-0.025	0.004	0.000	0.000	0.000	0.000
sector==8	-0.003	0.004	0.005	0.064	-0.002	0.001	-0.015	0.010	-0.003	0.006	-0.010	0.070	0.000	0.002	0.000	0.005
sector==9	0.035	0.019	-0.018	0.023	-0.031	0.005	0.018	0.005	0.035	0.009	0.008	0.014	-0.011	0.012	-0.008	0.010
sector==10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==3	0.003	0.005	-0.003	0.064	-0.005	0.001	0.047	0.010	0.003	0.002	0.044	0.067	-0.003	0.003	0.000	0.003
Industry==4	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
Industry==5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==7	0.000	0.000	0.000	0.003	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.003	0.000	0.000	0.000	0.000
Industry==8	0.002	0.001	-0.004	0.008	-0.001	0.000	0.015	0.002	0.002	0.001	0.012	0.007	0.000	0.000	0.000	0.001
Industry==9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==10	-0.034	0.007	0.002	0.003	0.020	0.001	0.001	0.001	-0.034	0.004	0.003	0.005	0.001	0.004	-0.001	0.002
Industry==11	0.001	0.003	0.014	0.033	0.000	0.000	0.012	0.004	0.001	0.004	0.027	0.037	-0.001	0.001	-0.002	0.004
Industry==12	0.003	0.001	0.002	0.006	0.000	0.000	-0.003	0.002	0.003	0.001	0.000	0.009	0.000	0.000	-0.001	0.003
Industry==13	0.000	0.001	-0.006	0.007	0.000	0.000	0.000	0.000	0.000	0.000	-0.005	0.006	0.000	0.000	-0.001	0.001
Industry==14	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.000	0.002	0.001	0.000	0.000	0.000	0.000
Industry==15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==17	0.000	0.000	0.681	0.324	0.000	0.000	-0.655	0.049	0.000	0.000	0.026	0.328	0.000	0.000	0.000	0.000

Table 11: Brazil, Inter-te poral ethnic wage gap deco position infor al sector

	Informal															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	-0.011	0.003	0.066	0.024	0.006	0.001	0.032	0.007	-0.011	0.002	0.101	0.026	-0.001	0.001	-0.003	0.002
Education in years	0.099	0.007	-0.038	0.024	-0.080	0.002	0.080	0.009	0.099	0.006	0.033	0.032	-0.010	0.004	0.010	0.006
Experience	-0.006	0.012	-0.104	0.101	-0.020	0.004	0.313	0.028	-0.006	0.013	0.216	0.098	-0.001	0.001	-0.007	0.007
Experience squared	0.000	0.009	-0.003	0.059	0.013	0.002	-0.148	0.017	0.000	0.009	-0.151	0.055	-0.001	0.001	0.000	0.006
Married=1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HH size	0.000	0.000	0.002	0.004	0.001	0.000	-0.002	0.001	0.000	0.001	0.001	0.006	-0.001	0.001	-0.001	0.002
Children between 6 and 18	0.014	0.005	0.021	0.048	-0.008	0.001	0.018	0.017	0.014	0.001	0.038	0.050	0.003	0.004	0.001	0.002
Children younger than 5	0.009	0.004	-0.049	0.020	-0.004	0.001	0.008	0.007	0.009	0.001	-0.039	0.020	0.003	0.003	-0.002	0.001
region==2	-0.002	0.001	0.001	0.009	0.002	0.000	0.008	0.003	-0.002	0.000	0.010	0.010	0.000	0.001	0.000	0.000
region==3	-0.020	0.004	-0.046	0.019	0.010	0.001	0.037	0.005	-0.020	0.003	-0.005	0.018	0.002	0.001	-0.004	0.002
region==4	-0.018	0.005	-0.043	0.030	0.006	0.001	0.049	0.006	-0.018	0.003	0.017	0.023	-0.001	0.002	-0.011	0.008
region==5	-0.002	0.001	-0.011	0.008	0.006	0.001	0.004	0.003	-0.002	0.001	-0.015	0.014	0.002	0.001	0.008	0.005
region==6	0.006	0.002	0.003	0.006	0.000	0.000	-0.001	0.002	0.006	0.002	0.004	0.010	0.000	0.000	-0.002	0.004
region==7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==8	-0.004	0.001	-0.007	0.002	0.007	0.001	0.005	0.001	-0.004	0.002	-0.004	0.003	0.000	0.002	0.001	0.001
sector==2	0.000	0.000	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.000	0.000	0.000	0.000
sector==3	-0.001	0.001	0.022	0.006	-0.002	0.000	0.019	0.002	-0.001	0.001	0.036	0.005	-0.001	0.001	0.006	0.002
sector==4	0.002	0.002	-0.063	0.016	0.002	0.000	0.043	0.009	0.002	0.003	-0.050	0.025	0.001	0.001	0.030	0.008
sector==5	0.002	0.001	-0.008	0.003	-0.002	0.001	0.010	0.001	0.002	0.001	-0.002	0.005	-0.001	0.000	0.004	0.002
sector==6	0.009	0.002	0.001	0.002	-0.008	0.001	0.005	0.001	0.009	0.001	0.006	0.004	-0.002	0.001	-0.001	0.002
sector==7	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.001	0.002	0.000	0.001	-0.001	0.001
sector==8	0.006	0.003	0.000	0.012	0.014	0.001	0.028	0.006	0.006	0.006	0.028	0.022	0.001	0.004	0.000	0.009
sector==9	-0.007	0.002	0.012	0.022	0.000	0.000	0.011	0.004	-0.007	0.002	0.018	0.014	0.000	0.000	0.005	0.009
sector==10	0.000	0.000	-0.001	0.002	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001
Industry==3	0.005	0.002	-0.009	0.006	-0.009	0.001	0.008	0.002	0.005	0.002	-0.002	0.007	0.002	0.002	0.001	0.001
Industry==4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==5	0.000	0.000	-0.072	0.008	0.000	0.000	0.000	0.000	0.000	0.000	-0.053	0.005	0.000	0.000	-0.019	0.004
Industry==6	0.002	0.001	0.012	0.008	0.003	0.001	0.011	0.006	0.002	0.002	0.031	0.014	0.002	0.001	-0.007	0.005
Industry==7	0.000	0.000	0.005	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.003	0.000	0.000	-0.001	0.001
Industry==8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==9	0.000	0.000	-0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.001	0.000	0.000	0.001	0.001
Industry==10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==11	0.000	0.000	0.000	0.000	-0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	-0.001	0.001	0.000	0.000
Industry==12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==13	-0.002	0.001	-0.004	0.002	0.000	0.000	-0.001	0.001	-0.002	0.001	-0.007	0.003	0.000	0.000	0.002	0.001
Industry==14	0.001	0.001	0.000	0.009	-0.001	0.001	-0.024	0.005	0.001	0.005	-0.023	0.017	-0.003	0.004	0.000	0.008
Industry==15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==17	0.000	0.000	0.784	0.112	0.000	0.000	-0.916	0.033	0.000	0.000	-0.132	0.117	0.000	0.000	0.000	0.000

Table 12:Bolivia, Inter-te poral ethnic wage gap deco position

	Total															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	0.007	0.007	0.336	0.216	0.005	0.005	0.102	0.084	0.007	0.009	0.429	0.226	0.001	0.002	0.009	0.008
Education in years	0.017	0.012	-0.149	0.103	-0.015	0.006	0.290	0.089	0.017	0.013	0.037	0.197	0.002	0.004	0.104	0.072
Experience	0.007	0.016	-0.400	0.395	0.007	0.009	-0.168	0.143	0.007	0.018	-0.444	0.308	0.001	0.003	-0.124	0.123
Experience squared	-0.010	0.012	0.162	0.222	-0.003	0.006	0.098	0.076	-0.010	0.013	0.190	0.146	-0.001	0.002	0.071	0.097
Married=1	0.000	0.001	0.167	0.098	0.001	0.001	0.034	0.038	0.000	0.001	0.177	0.092	0.000	0.001	0.024	0.015
Union	0.009	0.010	-0.207	0.228	-0.003	0.002	-0.099	0.084	0.009	0.006	-0.307	0.243	0.001	0.005	0.000	0.004
HH size	-0.003	0.004	0.039	0.097	0.000	0.001	0.036	0.036	-0.003	0.007	0.071	0.095	0.004	0.004	0.004	0.010
Children between 6 and 18	-0.006	0.006	0.090	0.055	-0.001	0.001	-0.007	0.021	-0.006	0.009	0.066	0.049	0.003	0.004	0.018	0.012
Children younger than 5	0.001	0.006	-0.100	0.076	0.001	0.002	0.021	0.022	0.001	0.006	-0.027	0.043	-0.001	0.002	-0.052	0.040
region==2	0.015	0.012	-0.072	0.032	0.000	0.001	0.014	0.016	0.015	0.012	-0.052	0.032	0.000	0.001	-0.006	0.009
region==3	-0.002	0.004	-0.022	0.014	0.007	0.003	0.002	0.008	-0.002	0.005	-0.023	0.019	0.000	0.004	0.004	0.005
region==4	0.011	0.008	-0.062	0.031	-0.001	0.001	-0.002	0.008	0.011	0.007	-0.026	0.014	0.001	0.001	-0.038	0.020
region==5	-0.001	0.004	-0.016	0.010	-0.003	0.002	-0.002	0.012	-0.001	0.001	-0.052	0.031	-0.004	0.004	0.034	0.020
region==6	-0.008	0.010	-0.088	0.036	0.004	0.003	0.034	0.029	-0.008	0.007	-0.107	0.063	0.002	0.003	0.053	0.023
region==7	0.000	0.002	-0.003	0.006	0.000	0.001	0.022	0.016	0.000	0.003	-0.006	0.062	-0.001	0.002	0.024	0.054
region==8	0.002	0.003	-0.002	0.003	0.011	0.004	0.002	0.008	0.002	0.013	-0.027	0.039	-0.010	0.011	0.027	0.035
region==9	0.005	0.005	0.010	0.009	-0.001	0.004	0.007	0.020	0.005	0.009	0.064	0.049	-0.011	0.008	-0.047	0.038
sector==2	0.013	0.012	0.037	0.028	0.003	0.009	0.011	0.044	0.013	0.015	0.143	0.105	0.030	0.016	-0.096	0.070
sector==3	-0.026	0.013	0.066	0.053	0.000	0.003	0.035	0.052	-0.026	0.016	0.171	0.119	0.001	0.012	-0.070	0.057
sector==4	0.000	0.000	0.005	0.013	-0.005	0.005	0.018	0.038	0.000	0.000	0.048	0.086	-0.005	0.005	-0.025	0.064
sector==5	-0.007	0.010	0.239	0.257	0.000	0.011	0.096	0.094	-0.007	0.011	0.271	0.210	0.000	0.015	0.064	0.071
sector==6	0.006	0.007	0.091	0.053	-0.005	0.006	0.023	0.013	0.006	0.009	0.073	0.032	-0.006	0.008	0.041	0.029
sector==7	-0.006	0.012	0.345	0.314	-0.021	0.015	0.148	0.104	-0.006	0.012	0.379	0.234	-0.029	0.020	0.115	0.107
sector==8	0.023	0.015	0.097	0.073	-0.002	0.007	0.033	0.045	0.023	0.017	0.159	0.104	-0.005	0.015	-0.029	0.027
sector==9	0.003	0.009	0.187	0.147	0.023	0.012	0.050	0.051	0.003	0.011	0.180	0.114	0.034	0.017	0.058	0.049
sector==10	0.003	0.002	0.000	0.000	0.000	0.000	-0.001	0.001	0.003	0.003	0.000	0.001	0.000	0.001	-0.002	0.001
Industry==2	0.006	0.007	0.013	0.012	-0.001	0.002	0.000	0.003	0.006	0.007	0.007	0.007	0.000	0.001	0.006	0.007
Industry==3	-0.003	0.007	-0.033	0.105	0.000	0.001	0.005	0.032	-0.003	0.008	-0.022	0.090	0.001	0.004	-0.006	0.021
Industry==4	0.002	0.003	0.000	0.000	-0.001	0.001	0.000	0.001	0.002	0.002	0.001	0.002	0.000	0.001	-0.001	0.002
Industry==5	0.002	0.008	-0.056	0.075	-0.004	0.003	0.004	0.017	0.002	0.012	-0.028	0.046	-0.005	0.005	-0.024	0.033
Industry==6	0.007	0.012	-0.057	0.153	0.004	0.005	0.010	0.049	0.007	0.006	-0.039	0.140	0.012	0.014	-0.008	0.023
Industry==7	0.000	0.002	-0.037	0.042	-0.002	0.002	0.009	0.011	0.000	0.004	-0.017	0.031	-0.001	0.003	-0.011	0.014
Industry==8	-0.009	0.012	-0.022	0.038	0.000	0.001	0.013	0.024	-0.009	0.012	-0.026	0.071	0.000	0.003	0.017	0.029
Industry==9	0.000	0.002	0.000	0.000	0.001	0.002	0.003	0.004	0.000	0.004	0.001	0.012	0.002	0.003	0.003	0.011
Industry==10	0.000	0.001	-0.003	0.012	-0.001	0.003	0.013	0.010	0.000	0.012	0.007	0.029	-0.002	0.011	0.004	0.016
Industry==11	0.000	0.001	0.004	0.019	0.001	0.004	-0.010	0.014	0.000	0.001	-0.003	0.039	0.001	0.003	-0.003	0.017
Industry==12	-0.011	0.010	0.018	0.032	0.002	0.004	-0.013	0.020	-0.011	0.011	0.020	0.062	-0.001	0.002	-0.015	0.028
Industry==13	0.000	0.000	-0.004	0.008	0.000	0.002	0.002	0.011	0.000	0.001	-0.013	0.035	0.000	0.002	0.012	0.026
Industry==14	0.002	0.007	0.001	0.017	-0.001	0.002	-0.002	0.011	0.002	0.006	0.000	0.031	-0.001	0.002	-0.001	0.012
Industry==15	0.001	0.004	-0.032	0.039	-0.001	0.001	-0.004	0.008	0.001	0.007	-0.020	0.022	-0.002	0.003	-0.015	0.020
Industry==16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==17	0.000	0.000	-0.407	1.139	0.000	0.000	-0.862	0.537	0.000	0.000	-1.269	1.259	0.000	0.000	0.000	0.000

Table 13: Bolivia, Inter-te poral ethnic wage gap deco position for al sector

	Formal															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	0.001	0.025	0.520	0.265	0.001	0.003	-0.079	0.090	0.001	0.025	0.440	0.279	0.001	0.003	0.001	0.016
Education in years	0.056	0.039	0.127	0.192	-0.018	0.010	0.522	0.138	0.056	0.040	0.710	0.315	0.004	0.005	-0.061	0.091
Experience	0.010	0.026	-1.099	0.417	-0.003	0.009	0.068	0.133	0.010	0.024	-0.764	0.341	-0.002	0.007	-0.267	0.115
Experience squared	0.001	0.019	0.552	0.234	0.001	0.003	-0.014	0.071	0.001	0.017	0.336	0.162	0.001	0.004	0.202	0.097
Married=1	-0.006	0.015	0.050	0.118	-0.003	0.002	0.004	0.043	-0.006	0.012	0.050	0.116	-0.004	0.005	0.004	0.010
Union	0.026	0.021	-0.482	0.301	-0.004	0.003	-0.059	0.092	0.026	0.020	-0.529	0.307	0.008	0.008	-0.013	0.018
HH size	-0.007	0.011	0.033	0.135	0.001	0.002	0.062	0.037	-0.007	0.016	0.089	0.115	0.009	0.008	0.007	0.027
Children between 6 and 18	-0.003	0.007	0.008	0.072	-0.001	0.003	0.027	0.024	-0.003	0.014	0.033	0.061	0.008	0.010	0.002	0.016
Children younger than 5	0.009	0.015	0.129	0.093	0.000	0.001	-0.004	0.028	0.009	0.014	0.068	0.058	0.001	0.003	0.056	0.043
region==2	0.018	0.016	0.020	0.038	0.001	0.002	-0.010	0.020	0.018	0.019	0.010	0.045	-0.004	0.005	-0.001	0.005
region==3	-0.001	0.004	0.039	0.031	0.005	0.003	-0.011	0.009	-0.001	0.011	0.016	0.023	0.005	0.007	0.011	0.014
region==4	-0.001	0.008	0.074	0.043	0.000	0.001	-0.007	0.008	-0.001	0.008	0.022	0.018	0.002	0.003	0.045	0.029
region==5	-0.003	0.006	0.014	0.018	-0.003	0.002	0.000	0.012	-0.003	0.011	0.029	0.037	0.002	0.006	-0.015	0.019
region==6	-0.063	0.032	0.058	0.058	0.002	0.003	-0.002	0.035	-0.063	0.033	0.076	0.085	-0.011	0.011	-0.020	0.022
region==7	0.001	0.005	0.008	0.010	0.000	0.000	0.010	0.018	0.001	0.008	0.094	0.079	0.000	0.006	-0.076	0.070
region==8	0.008	0.007	0.000	0.000	0.011	0.005	-0.006	0.011	0.008	0.021	0.045	0.034	-0.011	0.015	-0.051	0.033
region==9	0.001	0.004	0.004	0.020	-0.003	0.007	0.009	0.029	0.001	0.015	0.021	0.070	-0.005	0.014	-0.008	0.044
sector==2	-0.001	0.025	-0.006	0.062	0.005	0.014	-0.004	0.060	-0.001	0.004	-0.017	0.143	0.004	0.025	0.007	0.068
sector==3	-0.008	0.033	0.013	0.113	-0.009	0.010	0.031	0.069	-0.008	0.022	0.047	0.159	-0.012	0.016	-0.003	0.030
sector==4	-0.008	0.013	-0.015	0.025	-0.009	0.009	0.037	0.052	-0.008	0.020	-0.034	0.123	0.002	0.009	0.056	0.088
sector==5	-0.020	0.021	0.000	0.041	0.017	0.012	0.033	0.030	-0.020	0.019	0.033	0.068	0.004	0.010	0.000	0.020
sector==6	0.000	0.000	0.008	0.010	0.000	0.004	0.011	0.007	0.000	0.000	0.030	0.019	0.000	0.004	-0.011	0.013
sector==7	-0.024	0.030	0.072	0.237	0.016	0.014	0.070	0.053	-0.024	0.027	0.102	0.117	0.007	0.011	0.040	0.132
sector==8	-0.004	0.013	0.007	0.060	0.006	0.008	0.026	0.023	-0.004	0.010	0.032	0.051	0.005	0.007	0.002	0.015
sector==9	0.074	0.050	-0.013	0.187	-0.016	0.014	0.050	0.045	0.074	0.046	0.043	0.099	-0.004	0.009	-0.007	0.098
sector==10	0.000	0.000	0.000	0.000	0.000	0.001	-0.001	0.001	0.000	0.000	-0.001	0.001	0.000	0.001	0.000	0.000
Industry==2	0.016	0.024	0.007	0.033	-0.001	0.002	0.006	0.005	0.016	0.023	0.009	0.015	0.000	0.002	0.004	0.019
Industry==3	-0.020	0.028	-0.068	0.144	0.002	0.005	0.024	0.030	-0.020	0.026	-0.021	0.100	-0.017	0.016	-0.023	0.049
Industry==4	-0.002	0.011	0.000	0.000	-0.001	0.001	0.001	0.002	-0.002	0.009	0.001	0.003	-0.001	0.003	0.000	0.003
Industry==5	-0.009	0.017	-0.103	0.103	-0.002	0.003	0.028	0.018	-0.009	0.014	-0.026	0.056	-0.010	0.011	-0.049	0.052
Industry==6	-0.002	0.009	-0.027	0.030	-0.001	0.004	0.040	0.023	-0.002	0.016	-0.035	0.079	0.009	0.012	0.047	0.050
Industry==7	-0.004	0.014	0.000	0.000	-0.001	0.001	0.005	0.008	-0.004	0.010	0.000	0.016	-0.002	0.004	0.005	0.014
Industry==8	0.010	0.015	-0.042	0.041	0.000	0.001	0.018	0.016	0.010	0.016	-0.041	0.056	0.005	0.008	0.017	0.022
Industry==9	-0.006	0.007	0.000	0.000	0.001	0.002	0.013	0.009	-0.006	0.012	-0.007	0.021	0.006	0.008	0.020	0.020
Industry==10	-0.021	0.017	-0.005	0.008	0.001	0.005	0.021	0.009	-0.021	0.013	-0.003	0.033	-0.024	0.017	0.020	0.027
Industry==11	-0.005	0.014	-0.018	0.081	0.000	0.002	0.015	0.029	-0.005	0.016	-0.006	0.101	0.001	0.008	0.004	0.017
Industry==12	-0.003	0.020	0.012	0.133	0.001	0.002	0.032	0.044	-0.003	0.015	0.046	0.161	0.000	0.005	-0.002	0.022
Industry==13	-0.004	0.013	-0.033	0.033	0.000	0.001	0.024	0.017	-0.004	0.015	-0.039	0.059	-0.003	0.008	0.030	0.031
Industry==14	-0.004	0.008	-0.012	0.021	0.000	0.002	0.013	0.011	-0.004	0.008	-0.009	0.037	-0.001	0.004	0.009	0.017
Industry==15	0.000	0.000	-0.016	0.118	0.000	0.000	0.012	0.011	0.000	0.000	0.007	0.038	0.000	0.000	-0.011	0.082
Industry==16	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Industry==17	0.000	0.000	0.539	1.119	0.000	0.000	-1.159	0.483	0.000	0.000	-0.620	1.218	0.000	0.000	0.000	0.000

Table 14:Bolivia , Inter-te poral ethnic wage gap deco position infor al sector

	Informal															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	-0.007	0.011	0.235	0.263	0.011	0.008	0.204	0.135	-0.007	0.013	0.433	0.290	0.002	0.004	0.006	0.008
Education in years	0.011	0.010	-0.203	0.120	-0.014	0.006	0.162	0.111	0.011	0.011	-0.186	0.233	0.002	0.007	0.145	0.086
Experience	-0.013	0.023	-0.107	0.594	0.018	0.013	-0.012	0.199	-0.013	0.027	-0.088	0.464	-0.001	0.010	-0.031	0.174
Experience squared	-0.004	0.016	0.013	0.338	-0.011	0.011	0.036	0.116	-0.004	0.019	0.043	0.233	-0.003	0.007	0.005	0.137
Married=1	-0.003	0.007	0.160	0.138	0.003	0.003	0.055	0.060	-0.003	0.002	0.192	0.132	0.000	0.006	0.023	0.021
Union	-0.003	0.013	0.028	0.292	-0.002	0.003	-0.220	0.136	-0.003	0.006	-0.192	0.328	-0.003	0.008	-0.001	0.006
HH size	-0.002	0.004	0.017	0.129	0.000	0.001	0.027	0.061	-0.002	0.005	0.043	0.140	0.001	0.002	0.000	0.003
Children between 6 and 18	-0.007	0.009	0.124	0.075	0.000	0.001	0.005	0.035	-0.007	0.010	0.110	0.072	0.001	0.002	0.019	0.014
Children younger than 5	0.010	0.011	-0.190	0.105	0.003	0.003	0.015	0.033	0.010	0.014	-0.069	0.057	-0.003	0.005	-0.106	0.059
region==2	0.014	0.017	-0.099	0.043	-0.003	0.003	0.017	0.023	0.014	0.015	-0.066	0.042	-0.001	0.003	-0.017	0.015
region==3	-0.007	0.007	-0.030	0.016	0.007	0.005	0.009	0.013	-0.007	0.007	-0.039	0.028	0.000	0.004	0.018	0.013
region==4	0.024	0.014	-0.118	0.044	-0.002	0.003	0.002	0.013	0.024	0.013	-0.045	0.022	0.004	0.004	-0.071	0.030
region==5	-0.003	0.008	-0.021	0.012	-0.003	0.004	-0.010	0.021	-0.003	0.005	-0.101	0.050	-0.004	0.005	0.069	0.036
region==6	0.005	0.010	-0.131	0.046	0.005	0.005	0.048	0.044	0.005	0.007	-0.178	0.087	0.007	0.008	0.096	0.037
region==7	0.000	0.002	-0.007	0.008	0.001	0.002	0.027	0.026	0.000	0.004	-0.051	0.086	0.000	0.002	0.071	0.075
region==8	0.000	0.004	-0.003	0.005	0.011	0.005	-0.002	0.011	0.000	0.014	-0.026	0.038	-0.010	0.013	0.022	0.032
region==9	-0.005	0.006	0.000	0.000	0.000	0.000	0.006	0.005	-0.005	0.006	-0.007	0.012	-0.001	0.005	0.012	0.012
sector==2	0.000	0.000	0.000	0.000	0.001	0.002	0.022	0.016	0.000	0.000	0.022	0.016	0.001	0.002	0.000	0.000
sector==3	0.008	0.012	-0.020	0.021	0.005	0.006	0.036	0.019	0.008	0.035	-0.025	0.061	-0.038	0.029	0.041	0.040
sector==4	-0.006	0.015	-0.017	0.014	-0.001	0.003	0.011	0.014	-0.006	0.024	-0.061	0.048	0.004	0.015	0.055	0.037
sector==5	0.072	0.063	-0.580	0.460	-0.015	0.014	0.235	0.120	0.072	0.057	-0.249	0.401	0.012	0.022	-0.096	0.088
sector==6	-0.016	0.025	-0.006	0.083	-0.009	0.009	0.043	0.013	-0.016	0.031	0.040	0.048	0.001	0.008	-0.002	0.037
sector==7	0.052	0.054	-0.518	0.436	-0.048	0.019	0.298	0.119	0.052	0.049	-0.150	0.393	0.024	0.050	-0.071	0.072
sector==8	-0.027	0.030	-0.096	0.103	-0.007	0.007	0.062	0.054	-0.027	0.042	-0.108	0.188	0.007	0.014	0.074	0.081
sector==9	-0.070	0.057	-0.150	0.148	0.037	0.015	0.086	0.040	-0.070	0.034	-0.041	0.131	-0.040	0.057	-0.023	0.033
sector==10	0.004	0.004	0.000	0.000	0.000	0.001	-0.001	0.002	0.004	0.004	0.001	0.002	0.000	0.001	-0.002	0.002
Industry==2	0.000	0.006	0.004	0.011	0.000	0.001	0.001	0.002	0.000	0.006	0.002	0.005	0.000	0.000	0.002	0.007
Industry==3	-0.001	0.006	0.037	0.153	0.002	0.009	0.014	0.066	-0.001	0.022	0.048	0.155	0.010	0.020	0.003	0.014
Industry==4	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000
Industry==5	0.005	0.021	-0.011	0.110	-0.001	0.002	0.006	0.031	0.005	0.023	0.000	0.072	-0.001	0.004	-0.004	0.045
Industry==6	0.011	0.031	0.067	0.307	0.006	0.013	-0.010	0.134	0.011	0.007	0.053	0.318	0.016	0.031	0.004	0.019
Industry==7	-0.002	0.010	-0.010	0.085	-0.002	0.003	0.011	0.027	-0.002	0.013	0.004	0.064	-0.001	0.004	-0.003	0.028
Industry==8	0.001	0.027	0.019	0.069	0.000	0.002	0.049	0.058	0.001	0.026	0.089	0.159	0.000	0.003	-0.022	0.079
Industry==9	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.002	0.000	0.000	0.000	0.002	0.000	0.001	0.000	0.000
Industry==10	-0.002	0.011	-0.006	0.025	-0.001	0.005	0.015	0.021	-0.002	0.027	0.001	0.058	0.002	0.017	0.007	0.030
Industry==11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Industry==12	0.000	0.000	0.000	0.000	-0.002	0.002	0.001	0.002	0.000	0.000	0.001	0.002	-0.002	0.002	0.000	0.000
Industry==13	0.000	0.000	0.000	0.000	0.001	0.002	0.001	0.012	0.000	0.000	0.001	0.012	0.001	0.002	0.000	0.000
Industry==14	0.005	0.011	0.020	0.027	-0.001	0.002	-0.001	0.021	0.005	0.009	0.034	0.052	0.000	0.003	-0.015	0.022
Industry==15	0.001	0.028	0.001	0.016	-0.008	0.015	-0.004	0.007	0.001	0.003	-0.003	0.016	-0.007	0.034	0.000	0.002
Industry==16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==17	0.000	0.000	1.763	1.414	0.000	0.000	-1.259	0.427	0.000	0.000	0.503	1.478	0.000	0.000	0.000	0.000

Table 15:Guatemala, Inter-temporal ethnic wage gap decompositio

	Total															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	0.022	0.006	-0.077	0.065	-0.008	0.002	-0.013	0.027	0.022	0.006	-0.095	0.074	0.003	0.002	0.005	0.005
Education in years	-0.001	0.012	-0.096	0.068	0.096	0.007	0.125	0.045	-0.001	0.015	-0.054	0.133	0.010	0.007	0.082	0.058
Experience	0.016	0.020	0.196	0.348	-0.062	0.008	-0.182	0.145	0.016	0.024	-0.020	0.323	0.029	0.013	0.033	0.059
Experience squared	-0.019	0.016	-0.255	0.243	0.040	0.006	0.083	0.087	-0.019	0.018	-0.110	0.202	-0.024	0.010	-0.063	0.061
Married=1	0.001	0.002	0.153	0.078	-0.003	0.001	0.060	0.030	0.001	0.002	0.197	0.076	0.000	0.001	0.016	0.009
HH size	0.002	0.002	-0.010	0.009	0.001	0.001	-0.001	0.005	0.002	0.001	-0.018	0.017	0.002	0.002	0.007	0.007
Children between 6 and 18	0.000	0.001	0.015	0.132	0.000	0.000	-0.004	0.055	0.000	0.001	0.009	0.127	0.000	0.000	0.002	0.017
Children younger than 5	0.001	0.001	-0.082	0.065	0.000	0.001	0.041	0.029	0.001	0.001	-0.018	0.055	0.002	0.001	-0.023	0.019
region==2	0.000	0.000	-0.087	0.055	0.000	0.000	0.001	0.014	0.000	0.000	-0.058	0.040	0.000	0.000	-0.028	0.018
region==3	0.005	0.006	0.503	0.259	0.036	0.006	-0.028	0.040	0.005	0.028	0.342	0.195	0.062	0.035	0.133	0.069
region==4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
sector==2	0.000	0.000	0.000	0.000	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.000	0.000
sector==3	0.013	0.005	0.018	0.024	-0.012	0.002	-0.044	0.014	0.013	0.006	-0.026	0.027	0.003	0.002	0.000	0.003
sector==4	-0.015	0.008	0.137	0.095	-0.007	0.004	-0.302	0.061	-0.015	0.008	-0.152	0.120	-0.001	0.001	-0.013	0.013
sector==5	0.007	0.004	0.049	0.029	-0.002	0.001	-0.037	0.013	0.007	0.004	0.084	0.065	0.001	0.001	-0.072	0.041
sector==6	0.002	0.002	0.002	0.007	0.019	0.003	-0.054	0.017	0.002	0.005	-0.046	0.036	0.005	0.004	-0.006	0.025
sector==7	-0.012	0.007	-0.003	0.032	0.001	0.004	-0.031	0.019	-0.012	0.007	-0.035	0.043	0.000	0.001	0.001	0.006
sector==8	-0.057	0.015	0.011	0.094	0.044	0.006	-0.240	0.059	-0.057	0.014	-0.225	0.136	-0.010	0.009	-0.003	0.029
sector==9	-0.006	0.003	0.030	0.040	0.000	0.001	-0.041	0.015	-0.006	0.004	-0.021	0.031	0.000	0.000	0.009	0.013
sector==10	0.000	0.001	0.000	0.000	-0.002	0.001	0.000	0.000	0.000	0.001	0.000	0.000	-0.001	0.002	0.000	0.000
Industry==2	-0.001	0.002	0.002	0.003	-0.002	0.000	0.000	0.001	-0.001	0.002	0.000	0.001	0.001	0.001	0.001	0.003
Industry==3	0.012	0.006	0.061	0.018	0.010	0.003	-0.163	0.042	0.012	0.008	-0.110	0.045	0.002	0.002	0.008	0.005
Industry==4	0.000	0.000	0.000	0.000	0.001	0.001	-0.001	0.002	0.000	0.000	-0.001	0.002	0.001	0.001	0.000	0.000
Industry==5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==6	0.000	0.000	0.000	0.000	-0.005	0.002	0.065	0.010	0.000	0.000	0.065	0.010	-0.005	0.002	0.000	0.000
Industry==7	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.000	0.003	0.003	0.000	0.000
Industry==8	-0.001	0.003	-0.040	0.025	0.000	0.000	0.000	0.000	-0.001	0.001	-0.092	0.052	-0.001	0.002	0.052	0.032
Industry==9	-0.003	0.002	0.005	0.003	0.000	0.000	0.000	0.000	-0.003	0.010	0.023	0.013	-0.019	0.011	-0.019	0.011
Industry==10	0.000	0.000	0.000	0.000	0.006	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.002	0.000	0.000
Industry==11	-0.002	0.004	0.019	0.026	0.000	0.001	-0.001	0.017	-0.002	0.003	0.022	0.036	-0.001	0.002	-0.005	0.007
Industry==12	-0.015	0.006	0.038	0.012	0.006	0.002	0.001	0.010	-0.015	0.006	0.042	0.015	-0.002	0.002	-0.002	0.005
Industry==13	0.000	0.000	0.071	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.111	0.031	0.000	0.000	-0.041	0.015
Industry==14	-0.006	0.004	0.000	0.000	0.011	0.003	0.000	0.000	-0.006	0.003	0.000	0.000	0.002	0.007	0.000	0.000
Industry==15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==17	0.000	0.000	-0.622	0.544	0.000	0.000	0.679	0.355	0.000	0.000	0.057	0.650	0.000	0.000	0.000	0.000

Table 16:Guate ala, Inter-te poral ethnic wage gap deco position for al sector

	Formal															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	0.001	0.004	-0.256	0.104	-0.006	0.002	0.041	0.025	0.001	0.005	-0.184	0.094	0.002	0.004	-0.030	0.016
Education in years	0.052	0.029	-0.051	0.120	0.102	0.011	0.109	0.048	0.052	0.032	0.031	0.190	0.010	0.008	0.027	0.064
Experience	-0.035	0.029	0.182	0.367	-0.065	0.010	0.001	0.083	-0.035	0.035	0.149	0.309	0.005	0.013	0.035	0.070
Experience squared	0.005	0.018	-0.097	0.196	0.037	0.007	-0.046	0.045	0.005	0.022	-0.118	0.152	-0.004	0.011	-0.025	0.051
Married=1	-0.003	0.006	0.298	0.114	-0.005	0.002	0.037	0.028	-0.003	0.007	0.301	0.104	0.003	0.002	0.035	0.019
HH size	-0.002	0.003	-0.003	0.013	0.001	0.001	-0.002	0.005	-0.002	0.001	-0.007	0.024	-0.001	0.002	0.002	0.010
Children between 6 and 18	0.001	0.003	-0.098	0.172	0.001	0.001	-0.008	0.048	0.001	0.002	-0.095	0.161	0.001	0.001	-0.010	0.019
Children younger than 5	-0.001	0.002	0.034	0.074	0.001	0.001	0.022	0.019	-0.001	0.002	0.048	0.059	-0.001	0.002	0.008	0.018
region==2	0.001	0.002	-0.055	0.050	0.000	0.000	-0.006	0.012	0.001	0.002	-0.042	0.035	-0.001	0.001	-0.018	0.018
region==3	-0.001	0.011	0.590	0.309	0.034	0.007	-0.048	0.029	-0.001	0.044	0.358	0.214	0.031	0.056	0.184	0.097
region==4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
sector==2	0.000	0.000	0.000	0.000	-0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.002	0.000	0.000
sector==3	0.018	0.008	0.026	0.018	-0.011	0.002	-0.009	0.005	0.018	0.008	0.011	0.014	0.005	0.003	0.006	0.008
sector==4	-0.014	0.010	0.110	0.052	0.002	0.003	-0.059	0.020	-0.014	0.010	0.059	0.057	0.000	0.001	-0.008	0.015
sector==5	0.002	0.003	-0.008	0.011	-0.004	0.003	0.001	0.010	0.002	0.002	-0.016	0.026	-0.002	0.002	0.009	0.014
sector==6	0.008	0.005	0.004	0.008	0.012	0.003	0.004	0.009	0.008	0.011	0.026	0.045	-0.004	0.007	-0.019	0.036
sector==7	-0.007	0.008	-0.013	0.074	-0.010	0.004	-0.006	0.010	-0.007	0.011	-0.016	0.055	-0.002	0.005	-0.004	0.020
sector==8	-0.016	0.012	0.069	0.092	0.010	0.003	-0.013	0.027	-0.016	0.011	0.051	0.089	-0.002	0.004	0.005	0.010
sector==9	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000
sector==10	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.002	0.000	0.000	0.002	0.003	0.000	0.000
Industry==2	-0.001	0.002	0.002	0.004	-0.002	0.001	0.000	0.001	-0.001	0.003	0.000	0.001	-0.001	0.002	0.001	0.004
Industry==3	0.010	0.008	0.026	0.018	0.009	0.002	-0.033	0.006	0.010	0.014	0.003	0.025	-0.001	0.007	-0.010	0.008
Industry==4	0.000	0.000	0.009	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.022	0.010	0.000	0.000	-0.013	0.012
Industry==5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==6	-0.004	0.011	0.010	0.026	-0.004	0.002	0.019	0.010	-0.004	0.006	0.030	0.030	-0.006	0.006	-0.001	0.002
Industry==7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==8	0.000	0.002	0.001	0.004	0.003	0.002	0.001	0.009	0.000	0.001	0.004	0.013	0.004	0.003	-0.001	0.005
Industry==9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==10	-0.002	0.004	0.000	0.000	0.006	0.002	0.000	0.000	-0.002	0.002	0.000	0.000	0.003	0.007	0.000	0.000
Industry==11	-0.004	0.006	0.030	0.068	0.005	0.003	0.016	0.007	-0.004	0.009	0.038	0.051	0.008	0.005	0.008	0.018
Industry==12	-0.027	0.014	-0.021	0.070	-0.002	0.002	-0.004	0.012	-0.027	0.015	-0.018	0.047	0.001	0.002	-0.008	0.025
Industry==13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==14	0.009	0.005	0.000	0.000	-0.002	0.002	0.000	0.000	0.009	0.002	0.000	0.000	0.007	0.005	0.000	0.000
Industry==15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==16	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.000	0.002	0.001	0.000	0.000	0.000	0.000
Industry==17	0.000	0.000	-0.429	0.450	0.000	0.000	-0.363	0.116	0.000	0.000	-0.792	0.465	0.000	0.000	0.000	0.000

Table 17: Guate ala, Inter-te poral ethnic wage gap deco position infor al sector

	Informal															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	0.039	0.009	0.021	0.054	-0.010	0.003	0.015	0.033	0.039	0.009	0.038	0.069	0.003	0.002	-0.003	0.007
Education in years	0.002	0.008	-0.103	0.063	0.028	0.006	0.055	0.051	0.002	0.011	-0.129	0.123	0.000	0.004	0.081	0.050
Experience	0.027	0.027	-0.004	0.403	-0.039	0.009	0.158	0.175	0.027	0.031	0.154	0.411	0.034	0.013	0.000	0.032
Experience squared	-0.018	0.022	-0.061	0.226	0.025	0.007	-0.179	0.102	-0.018	0.025	-0.233	0.223	-0.031	0.012	-0.007	0.028
Married=1	0.002	0.002	0.065	0.087	-0.003	0.001	0.080	0.041	0.002	0.002	0.138	0.087	0.000	0.002	0.007	0.010
HH size	0.004	0.003	-0.008	0.011	0.001	0.001	0.005	0.007	0.004	0.003	-0.008	0.019	0.002	0.002	0.005	0.007
Children between 6 and 18	-0.001	0.001	0.142	0.159	-0.001	0.001	0.134	0.076	-0.001	0.002	0.260	0.160	0.000	0.001	0.017	0.019
Children younger than 5	0.001	0.003	-0.090	0.075	0.000	0.001	-0.069	0.031	0.001	0.003	-0.135	0.063	0.003	0.002	-0.024	0.021
region==2	0.000	0.001	-0.033	0.042	0.001	0.001	-0.015	0.019	0.000	0.001	-0.039	0.036	0.001	0.001	-0.009	0.012
region==3	0.006	0.007	0.598	0.311	0.017	0.007	-0.150	0.061	0.006	0.028	0.331	0.258	0.046	0.036	0.116	0.061
region==4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==8	0.000	0.000	-0.067	0.039	0.000	0.000	0.040	0.019	0.000	0.000	-0.003	0.031	0.000	0.000	-0.024	0.015
sector==2	0.003	0.003	0.000	0.000	0.002	0.002	0.000	0.000	0.003	0.002	0.000	0.000	0.008	0.005	0.000	0.000
sector==3	0.010	0.007	-0.020	0.014	-0.012	0.005	-0.010	0.011	0.010	0.008	-0.037	0.022	-0.001	0.002	0.007	0.006
sector==4	-0.021	0.013	0.014	0.059	-0.004	0.010	-0.198	0.050	-0.021	0.015	-0.181	0.091	-0.001	0.003	-0.004	0.017
sector==5	0.007	0.009	0.006	0.013	-0.002	0.003	-0.002	0.016	0.007	0.008	0.013	0.036	0.000	0.002	-0.009	0.019
sector==6	-0.003	0.007	0.004	0.011	0.005	0.004	-0.001	0.005	-0.003	0.010	0.008	0.025	-0.003	0.006	-0.005	0.014
sector==7	-0.003	0.004	-0.003	0.006	0.001	0.003	-0.010	0.010	-0.003	0.006	-0.015	0.016	-0.007	0.007	0.003	0.006
sector==8	-0.086	0.025	0.106	0.033	0.058	0.011	0.037	0.039	-0.086	0.026	0.199	0.060	-0.039	0.015	-0.056	0.023
sector==9	-0.018	0.007	-0.030	0.023	0.013	0.005	-0.010	0.015	-0.018	0.007	-0.040	0.027	0.005	0.003	0.001	0.005
sector==10	0.001	0.001	0.000	0.000	-0.005	0.001	0.000	0.000	0.001	0.001	0.000	0.000	-0.004	0.002	0.000	0.000
Industry==2	0.001	0.001	0.000	0.000	-0.001	0.001	0.000	0.000	0.001	0.002	0.000	0.000	0.002	0.002	0.000	0.000
Industry==3	0.005	0.005	0.053	0.013	0.000	0.006	-0.093	0.008	0.005	0.005	-0.059	0.011	0.000	0.004	0.019	0.006
Industry==4	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000
Industry==5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==6	0.004	0.007	-0.017	0.034	-0.008	0.003	0.081	0.020	0.004	0.003	0.059	0.048	-0.006	0.005	0.005	0.010
Industry==7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==8	0.000	0.008	-0.001	0.011	-0.001	0.002	-0.005	0.014	0.000	0.005	-0.006	0.029	-0.001	0.003	0.001	0.015
Industry==9	0.000	0.000	0.000	0.000	0.003	0.006	-0.004	0.006	0.000	0.000	-0.004	0.006	0.003	0.006	0.000	0.000
Industry==10	-0.006	0.008	0.000	0.000	0.000	0.000	0.000	0.000	-0.006	0.008	0.000	0.000	-0.013	0.015	0.000	0.000
Industry==11	0.000	0.000	0.001	0.003	0.000	0.000	0.012	0.009	0.000	0.000	0.015	0.015	0.000	0.000	-0.002	0.008
Industry==12	0.000	0.000	-0.012	0.008	0.002	0.002	-0.005	0.003	0.000	0.000	-0.032	0.012	0.002	0.002	0.015	0.010
Industry==13	0.034	0.028	-0.036	0.030	0.000	0.000	-0.094	0.030	0.034	0.013	-0.147	0.052	0.049	0.040	0.017	0.015
Industry==14	-0.029	0.008	0.000	0.000	0.014	0.008	0.000	0.000	-0.029	0.009	0.000	0.000	-0.050	0.017	0.000	0.000
Industry==15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==16	0.000	0.001	0.000	0.002	0.000	0.001	-0.001	0.001	0.000	0.001	-0.001	0.001	0.000	0.001	0.000	0.002
Industry==17	0.000	0.000	0.036	0.422	0.000	0.000	-0.212	0.194	0.000	0.000	-0.176	0.465	0.000	0.000	0.000	0.000

Table 1:Peru, Inter-te poral ethnic wage gap deco position

	Total															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	-0.004	0.004	0.040	0.054	-0.005	0.002	0.002	0.028	-0.004	0.005	0.040	0.059	0.000	0.001	0.002	0.003
Education in years	-0.037	0.009	-0.090	0.099	-0.069	0.006	-0.064	0.064	-0.037	0.014	-0.167	0.129	-0.032	0.007	0.012	0.013
Experience	0.121	0.041	0.258	0.265	0.012	0.006	-0.174	0.163	0.121	0.046	0.053	0.284	-0.001	0.005	0.031	0.032
Experience squared	-0.098	0.032	-0.192	0.146	-0.007	0.004	0.054	0.083	-0.098	0.036	-0.098	0.142	0.004	0.004	-0.040	0.031
Married=1	0.016	0.007	-0.021	0.054	0.002	0.001	0.021	0.028	0.016	0.008	0.000	0.059	-0.001	0.001	0.000	0.001
HH size	0.103	0.817	-0.103	0.817	0.076	0.191	-0.076	0.191	0.103	0.001	-0.179	0.839	0.179	0.838	0.000	0.000
Children between 6 and 18	-0.003	0.004	0.035	0.078	-0.001	0.001	0.083	0.047	-0.003	0.004	0.116	0.087	-0.001	0.001	0.002	0.004
Children younger than 5	0.001	0.002	-0.001	0.034	0.002	0.002	-0.002	0.021	0.001	0.005	-0.003	0.040	-0.002	0.004	0.000	0.001
region==2	0.000	0.001	0.012	0.020	0.000	0.001	-0.010	0.012	0.000	0.003	0.003	0.024	0.004	0.003	-0.001	0.002
region==3	-0.047	0.010	-0.036	0.032	-0.003	0.001	0.032	0.014	-0.047	0.011	0.005	0.028	0.008	0.003	-0.009	0.008
region==4	-0.001	0.002	-0.002	0.014	0.000	0.001	-0.003	0.011	-0.001	0.002	-0.006	0.025	0.000	0.001	0.001	0.009
region==5	0.017	0.007	0.000	0.000	-0.039	0.004	0.000	0.000	0.017	0.004	0.000	0.000	-0.012	0.011	0.000	0.000
region==6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==7	0.000	0.000	-0.065	0.025	0.000	0.000	0.051	0.012	0.000	0.000	-0.001	0.022	0.000	0.000	-0.014	0.007
sector==2	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.005	0.000	0.000	0.005	0.005	0.000	0.000	0.000	0.000
sector==3	0.004	0.005	-0.019	0.013	0.002	0.001	0.006	0.007	0.004	0.005	-0.013	0.014	-0.002	0.002	-0.001	0.003
sector==4	-0.004	0.010	0.075	0.053	-0.001	0.001	0.058	0.029	-0.004	0.012	0.127	0.057	-0.015	0.006	0.006	0.006
sector==5	-0.023	0.013	-0.008	0.046	0.001	0.001	0.059	0.029	-0.023	0.016	0.052	0.050	0.010	0.007	-0.001	0.005
sector==6	-0.007	0.004	-0.008	0.027	-0.009	0.003	-0.008	0.007	-0.007	0.006	-0.018	0.034	-0.001	0.002	0.002	0.007
sector==7	0.004	0.005	-0.011	0.009	-0.007	0.002	0.005	0.006	0.004	0.006	-0.007	0.012	0.002	0.002	0.001	0.003
sector==8	-0.003	0.006	-0.028	0.037	0.004	0.004	0.024	0.024	-0.003	0.007	-0.020	0.063	0.000	0.002	0.016	0.022
sector==9	0.001	0.002	-0.006	0.009	0.000	0.000	0.013	0.006	0.001	0.003	0.005	0.011	0.000	0.001	0.001	0.002
sector==10	-0.011	0.006	0.005	0.005	0.001	0.001	-0.001	0.002	-0.011	0.006	0.003	0.005	-0.001	0.002	0.001	0.002
Industry==2	0.002	0.006	0.001	0.005	0.000	0.002	0.004	0.002	0.002	0.007	0.004	0.004	0.000	0.000	0.000	0.002
Industry==3	-0.008	0.005	-0.015	0.024	0.000	0.001	0.024	0.013	-0.008	0.006	0.008	0.027	-0.001	0.002	0.000	0.002
Industry==4	0.000	0.000	0.000	0.000	0.000	0.001	-0.002	0.001	0.000	0.000	-0.002	0.001	0.000	0.001	0.000	0.000
Industry==5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==6	0.005	0.005	-0.082	0.021	0.000	0.000	0.000	0.000	0.005	0.006	-0.073	0.018	0.008	0.003	-0.009	0.006
Industry==7	0.000	0.000	-0.013	0.008	-0.001	0.001	0.005	0.006	0.000	0.000	-0.009	0.010	-0.001	0.001	0.000	0.002
Industry==8	0.017	0.011	-0.009	0.042	0.000	0.000	-0.021	0.027	0.017	0.014	-0.029	0.047	-0.007	0.005	-0.001	0.004
Industry==9	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.002	0.002	0.002	0.001	0.002	0.000	0.001
Industry==10	0.000	0.000	0.010	0.026	0.004	0.002	0.015	0.004	0.000	0.000	0.027	0.031	0.004	0.002	-0.002	0.005
Industry==11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==12	-0.004	0.005	0.004	0.018	0.001	0.001	-0.007	0.013	-0.004	0.006	0.000	0.031	-0.002	0.003	-0.003	0.010
Industry==13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==14	0.000	0.002	-0.001	0.013	0.000	0.002	0.005	0.009	0.000	0.003	0.005	0.020	0.000	0.000	0.000	0.006
Industry==15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==17	0.000	0.000	0.210	0.329	0.000	0.000	-0.162	0.205	0.000	0.000	0.048	0.388	0.000	0.000	0.000	0.000

Table 19:Peru, Inter-te poral ethnic wage gap deco position for al sector

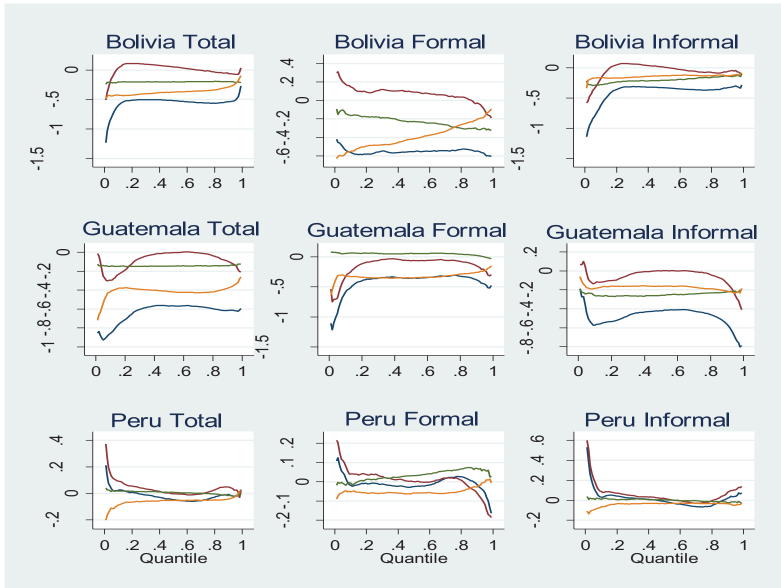
	Formal															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	-0.001	0.004	0.061	0.084	0.006	0.003	-0.156	0.037	-0.001	0.005	-0.101	0.084	0.002	0.002	0.006	0.009
Education in years	-0.007	0.008	0.000	0.165	-0.067	0.009	-0.125	0.100	-0.007	0.015	-0.126	0.210	-0.036	0.011	0.000	0.020
Experience	0.114	0.046	0.548	0.294	0.000	0.011	-0.153	0.126	0.114	0.047	0.309	0.277	0.000	0.000	0.086	0.052
Experience squared	-0.063	0.034	-0.314	0.168	-0.002	0.006	0.035	0.068	-0.063	0.035	-0.191	0.139	0.000	0.001	-0.087	0.052
Married=1	0.005	0.010	-0.133	0.085	0.000	0.002	0.028	0.036	0.005	0.010	-0.092	0.085	0.000	0.001	-0.013	0.011
HH size	-0.037	0.785	0.037	0.785	0.062	0.266	-0.062	0.266	-0.037	0.000	-0.025	0.829	0.025	0.828	0.000	0.000
Children between 6 and 18	-0.010	0.011	0.175	0.113	0.001	0.001	0.007	0.058	-0.010	0.012	0.164	0.116	0.001	0.002	0.018	0.013
Children younger than 5	-0.002	0.003	-0.043	0.045	-0.003	0.001	0.002	0.023	-0.002	0.006	-0.037	0.047	-0.001	0.004	-0.004	0.005
region==2	0.001	0.003	-0.031	0.032	0.001	0.001	-0.029	0.014	0.001	0.002	-0.055	0.030	0.003	0.004	-0.005	0.006
region==3	-0.022	0.012	-0.031	0.048	-0.003	0.001	0.024	0.019	-0.022	0.015	0.001	0.041	0.002	0.003	-0.008	0.012
region==4	-0.005	0.005	0.003	0.019	0.000	0.000	-0.011	0.013	-0.005	0.006	-0.006	0.035	-0.001	0.004	-0.002	0.013
region==5	0.000	0.010	0.000	0.000	-0.035	0.005	0.000	0.000	0.000	0.009	0.000	0.000	-0.036	0.020	0.000	0.000
region==6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==7	0.000	0.000	-0.096	0.037	0.000	0.000	0.033	0.016	0.000	0.000	-0.044	0.032	0.000	0.000	-0.019	0.012
region==8	0.003	0.005	0.009	0.023	0.000	0.000	-0.001	0.011	0.003	0.005	0.007	0.023	0.000	0.001	0.001	0.003
sector==2	0.000	0.000	0.000	0.000	0.000	0.001	-0.008	0.003	0.000	0.000	-0.008	0.003	0.000	0.001	0.000	0.000
sector==3	0.001	0.011	0.000	0.017	0.005	0.003	-0.002	0.009	0.001	0.012	-0.002	0.016	-0.005	0.003	0.000	0.003
sector==4	0.002	0.013	-0.018	0.033	-0.006	0.003	-0.003	0.019	0.002	0.015	-0.020	0.037	0.013	0.007	-0.001	0.003
sector==5	-0.011	0.014	-0.002	0.029	0.000	0.004	-0.004	0.011	-0.011	0.016	-0.006	0.028	0.000	0.003	0.000	0.004
sector==6	0.001	0.008	-0.017	0.030	-0.005	0.002	-0.006	0.009	0.001	0.010	-0.028	0.040	0.006	0.004	0.005	0.010
sector==7	0.010	0.011	-0.021	0.022	-0.005	0.004	-0.009	0.014	0.010	0.012	-0.031	0.026	0.002	0.002	0.000	0.004
sector==8	0.002	0.009	-0.083	0.067	0.015	0.005	-0.052	0.046	0.002	0.014	-0.181	0.113	-0.003	0.009	0.046	0.038
sector==9	0.000	0.000	0.000	0.000	0.001	0.001	-0.002	0.002	0.000	0.000	-0.002	0.002	0.001	0.001	0.000	0.000
sector==10	-0.004	0.014	-0.012	0.017	0.002	0.002	-0.004	0.004	-0.004	0.010	-0.011	0.011	0.001	0.004	-0.005	0.008
Industry==2	0.003	0.017	0.011	0.012	0.005	0.005	0.005	0.005	0.003	0.018	0.011	0.008	-0.002	0.002	0.005	0.007
Industry==3	-0.029	0.015	0.022	0.039	0.000	0.001	0.027	0.019	-0.029	0.017	0.045	0.038	0.001	0.006	0.004	0.008
Industry==4	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.001	0.002	0.000	0.000	0.000	0.000
Industry==5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==6	0.003	0.004	-0.017	0.018	0.005	0.002	0.015	0.005	0.003	0.009	0.000	0.016	0.000	0.005	-0.002	0.004
Industry==7	0.000	0.000	0.006	0.007	0.000	0.000	-0.001	0.005	0.000	0.000	0.008	0.011	0.000	0.000	-0.002	0.004
Industry==8	0.002	0.007	-0.001	0.022	0.000	0.003	0.020	0.007	0.002	0.008	0.019	0.024	0.000	0.001	0.000	0.001
Industry==9	0.000	0.001	0.001	0.002	-0.002	0.001	0.001	0.002	0.000	0.003	0.003	0.005	-0.001	0.002	-0.001	0.002
Industry==10	0.000	0.000	0.037	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.034	0.000	0.000	-0.009	0.014
Industry==11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==12	-0.011	0.013	0.049	0.050	0.009	0.003	0.003	0.027	-0.011	0.016	0.073	0.076	-0.022	0.012	-0.021	0.023
Industry==13	0.000	0.000	0.001	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.015	0.000	0.000	-0.001	0.008
Industry==14	-0.004	0.004	-0.004	0.004	0.002	0.002	0.005	0.006	-0.004	0.003	-0.004	0.010	0.000	0.002	0.005	0.005
Industry==15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==17	0.000	0.000	-0.135	0.271	0.000	0.000	0.372	0.163	0.000	0.000	0.237	0.317	0.000	0.000	0.000	0.000

Table20:Peru, Inter-te poral ethnic wage gap deco position infor al sector

	Informal															
	Decomposition 1								Decomposition 2							
	Component 1		Component 2		Component 3		Component 4		Component 1		Component 2		Component 3		Component 4	
	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD	Coef	SD
Sex	-0.007	0.008	0.128	0.055	-0.011	0.004	0.046	0.031	-0.007	0.010	0.169	0.061	0.001	0.002	0.005	0.007
Education in years	-0.028	0.012	-0.166	0.118	-0.023	0.005	0.089	0.078	-0.028	0.016	-0.097	0.154	-0.012	0.005	0.020	0.015
Experience	0.133	0.045	0.218	0.287	0.015	0.012	-0.235	0.151	0.133	0.049	-0.037	0.301	0.004	0.005	0.020	0.027
Experience squared	-0.125	0.038	-0.168	0.173	-0.007	0.008	0.124	0.090	-0.125	0.041	-0.017	0.171	0.000	0.002	-0.028	0.030
Married=1	0.019	0.009	0.006	0.062	0.002	0.001	0.043	0.038	0.019	0.011	0.050	0.075	-0.002	0.002	0.000	0.002
HH size	0.000	0.000	0.000	0.000	0.164	0.255	-0.164	0.256	0.000	0.000	-0.164	0.256	0.164	0.255	0.000	0.000
Children between 6 and 18	0.001	0.004	-0.048	0.102	-0.002	0.001	0.132	0.067	0.001	0.003	0.085	0.120	-0.001	0.002	-0.001	0.002
Children younger than 5	0.002	0.002	0.001	0.046	0.007	0.003	-0.005	0.031	0.002	0.007	-0.003	0.059	0.000	0.006	0.000	0.004
region==2	-0.001	0.001	0.039	0.023	0.000	0.002	0.008	0.016	-0.001	0.005	0.058	0.033	0.003	0.004	-0.011	0.008
region==3	-0.060	0.013	-0.039	0.039	-0.007	0.002	0.054	0.018	-0.060	0.016	0.025	0.034	0.009	0.004	-0.010	0.010
region==4	0.001	0.002	-0.006	0.019	0.001	0.002	0.006	0.015	0.001	0.003	-0.003	0.034	0.000	0.001	0.003	0.012
region==5	0.029	0.009	0.000	0.000	-0.043	0.005	0.000	0.000	0.029	0.004	0.000	0.000	-0.004	0.012	0.000	0.000
region==6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
region==7	0.000	0.000	-0.050	0.032	0.000	0.000	0.052	0.016	0.000	0.000	0.014	0.029	0.000	0.000	-0.012	0.008
sector==2	-0.001	0.002	0.005	0.007	0.000	0.000	0.000	0.000	-0.001	0.002	0.004	0.006	0.000	0.001	0.001	0.002
sector==3	0.007	0.007	-0.013	0.012	0.001	0.002	0.008	0.008	0.007	0.008	-0.007	0.016	-0.001	0.002	0.001	0.003
sector==4	-0.009	0.011	-0.069	0.100	0.013	0.006	0.013	0.054	-0.009	0.012	-0.052	0.109	-0.001	0.003	-0.004	0.007
sector==5	-0.010	0.006	-0.001	0.023	-0.004	0.002	0.005	0.094	-0.010	0.008	0.004	0.097	0.005	0.003	0.000	0.002
sector==6	-0.012	0.007	-0.004	0.011	0.000	0.002	0.012	0.006	-0.012	0.008	0.008	0.013	0.000	0.001	0.000	0.002
sector==7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
sector==8	-0.008	0.009	0.018	0.023	0.006	0.005	0.019	0.022	-0.008	0.010	0.046	0.040	-0.001	0.004	-0.008	0.011
sector==9	0.002	0.007	0.006	0.012	-0.004	0.002	0.028	0.009	0.002	0.008	0.035	0.017	0.004	0.003	-0.001	0.003
sector==10	-0.003	0.007	0.005	0.005	-0.001	0.002	0.000	0.002	-0.003	0.008	0.005	0.005	0.001	0.002	0.000	0.003
Industry==2	0.003	0.002	0.000	0.000	0.000	0.000	0.001	0.001	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.000
Industry==3	-0.001	0.005	-0.014	0.022	0.002	0.002	0.044	0.017	-0.001	0.006	0.028	0.030	-0.002	0.002	0.002	0.004
Industry==4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==6	0.000	0.000	0.110	0.059	-0.011	0.004	0.095	0.014	0.000	0.000	0.198	0.057	-0.011	0.004	0.007	0.008
Industry==7	0.001	0.004	0.023	0.007	0.000	0.000	0.029	0.008	0.001	0.004	0.052	0.011	0.003	0.002	0.000	0.004
Industry==8	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.093	0.000	0.000	0.036	0.093	0.000	0.000	0.000	0.000
Industry==9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Industry==10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==12	-0.001	0.001	0.000	0.000	0.000	0.000	-0.001	0.002	-0.001	0.003	-0.005	0.004	-0.006	0.004	0.004	0.003
Industry==13	0.000	0.000	-0.001	0.004	0.000	0.001	0.000	0.002	0.000	0.000	-0.002	0.007	0.000	0.001	0.001	0.003
Industry==14	0.002	0.004	-0.015	0.017	-0.001	0.002	0.010	0.017	0.002	0.004	-0.011	0.029	0.000	0.002	0.005	0.007
Industry==15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry==17	0.000	0.000	-0.043	0.282	0.000	0.000	-0.547	0.177	0.000	0.000	-0.591	0.333	0.000	0.000	0.000	0.000

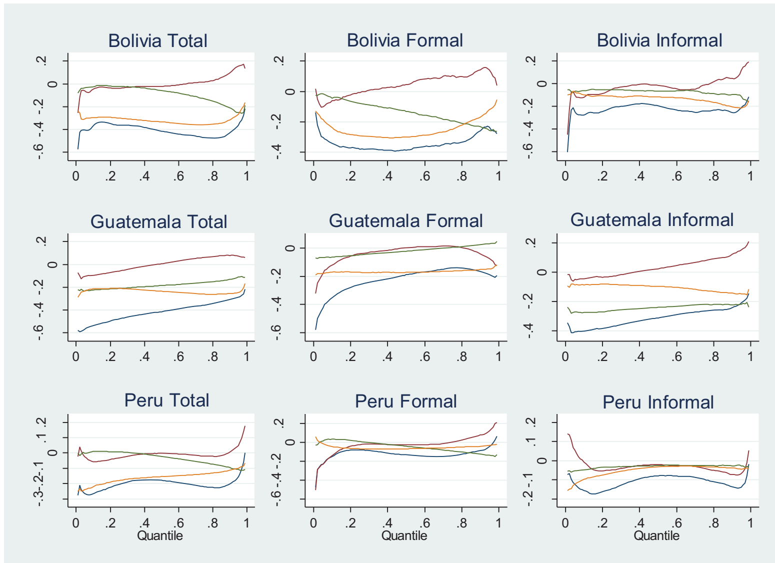
Appendix 3: Counterfactual quintile wage gap deco   position

Figure 3: Quintile regression deco   position Base year (t=0)



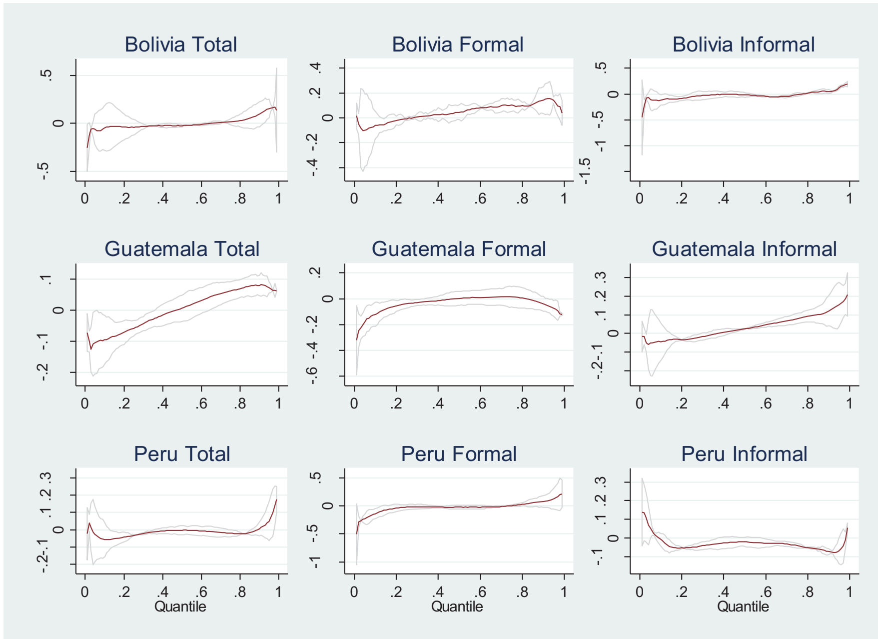
Notes: The decomposition shows the components of the total differential, the coefficients component, characteristics and residuals The top panel shows the results for the initial period while the bottom panel shows the results for the second period.

Figure 4:Quintile regression deco   position second year (t=1)



Notes The decomposition shows the components of the total differential, the coefficients component, characteristics and residuals The top panel shows the results for the initial period while the bottom panel shows the results for the second period.

Figure 6: Quintile residuals effects second year (t=1)



Notes The decomposition shows the residual (discrimination) component of the total differential. The top panel shows the results for the initial period while the bottom panel shows the results for the second period. The bands are constructed using a 95% confidence interval.

Appendix 3

Table21: Panel esti ation with infrastructure ti e variant interaction

	Subnational Expenditure/ GDP						Subnational Revenue/GDP					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Log of GDP per~a	0.0005**	-0.0001	0.0571**	-0.0003	0.0002	0.057**	0.0018	-0.0033	0.0586***	0.0028	-0.0026	0.0586***
	(0.0002)	(0.0136)	(0.0252)	(0.0167)	(0.0135)	(0.0250)	(0.0209)	(0.0207)	(0.0223)	(0.0206)	(0.0205)	(0.0221)
Infant mortality	-0.0008**	-0.0009**	0.0004	-0.0008**	-0.0009**	0.0004	-0.001	-0.0011	-0.0001	-0.0011	-0.0012	-0.0001
	(0.0004)	(0.0004)	(0.0009)	(0.0004)	(0.0004)	(0.0009)	(0.0008)	(0.0008)	(0.0007)	(0.0008)	(0.0008)	(0.0007)
polright	0.0007	0.001	-0.0107*	0.0006	0.001	-0.0107*	-0.0001	-0.0006	-0.0137***	-0.0001	-0.0007	-0.0138***
	(0.0021)	(0.0018)	(0.0056)	(0.0022)	(0.0018)	(0.0056)	(0.0059)	(0.0062)	(0.0039)	(0.0058)	(0.0061)	(0.0039)
Ethnoling Frac~l	-0.0497	0.0081	-0.0083**	-0.0569	0.0041	-0.0154*	-0.0856	-0.0097	-0.0503**	-0.0999	-0.0238	-0.0599**
	(0.0769)	(0.0983)	(0.0041)	(0.0756)	(0.0973)	(0.0081)	(0.0835)	(0.1028)	(0.0210)	(0.0817)	(0.1007)	(0.0251)
Log Port Dista~e	-0.0415***	-0.0339*	-0.0387*	-0.0402**	-0.0333*	-0.036*	-0.0534***	-0.0539***	-0.0465**	-0.0525***	-0.0515***	-0.0435**
	(0.0172)	(0.0201)	(0.0206)	(0.0171)	(0.0202)	(0.0209)	(0.0183)	(0.0202)	(0.0215)	(0.0178)	(0.0200)	(0.0211)
Log Area	0.0529***	0.0538***	0.049***	0.0323***	0.0352***	0.0288***	0.0526***	0.0513***	0.0572***	0.0274***	0.0281***	0.0329***
	(0.0096)	(0.0102)	(0.0133)	(0.0075)	(0.0084)	(0.0071)	(0.0108)	(0.0107)	(0.0138)	(0.0063)	(0.0064)	(0.0079)
corrupt	-0.002	0.0001	-0.0017**	-0.002	0.0001	-0.0017**	0.0035	0.0021	0.0024	0.0033	0.0022	0.0024
	(0.0049)	(0.0035)	(0.0007)	(0.0050)	(0.0035)	(0.0007)	(0.0050)	(0.0049)	(0.0062)	(0.0051)	(0.0049)	(0.0062)
indfrag1	0.0139***	0.0124***	0.0146***				0.0189***	0.0168***	0.0176***			
	(0.0038)	(0.0042)	(0.0054)				(0.0038)	(0.0040)	(0.0051)			
RPVindfrag1	0.00001***						0.000001					
	0.0000						(0.0000)					
RTKMindfrag1		0.0006						-0.0001				
		(0.0008)						(0.0007)				
TRAKindfrag1			-0.0074						-0.0084			
			(0.0214)						(0.0246)			
af				0.0062***	0.0051***	0.006***				0.00885***	0.0075***	0.0089***
				(0.0001)	(0.0002)	(0.0002)				(0.0001)	(0.0002)	(0.0002)
RPVaf				0.00001						0.000001		
				0.0001						(0.0000)		
RTKMaf					0.0001						0	
					(0.0001)						(0.0001)	
TRAKaf						-0.0005						-0.0007
						(0.0018)						(0.0022)
Constant	0.0211	-0.0129	-0.5696	0.2605	0.1993	-0.3443	-0.0322	0.0339	-0.5997**	0.2578	0.2911	-0.3292
	(0.2172)	(0.2238)	(0.3790)	(0.2114)	(0.2092)	(0.3744)	(0.2378)	(0.2458)	(0.2862)	(0.2266)	(0.2358)	(0.2740)
N. of cases	162	169	215	162	169	215	165	172	215	165	172	215

Table 22: aus an Taylor panel esti ation with infrastructure ti e variant interaction

	Subnational Expenditure/ GDP					Subnational Revenue/GDP						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Log of GDP per~a	-0.0014	-0.0159	0.0556***	-0.0011	-0.0156	0.056***	0.0032	-0.0019	0.0581***	0.0021	-0.0015	0.0583***
	(0.0204)	(0.0191)	(0.0192)	(0.0203)	(0.0190)	(0.0191)	(0.0158)	(0.0135)	(0.0194)	(0.0158)	(0.0135)	(0.0193)
Infant mortality	-0.0011**	-0.0012***	-0.0001	-0.0011**	-0.0012***	-0.0001	-0.0008**	-0.0009***	0.0003	-0.0008**	-0.0009***	0.0003
	(0.0005)	(0.0005)	(0.0004)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0004)	(0.0004)	(0.0003)	(0.0004)
polright	0.0001	-0.0001	-0.0138***	0.0001	-0.0001	-0.0139***	0.0008	0.0011	-0.0108***	0.0007	0.0011	-0.0109***
	(0.0032)	(0.0030)	(0.0033)	(0.0032)	(0.0030)	(0.0033)	(0.0023)	(0.0020)	(0.0033)	(0.0023)	(0.0020)	(0.0033)
Ethnoling Frac~l	-0.0944	-0.0127	-0.0637	-0.1006	-0.0262	-0.08	-0.0644	0.0147	-0.0158*	-0.0721	0.0106	-0.0324*
	(0.0903)	(0.0954)	(0.0984)	(0.0896)	(0.0937)	(0.0968)	(0.0841)	(0.0894)	(0.0090)	(0.0846)	(0.0883)	(0.0182)
Log Port Dista~e	-0.0457*	-0.0508*	-0.0711**	-0.0405	-0.0481*	-0.0646*	-0.0495**	-0.0333	-0.0679*	-0.0471*	-0.0328	-0.0646*
	(0.0267)	(0.0264)	(0.0351)	(0.0270)	(0.0260)	(0.0342)	(0.0245)	(0.0246)	(0.0351)	(0.0250)	(0.0242)	(0.0344)
Log Area	0.0558***	0.0538***	0.0459***	0.029***	0.0296***	0.0295***	0.0498***	0.0533***	0.0353*	0.0314***	0.0346***	0.0238**
	(0.0116)	(0.0121)	(0.0183)	(0.0072)	(0.0080)	(0.0105)	(0.0108)	(0.0116)	(0.0182)	(0.0077)	(0.0087)	(0.0106)
corrupt	0.0035	0.0018	0.0019	0.0034*	0.0017	0.002*	-0.0023	0.0001	-0.0024	-0.0023	0.0001	-0.0024
	(0.0052)	(0.0049)	(0.0054)	(0.0020)	(0.0049)	(0.0010)	(0.0038)	(0.0033)	(0.0055)	(0.0038)	(0.0033)	(0.0055)
indfrag1	0.0198***	0.0172***	0.0137**				0.0128***	0.0124***	0.01*			
	(0.0041)	(0.0043)	(0.0060)				(0.0040)	(0.0041)	(0.0060)			
RPVindfrag1	0.000001						0.000001					
	(0.0000)						(0.0000)					
RTKMindfrag1		0.0002						0.0007				
		(0.0008)						(0.0006)				
TRAKindfrag1			-0.0223						-0.0242			
			(0.0311)						(0.0312)			
af				0.0008***	0.0007***	0.0007***				0.0006***	0.0005***	0.0005***
				(0.0002)	(0.0002)	(0.0002)				(0.0002)	(0.0002)	(0.0002)
RPVaf				0.000001						0.000001		
				(0.0000)						(0.0000)		
RTKMaf					0						0.000001	
					(0.0001)						(0.0000)	
TRAKaf						-0.0016						-0.0018
						(0.0025)						(0.0025)
Constant	-0.1032	0.1193	-0.1957	0.1813	0.3895	-0.0711	0.1132	0.054	-0.1417	0.3089	0.2677	-0.0491
	(0.3357)	(0.3108)	(0.4718)	(0.2990)	(0.2819)	(0.3747)	(0.2941)	(0.2671)	(0.4718)	(0.2602)	(0.2390)	(0.3781)
	R-squared											
N. of cases	165	172	215	165	172	215	162	169	215	162	169	215

Table 23:Robustness OLS esti ations

	Subnational Experndtitures/ GDP				Subnational Revenues / GDP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log of GDP per~a	0.0773**	0.0992*	0.0694**	0.078	0.0465**	0.0669*	0.0285	0.0468
	(0.0347)	(0.0562)	(0.0354)	(0.0504)	(0.0235)	(0.0346)	(0.0551)	(0.0521)
Infant mortality	0.0001	0	-0.0001	0	-0.0005	-0.0006	-0.0007	-0.0005
	(0.0012)	(0.0011)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)
polright	-0.0198**	-0.0253	-0.019**	-0.0218	-0.0216*	-0.0272	-0.023**	-0.0222
	(0.0088)	(0.0163)	(0.0082)	(0.0184)	(0.0125)	(0.0181)	(0.0110)	(0.0199)
Ethnoling Frac~l	0.11	0.0282*	0.1355*	0.1046	0.1353	0.0593	0.1397	0.1338
	(0.1102)	(0.0169)	(0.0711)	(0.1064)	(0.1070)	(0.1040)	(0.1023)	(0.1059)
Log Port Dista~e	-0.031	-0.0342	-0.0516**	-0.0278	-0.02	-0.0225	-0.0496***	-0.0189
	(0.0267)	(0.0244)	(0.0228)	(0.0250)	(0.0286)	(0.0266)	(0.0204)	(0.0276)
Log Area	0.0395**	0.0461***	0.0397**	0.0372**	0.0479**	0.0544***	0.0542***	0.0474**
	(0.0179)	(0.0185)	(0.0181)	(0.0178)	(0.0214)	(0.0218)	(0.0213)	(0.0214)
corrupt	-0.0034	-0.0054*	-0.0004	-0.0054	-0.0141	-0.0167	-0.0051	-0.0141
	(0.0022)	(0.0032)	(0.0304)	(0.0331)	(0.0332)	(0.0340)	(0.0308)	(0.0343)
elevpop_cv	0.0263				0.0169			
	(0.0506)				(0.0531)			
elevpop_sd		0.0002**				0.0001		
		(0.0001)				(0.0001)		
gin_poptropic			0.161				0.0706	
			(0.1496)				(0.1373)	
gin_popelev				0.1414*				0.0349
				(0.0791)				(0.1602)
Constant	-0.1609	-0.2905	0.1291	-0.2039	0.0339	-0.0981	0.3042	0.033
	(0.5156)	(0.4778)	(0.6314)	(0.5684)	(0.5334)	(0.5113)	(0.5507)	(0.5881)
N. of cases	338	338	316	338	335	335	313	335

Table 24: Robustness Panel esti ations

	Subnational Expenditures/ GDP				Subnational Revenues / GDP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log of GDP per~a	0.0721**	0.0938**	0.0702**	0.0789*	0.0608*	0.0816*	0.0518*	0.063
	(0.0345)	(0.0409)	(0.0346)	(0.0453)	(0.0351)	(0.0481)	(0.0295)	(0.0498)
Infant mortality	-0.0008	-0.0009	-0.0009	-0.0009	-0.001	-0.0012	-0.0012	-0.0011
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0012)	(0.0011)	(0.0012)	(0.0011)
polright	-0.0213	-0.0244**	-0.0205**	-0.0227*	-0.0217	-0.0254*	-0.0225	-0.0218
	(0.0135)	(0.0103)	(0.0104)	(0.0138)	(0.0155)	(0.0151)	(0.0163)	(0.0155)
Ethnoling Frac~l	0.1498	0.0589*	0.1825**	0.1401	0.1503	0.0625	0.1599	0.1486
	(0.1286)	(0.0312)	(0.0913)	(0.1270)	(0.1216)	(0.1181)	(0.1213)	(0.1244)
Log Port Dista~e	-0.0282	-0.0333	-0.0484**	-0.0267	-0.0165	-0.0201	-0.0471**	-0.0167
	(0.0270)	(0.0241)	(0.0240)	(0.0252)	(0.0287)	(0.0268)	(0.0219)	(0.0281)
Log Area	0.0389*	0.0451**	0.0364*	0.0362*	0.0538**	0.0604***	0.0574**	0.0541**
	(0.0201)	(0.0211)	(0.0200)	(0.0202)	(0.0245)	(0.0250)	(0.0243)	(0.0249)
corrupt	-0.0161	-0.0158*	-0.0137	-0.0153	-0.0224	-0.0235	-0.0173	-0.021
	(0.0304)	(0.0093)	(0.0093)	(0.0306)	(0.0302)	(0.0311)	(0.0288)	(0.0305)
elevpop_cv	0.0477				0.0275			
	(0.0524)				(0.0551)			
elevpop_sd		0.0002**				0.0002**		
		(0.0001)				(0.0001)		
gin_poptropic			0.2361				0.0974	
			(0.1687)				(0.1519)	
gin_popelev				0.1554**				-0.0148
				(0.0717)				(0.1661)
Constant	-0.0895	-0.2001	-0.0133	-0.1566	-0.0651	-0.2016	0.2104	-0.0398
	(0.4079)	(0.3959)	(0.4522)	(0.4719)	(0.4418)	(0.4289)	(0.4523)	(0.5044)
N. of cases	338	338	316	338	335	335	313	335

Table 25:Robustness aus an-Taylor esti ations

	Subnational Expenditures/ GDP				Subnational Revenues / GDP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log of GDP per~a	0.0958**	0.1031*	0.1057*	0.1026	0.1118*	0.1204*	0.1215	0.118
	(0.0468)	(0.0567)	(0.0572)	(0.0677)	(0.0673)	(0.0672)	(0.0767)	(0.0727)
Infant mortality	-0.0005	-0.0006	-0.0005	-0.0006	-0.0003	-0.0005	-0.0002	-0.0003
	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0015)	(0.0014)	(0.0015)	(0.0015)
polright	-0.0215**	-0.025*	-0.0211**	-0.0226	-0.02	-0.0246**	-0.0203*	-0.0199
	(0.0105)	(0.0149)	(0.0106)	(0.0152)	(0.0162)	(0.0110)	(0.0107)	(0.0163)
Ethnoling Frac~l	0.0973	0.0148	0.1294	0.0902	0.115	0.0313	0.1277	0.1148
	(0.1381)	(0.0214)	(0.0914)	(0.1377)	(0.1365)	(0.1349)	(0.1403)	(0.1367)
Log Port Dista~e	-0.0524	-0.0523	-0.0797*	-0.0502	-0.0319	-0.0347	-0.0637	-0.0308
	(0.0406)	(0.0381)	(0.0443)	(0.0408)	(0.0393)	(0.0372)	(0.0419)	(0.0395)
Log Area	0.0362***	0.0434***	0.0366***	0.0341***	0.0497***	0.0565***	0.0559***	0.0496***
	(0.0108)	(0.0106)	(0.0119)	(0.0112)	(0.0117)	(0.0115)	(0.0132)	(0.0124)
corrupt	-0.0213	-0.0199**	-0.0208**	-0.021	-0.0275	-0.0286	-0.0238	-0.0268
	(0.0235)	(0.0092)	(0.0093)	(0.0235)	(0.0249)	(0.0243)	(0.0266)	(0.0249)
elevpop_cv	0.0317				0.0149			
	(0.0536)				(0.0538)			
elevpop_sd		0.0002**				0.0002**		
		(0.0001)				(0.0001)		
gin_poptropic			0.1121				0.0052	
			(0.2108)				(0.2093)	
gin_popelev				0.1336*				0.0056
				(0.0725)				(0.2510)
Constant	0.0227	-0.0115	0.1225	-0.0541	-0.3299	-0.354	-0.192	-0.3782
	(0.7703)	(0.7530)	(0.8270)	(0.7936)	(0.8037)	(0.7866)	(0.8533)	(0.8190)
N. of cases	338	338	316	338	335	335	313	335

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5 Vita

Gustavo Javier Canavire Bacarreza was born in La Paz, Bolivia.

He holds a Licenciatura in Economics from the Universidad Catolica Boliviana (La Paz, Bolivia), an Advanced Studies Program in International Economics and Policy Research from the Kiel Institute for World Economics at Kiel University (Germany) and a Master's of Arts in Economics from Georgia State University (Atlanta, GA).

In fall 2006, Gustavo joined Georgia State University to pursue a doctoral degree in economics. During his doctoral program, he received the Carols Carole Keels Scholarship and the best third year Ph.D. paper award. He also received several research grants from international organizations.

Gustavo has been consulting for several institutions (the World Bank, the United Nations and the IADB, among others) on topics of development, labor economics, impact evaluation and fiscal policy. Prior to joining the doctoral program, he worked as a researcher for the Social and Economic Policy Analysis Unit (UDAPE)—a government advisory unit and public policy think tank in La Paz, Bolivia), the World Bank, the Bolivian statistical office, and the Universidad Catolica Boliviana, and has also worked as a consultant for the Interamerican Development Bank and the United Nations. He is affiliated with the Institute for the Study of Labor (IZA).

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