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EQUALITY OF EDUCATIONAL OPPORTUNITIES IN COLOMBIA: A METROPOLITAN AREA COMPARISON

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Equality of Educational Opportunities in Colombia: A Metropolitan Area Comparison[♣].

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Abstract

This document aims to provide evidence about the existence of different patterns in equality of opportunities in academic achievement during the last fifteen years in Colombia. The outcomes selected for measuring inequality are the scores obtained on SABER 11 in math as well as reading. It is found that inequality has grown around 11% in the country, and that this trend is common for all the metropolitan areas included in the analysis. Most of the increase found comes from factors related to the school market. The fraction of unfair inequality, conditional to the circumstances included in the definition of "types", is higher than 20% of gross inequality in 2012.

Keywords: Inequality of Opportunities, Education, Colombia

JEL: I24, O15, O54

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1. Introduction

The typical pattern in Latin America for the distributions of socio-economic indicators is one of large inequalities in areas such as education and health. The unequal distributions of education are worrying for a number of reasons, which include limitations on economic growth and under-exploitation of potential positive externalities of education. They also limit, for an important fraction of the population, the prospects of leading a materially comfortable life. The discussion about inequalities in education has been highly interesting in terms of theoretical and empirical works (Ferreira and Gignoux, 2011; Paes de Barros et al., 2009; Gamboa and Waltenberg, 2012; Wendelspiess and Soloaga, 2013).

Economists explicitly recognize that education has an important economic value (Schultz, 1963; Becker, 1964; Hanushek and Woessmann, 2007). Educational outcomes are important means for achieving a wide array of personal goals. Indeed, educational achievements can be good predictors not only of an individual's future earnings capacity, but also of her access to college and of the social position she will hold in the future. There is evidence indicating that test scores and future productivity are correlated (Currie and Thomas, 2001). Furthermore, education is likely to be positively correlated to outcome variables or "advantages" valued by various theories of distributive justice, and not exclusively within the specific normative framework adopted by economists. In other words, being educated arguably has an intrinsic value, regardless of the effect education might have on other contemporaneous or future goals. As a consequence, the existence of inequalities is one constraint for acquiring development. Finally, from a macroeconomic viewpoint, education quality, as measured by test scores, seems to be a key determinant of economic growth (Hanushek and Woessmann, 2007).

Inequality in education (achievement or access) implies that some fraction of the population does not have the same tools for working or for having higher access to the markets. However, it is not clear why inequality is so important and what are the main problems related to it. Distributive justice approaches are focused on studying the causes and implications of allowing inequality in some spaces versus in others. One of these approaches is the equality of opportunities.

The purpose of the document is to identify how different are inequality levels in academic achievement among the main metropolitan areas in Colombia and to characterize their recent evolution. We use the equality of opportunities approach in order to isolate those circumstances beyond the individual control from other aspects such as effort and luck. We deal with metropolitan areas instead of regions because of the great differences between the urban and rural populations in big regions compared to small and low density regions. This is very important in terms of the resources available to the students

in to each metropolitan area. The measurement of inequality starts with the choice of the variable. This is crucial for the policies designed to control and reduce inequality, and for its implications for latent inequalities in other spaces. Individuals seek many outcomes with different priority levels, but among them it is easy to find one that influences others. Education is one life dimension that provides several aspects to the people. More educated people can buy more goods and services, enjoy broader freedom sets and anticipate negative income or health shocks with higher accuracy than can less educated people. Thus, the analysis of inequality in education can be understood as a precursor to the study of economic inequality.

This approach also allows us to form an idea about whether convergence exists in regional inequality in academic achievement. However, our approach is not free of critics. First, our results are only representative of the fraction of the population that finishes secondary education. As it is well known, Latin American countries have been characterized by considerable drop-out levels in basic and secondary education. Thus this fraction of the population does not benefit from the added value of education. Second, we do not have a longer period that allows us to gain a better idea about the existence of trends surrounding equality indicators. Additionally, for some years (2004-2007) there is no available information about parents' schooling, which is the most used circumstance in the literature. Last but not least, the choice of the set of circumstances is not always free of subjectivity. More detail in the circumstances implies more precision in the space of opportunities faced by the individual but less variability in the samples with respect to statistical significance and unbiasedness. As a consequence, we provide an estimation of the lower bound of inequality, but it is a lower bound equally defined for all the metropolitan areas.

The rest of the document is divided as follows. Section 2 briefly summarizes the equality of opportunities approach, the previous attempts to measure it and the state of the art of regional equality in education in Colombia. Section 3 describes the methodology and the database used for the empirical section of the paper. Section 4 presents the results regarding the measurement of equality of opportunities using two alternative methodologies and their relationship with other educational indicators (gross inequality and quality). Section 5 discusses the results and their implications for future research.

2. The Equality of Opportunities approach

A liberal-egalitarian theory of justice that has been widely discussed in recent years is that of “equality of opportunity” (EOp), popularized among economists by John Roemer, according to whom inequalities due to different circumstances are intolerable, but

inequalities due to choices made by the individuals are acceptable (Roemer, 1998). Different methodologies have been proposed in an attempt to translate the theory into measuring procedures (e.g., Checchi et al., 2010; Dunnzlauf et al., 2010). Two recent extensive surveys are available documenting the vast literature produced over the course of the last ten years (Pignataro, 2012; Ramos and Van de Gaer, 2012).

The set of variables that are out of people's control is known in the literature as the set of circumstances. Belonging to any specific set of circumstances is also defined as being part of any type because the kind of opportunities faced by each one. From this definition, we have equality of opportunities when there are no differences *a priori* between the outcomes reached by one or another type. The main question with this perspective is therefore how to define the threshold between something controllable and non-controllable. Many important aspects of this question remain unanswered. Some authors, such as Pignataro (2012) and Ramos and Van de Gaer (2012), have carried out detailed surveys about the implications of the choice of the set of circumstances and the definitions of equality of opportunities, but the discussion remains unsolved. As an example, scores in math should be very similar between boys and girls with equal socioeconomic and genetic conditions[2].

Following Pignataro (2012), according to equality of opportunity, a society "should split equally the means to reach a valuable outcome among its members; once the set of opportunities have been equalized, which particular opportunity, the individual chooses from those open to her, is outside the scope of justice" (p. 801). This approach calls for an initial intervention that eliminates or compensates ex ante inequalities.

Different methodologies have been proposed attempting to translate the theory into measuring procedures (Dunnzlauf et al. 2010; Pignataro, 2012; Ramos and Van de Gaer, 2012). The main concern is not the gross inequality itself but the part which comes from factors beyond the individual's control. That is, a part of inequality comes from factors under people's control and another part does not. Although educational systems are designed to provide education to those who demand it, there are multiple reasons that limit the perceived benefits of this system. This assumption relies on the definition of any threshold that splits the set of inequality sources between those that are controllable by the individual and those that are not. In the economic and political philosophy literature the discussion about equality of opportunities has received a great deal of attention since John Roemer's approach. The problem widely discussed in the literature is the definition of the set of circumstances. Gamboa and Waltenberg (2012) discuss the tradeoff between an accurate definition and the statistical significance. Some of the variables used to

[2] For more detail about this literature see **Peragine, 1999**; **Peragine, 2002**; **Peragine, 2004a** and **Peragine, 2004b**.

determine whether the individual has control or not are socially determined by institutional arrangements or previous conditions.

The study of regional disparities in Colombia has been analyzed from different perspectives (Galvis and Meisel, 2010; Bonilla, 2011; Bonilla and Galvis, 2012). There are a few works that undertake the equality of opportunities approach on education for Colombia. In Gamboa and Waltenberg (2012), the authors provide a measure of equality of opportunities in academic achievement (math, reading and sciences) using the test scores available from the Programme for International Student Assessment (PISA). According to their work, colombian pupils belong to a more egalitarian educational system than other Latin American countries such as Argentina and Brazil in 2006. By means of inequality index decomposition and following the approach of Checchi et al. (2010), they found that independent of the set of circumstances included in the analysis, Colombia exhibits lower unfair inequalities than its counterparts. In PISA 2009, the equality level decreases a few points and the rankings show some changes. These changes could be the consequence of multiple factors such as sample design, internal educational, social policies and previous interventions. In a similar approach, Gamboa (2012) studied recent trends in unfair inequalities (inequality of opportunities) using the scores obtained by the students on the SABER 11 test. The methodology employed in this study consists of the decomposition of inequality indices among the fraction of inequalities explained by circumstances such as parents' level of schooling, gender and type of school (public or private).

One of the main concerns that emerge from the measurement of inequalities in education from the analysis of inequality in academic achievement is the role of other variables related to educational outcomes. In response, De Carvalho et al. (2013) propose a bi-dimensional index of equality of opportunities that includes the access and the achievement dimensions as a way to be fair to those educational systems that make efforts to improve quality, to keep students in the system and to provide facilities for those who are vulnerable. All the studies carried out in this field state that one of the main challenges is the choice of the threshold between what can be considered a circumstance and what cannot, because of the role played by the student in his academic process. Nonetheless, it is also important to establish that in the face of different findings obtained by distinct methodologies, it is necessary to read them with the appropriate caution.

One important feature of equality of opportunities is the choice of the variable of interest. This choice is important as a consequence of the effect that it has on other spheres. For example, if we increase the liberty of freedom equality space, this could imply more inequalities in the market of goods and services. In our approach, we deal with equality of opportunities in academic achievement. As it can be noted, education is an important dimension in people's lives. However, for some people, it may be more important to work

on equality of access than equality of results. This debate can generate some unexpected results. For instance, we assume that the central government designs some specific programs oriented to reduce inequality of access by promoting a reduction in drop-out levels in schools. As a result, many principals might choose to reduce time-intensive tasks and modify grading schemes to increase promotion among academic levels. This choice will lead to a reduction in quality or an increase in inequality of achievement, since the degree of effort is not recognized in the same way.

The equality of opportunities approach has been studied from two perspectives: *ex ante* and *ex post.* The former (*ex ante*) promotes the equality of outcomes among those people who belong to the same type -the set of people who face the same set of initial conditions-, making their values as equal as possible. According to this approach, there is equality of opportunity if everybody enjoys the same opportunities. In this context, any policy oriented toward the reduction of inequality of opportunity has to be focused on reducing inequality between individual opportunity sets. Under this perspective, it is easy to classify Bourguignon et al. (2007), Ferreira and Gignoux (2011) and Lefranc et al. (2008). The second perspective (*ex post*) seeks to compensate for the inequality generated by different initial circumstances. This requires identification of the effort levels of individuals, and then an emphasis on the inequalities within groups of individuals at the same effort levels[3]. There is equality of opportunity if the same outcome is achieved for those who exert the same effort. This approach has been empirically used by Checchi et al. (2010), Pistolesi (2009), Lefranc et al. (2009) and Gamboa and Waltenberg (2012).

The convenience of using each of the previous frameworks depends on the kind of public policy designed to fight inequality. The '*a priori'* approach will contain those policies that tend to reduce outcome inequalities among opportunity sets. In contrast, the ex post approach includes policies targeted at compensating individuals who exert the same effort. These alternative frameworks allow us to provide a broader view of the recent equality of opportunities literature since the publication of Roemer's 1998 and 2003 works.

Roemer's approach calls for a fair method that does not generate adverse incentives. Following Pignataro's argument, "it is necessary to distribute goods to neutralize unequal initial conditions but efficiency-based goals must also be considered" (p. 803). This idea is crucial for the comprehension of this field by the justice distributive theory because the goal should not be the "leveling down" of those individuals with marked advantages. Some advantages can be understood as circumstances, generating methodological

[3] The term effort is traditionally used in this literature as a synonym for all the things under an individual's control.

problems for the equality of opportunities approach, since the distinction between what is a circumstance and what is not is at the core of the problem.

The individual will be responsible for her choices. The effort involved in seeking any specific goal will be a function of her position in the type distribution. That is, when the population is divided into n-types, those individuals located at the same percentile of each distribution are individuals considered to have similar effort levels. Therefore the expected outcome should be very similar.

3. Methodology

There are several approaches designed to quantify the degree of inequality in specific cases such as wealth, income, land and other outcomes (Bourgignon et al. (2007a), Dardanoni et al. (2005), Ferreira and Gignoux (2011), Lefranc et al. (2009), Paes de Barros et al. (2009), Checchi et al. (2010)). These approaches can be classified into three different branches: i. *Regression-based measures,* characterized by using functional forms in order to estimate some outcome as a function of a set of variables representing circumstances and other aspects; ii. *Non-parametric approaches:* in this branch, the main purpose is to describe and characterize the entire picture of inequality and not to provide a specific value. An important tool used in this branch is stochastic dominance analysis (Lefranc et al. 2009); iii. *Index decomposition:* although it can also be located within group ii, it is better to set this method apart because the methodology used decomposes gross inequality into its "components" using alternative methods. On one hand**,** Checchi et al. (2010) decompose gross inequality using smooth artificial distributions. On the other hand, Oppedisano and Turati (2012) use regression analysis to estimate the concentration index. They also decompose it through an elasticity method. The next section describes each of the methods used.

We adopt the regression based approach throughout this document. In this field, the framework rests on the importance of inequality indices and their properties. As Ferreira and Gignoux (2011) mention, measurement of inequality needs some index with specific conditions such as invariance and scale translation. Since Gini's and Theil's index decompositions cannot be used for these reasons, the strategy adopted comes from another method. Ferreira and Gignoux (2011) use a regression based approach in which the outcome is explained by a series of variables. Let *Yi* be the score obtained by the pupil *i* in a standardized test. Assume that *Yi* is a function of the set of circumstances she faces, *Ci,* other variables under her control, *xi,* and an error term, *e.*

$$Y=F(C, X, e)$$

The variance of (*Var[Y]= Var[F(C, X, e)]*), is the gross inequality in educational achievement. This variance can be expressed as follows:

$$Var(Y)= Var(C) + Var(X)$$

Gross inequality is equivalent to the sum of the inequality due to circumstances (*Var*(Ci) and the other terms. In practical terms, the estimation can be carried out by using a regression model such as the following:

$$Y=\beta C+u$$

For our purpose, inequality of opportunities is measured as the fraction of total variance explained by the circumstances included in the model. Under this perspective, the R^2 coefficient of a regression of the (student i in the subject j) on an X vector of circumstances can be read as the percentage of inequality that comes from factors out of the individual's control, which is also a measure of inequality of opportunities.

This index has at least two advantages in practical terms. First, the advantage of the R^2 coefficient is that it is easy to interpret, since $0< R^2 <1$. That is, $R^2 = 1$ is a signal of high inequality of opportunities, because it implies that the variance is completely explained by circumstances. Second, the measurement of inequality through this index is a lower bound of the real inequalities, since the introduction of additional circumstances into the regression does not reduce the R^2 coefficient. This is an important starting point because most of the discussion is about the eligibility of any particular circumstance and the most accurate definition of types. Thus the R^2 coefficient does not decrease as the number of circumstances included increases.

3.1. Data

The measurement of equality of opportunities on academic achievement at a regional level requires merging information from different databases. The main databases used for this task are the Saber 11 database, the form C-600 and the demographic data from the Statistic National Office (DANE). Since the end of the 1980s, all students in their final year of secondary education must take the National Test Saber 11, which is administered by the ICFES. This test is intended to obtain information about students' academic competences and has been traditionally used by universities (mainly private ones) as a measure of applicant quality. This test is taken twice per year in order to obtain information about the pupils from the schools that follow different academic calendars. Although there are three different calendars (A, B and F); calendar A is most frequently used by students and by the public sector.

The structure of the test includes questions about subjects such as mathematics, natural and social sciences, reading comprehension and other optative areas. Since its creation, there have been some changes in its structure, scale of scores, number of questions and main objectives. These are important changes when we are dealing with time-comparisons. We will mention below how we proceeded with this constraint.

The database includes information from 1997 to 2012. The strategy adopted here consists in comparing the first set of years (1997-2003) against the last set (2008-2012). The period between 2004 and 2007 is not considered because during these years there is no information available about parents' schooling, which is far the most important variable in international literature.

In the depuration process of the database we drop out all the missing values, and we also exclude from the analysis those students who are not in the 15-20 year age range, in order to reduce the dispersion in the characteristics of the population[4]. Further, we restrict our sample to schools that provide education on a full-day or morning schedule, since in Colombia, some schools serve different socioeconomic populations in different hours.

Also, in order to have similar and comparable statistical distributions, the scores have been standardized using mean and standard deviation from each test. We constructed a balanced panel with the same schools in each year (3.376), since the structure of the student population could change considerably over the period and the availability of information at school level is not continuously reported by all the schools. This strategy allows us to avoid biased estimations from re-localization, creation or modification of the schools included in the sample.

After the depuration carried out in the database, the composition of the sample does not change considerably. This depuration was done as a function of the set of variables necessary to find the estimations of equality of opportunities. The criterion employed for selecting the variables is that we are only interested in circumstances. Due to the availability of information, parents' schooling, gender and type of school are the variables selected as circumstances.

The assessment of regional disparities is always done with a subjective component related to the definition of the geographical units. This case is not an exception. The analysis is carried out using a subjective definition of geographic spaces based on the similitude of the geographic conditions and the importance of a big city in the region. Traditionally, most development analysis in Colombia has been collected at the regional level, but the definition of economic region used by the National Statistics Office (DANE) is very wide

[4] This is, however, an important fraction of the educational population, comprised mainly of students are workers or who already have a family.

and includes cities and small towns with very different characteristics. Additionally, these regions do not have a unique government that allows us to assess their performance. In this document, we opt for the use of a metropolitan area approach. The advantage of this approach lies in the similarity in the living conditions faced by the students in each area and the influence of a big city on the small cities located around it.

Each area was defined according to the cities where economic development has been more stable during the last decade. As we can see in **Table 1**, the structure of each area is composed of a big capital and a set of small towns surrounding it. There are 6 main metropolitan areas (Bogotá, Medellín, Cali, Barranquilla, Armenia and Bucaramanga) that are studied in this document. Although the definition of each area or the number of areas can be discretional and subjective, we will show that the inclusion or exclusion of any small city does not produce an important change in the estimations.

Table 1 summarizes the structure of the database in terms of geographic composition and its importance with respect to total population. We only show a few years (initial and final) in order to provide a gross description of how the student population changed during this period over the sample of schools.

During this period, the two most-populated areas (Bogotá and Medellín) increased their total population with respect to the other areas, but there is not a positive increase in terms of student population and total enrollment in the last year of mandatory education. This fact is the result of multiple factors. First, the demographic change exhibited during the 1980s and 1990s was more evident in the big cities where the demand for children decreased as a result of the opportunity cost of having children for more educated families. Second, there was a considerable change in the supply of education provided by the private sector. Two important and frequent facts were the creation of new models of schools and the re-localization out of the cities. The combination of these factors has implications for the evolution of the opportunities available for all the students and other unobserved factors. In order to reduce the bias coming from unobserved factors, we chose a balanced sample of schools. This strategy does not avoid all problems but it allows us to compare the same set of schools across time.

Once we have described the database, we proceed to study the evolution of quality measured by average scores in Saber 11. The average performance is considered only in relative terms **(Figure 1)**. That is, we are interested in seeing how far the scores are from each other. Our period is very short for making inferences about long run trends. Since, but we make a standardization of the scores, we are able to provide some comments about the scores' evolution; however, this is not the core of the problem. The relative performance observed in each area changes over time and over each subject. In 1997, Bucaramanga and Bogotá had the highest performances while Armenia and Cali

performed worse. For that year, the rankings are similar in math, verbal and reading scores. Although it is common in the literature to work only with math and reading, we also include sciences in order to check whether there are considerable differences. At the end of the period, the differences among areas have been reduced and it is easy to see that there is a change in the rankings. Bogotá obtained the highest average score in two of the three subjects and Cali improved its position. One interesting fact is that the set of municipalities belonging to the category "Other" underperformed compared to the national average and its performance is decreasing over time.

4. Results

The analysis is carried out for two sub-periods. As we can see in **Figure 2**, before the year 2000, there were similar and very stable dispersion levels among regions in the three subjects. However, it is interesting to note that Bogotá, which is the most populated metropolitan area, does not have the highest inequality levels. Bogotá is the biggest receiver of migrants (forced and unforced) from the rest of the country.

Bucaramanga and Cali exhibit important differences with respect to other areas in terms of inequality. In the first decade of the twenty-first century, more oscillations are found for these areas. In particular, Cali showed strong fluctuations with respect to similar developed areas (Bogotá and Medellín) that are similar to the economic cycle. After the drug war of the last decade of the twentieth century, cities such as Medellín and Cali suffered from a decrease in the expected value of education. It is found that there is an increase in gross inequality through the decade mainly in math and sciences. These subjects are more related to the use of scholarly inputs and technology than verbal or reading skills. Verbal learning requires other inputs, such as time with parents or books. These latter subjects do not exhibit change over the period.

It is not clear how effective it is to reduce the heterogeneity of the student population. For those who are in favor of tracking policies, it is better to have small courses with fewer differences in the performance achieved by the students. But for those who are against these policies, the main outcome of these types of interventions is discrimination against the subset of students who are in the low-track courses. As a consequence it is not possible to affirm that heterogeneity is positive or negative for the entire educational system.

In this part of the document, we provide an estimate of the level of inequality of opportunities by using two alternative methods. The first is based on Ferreira's approach, and the second is done by following the decomposition of the concentration index suggested by Oppedisano and Turati (2012). The analysis of inequality has to take into

account the importance of the factors involved in its evolution. The evolution of inequality of opportunities in academic achievement is summarized in the **Table 2**. The set of variables used in the definition of the circumstances that are beyond the individual's control were: gender, father's and mother's level of schooling, size of the city and type of school (calendar and management, private or public). This small set of variables provides a good description about the type of circumstances which affect pupils[5].

The set of variables used as circumstances is crucial for the interpretation of the results. More variables imply a better definition of the kind of life the individual lives, but at the same time this set reduces the precision and robustness of the results. Our findings are therefore conditional to this set of variables. It is possible that by including additional variables we could get a more detailed description of the "type" of the students, but this strategy does not always provide additional information since the variables already included explain an important fraction of the scores. Since the methodology adopted by Ferreira and Gignoux (2011) starts from the fraction of the gross inequality that is explained by the set of circumstances, the results can be read in percentage terms.

There is a common feature in the size of inequality of opportunities (IOp) for the three subjects: a decrease from 1997 to 2003 and a jump to a higher value in 2008 accompanied by a subsequent reduction (See the **Appendix A.1**). During this period, Colombia faced at least two important changes in terms of educational policy. First, some strategies were implemented to improve student retention in order to prevent enrollment in guerrilla and paramilitary groups. Second, a new contract scheme was designed for teachers in the public sector. It is also important to mention that the changes included in the test might also explain the differences. Before 2000, the test included more emphasis on knowledge than on competences. Thus the effect of preparatory courses on achievement could be smaller in the years following 2000.

To follow, since the set of circumstances can be divided into household and school factors, the relative importance of each one has been estimated. The fraction of inequality that comes from school factors grew during the period from 27% in 1997 to 40% in 2011 for math (38% to 48% in reading and 26% to 37% in sciences). Most of these increments are a consequence of the private education system's capability of adapting to changes in resources and teaching strategies into the private education. For example, the constraints faced by the public sector in its negotiations with labor unions such as FECODE (*Federación*

[5] One of the most questionable variables is the type of school. The main justification for its inclusion is the impossibility of choice of type of school for most of pupils, even in the most developed cities.

Colombiana de Educadores). In regional terms, this trend is very similar at both the metropolitan and state levels (See **Appendix A.2.** and **A.3**)[6].

In general terms, equality of opportunities has deteriorated over the period. Most of this trend took place at the end of the period. The size of the change is so evident that while in 1997 about 11% out of the total inequality was explained by circumstances, in 2012 this figure rose to 22% at the national level in math and reading (13% to 26% in sciences). The most important observation is that gross inequality has tended to decrease, which implies that among the set of variables that explain the differences in academic achievement, the relative importance of those related to circumstances beyond the control of the individual increased (See **Appendix A.6.**). The evolution among metropolitan areas and subjects is diverse, and some show higher increases in equality than others.

At the national level, the indicator of unfair inequalities ranges from 11% to 19,7% in math, the subject with small change. Sciences and reading vary from 12,3% and 12% in 1997 to 24,9% and 22,8% in 2012. It is not clear what explains these differences, but it is important to take it into account since most international studies about academic achievement only deal with math. The set of maps that show the change in EOp from 1997 to 2012 summarize these facts. The number of departments with the highest category of inequality increases regardless of the subject employed as outcome.

As a way to check the robustness of the results, we carry out a simple strategy consisting of adding or subtracting one municipality to each area. The results of this strategy are summarized in the **Appendix A.7.** As it can be noted, the previous findings are highly stable because there are no cases where the variation will be more than 1%. These results suggest that the importance of circumstances might be similar in all the metropolitan areas. Then, we provide a brief description of the evolution of the inequality for each area:

Bogotá

> In spite of its stable trend over the period, it has the highest fluctuation of gross inequality with respect to the other areas. At the end of the period, Bogotá remains the most unequal area after Bucaramanga and Barranquilla. The level of inequality of opportunities rose during this period faster than in other regions, obtaining its highest value in 2008. This feature is accompanied by the fact that average performance is considerably high although the structure of the population is very diverse.

[6] Although this measurement it is not comparable at a state level, we also calculate EOP for all the states. Results are shown in **Appendix A.4,** and the maps in the **Appendix A.5**.

Medellín

This metropolitan area was below the national average in terms of gross inequality in mathematics. This privileged position changed with time, as gross inequality increased during the first years of the simple period. At the end of the period, the inequality level was similar to that of the capital of the country. The evolution of inequality of opportunities is part of a rising trend but as of 2009 was changing more slowly than other areas. One important aspect of this region is that lower inequality is accompanied by lower performance. This is the conjunction of two adverse factors is not always desirable in educational policy. Medellín has improved its performance in other subjects as a result of multiple efforts to link several institutions, and now this gap with other regions has disappeared.

Cali

This is the metropolitan area with highest gross inequality during the first four years, far above the national average. Additionally, Cali and Bucaramanga are characterized by considerable fluctuations represented in the lowest and highest inequality levels. At the end of the period, its gross inequality level decreased to that of second place in the regional rankings. When this feature is compared with the inequality of opportunities achieved using the Ferreira and Gignoux method, we find different conclusions. Cali obtains first place in inequality of opportunities as a result of multiple factors commonly latent in economies after a crisis. The relative performance of its students is variable with respect to other regions, but in some cases these differences are not significant in statistical terms (they obtain the highest average in 2000 and the lowest in 2010).

Barranquilla

While this area is not characterized by oscillating, behavior, it is the most deteriorated region according to its gross inequality on mathematics achievement. Its relative position changed from last place (most equal) to second place. What is most important to state is the evolution of unfair inequalities over this decade. It is important to mention that while the comparisons are carried out with respect to other regions, the metropolitan area labeled as “Other” includes a considerable proportion of the population included in the national average. Its performance on mathematics rose during the period but no so fast as to improve its relative performance with respect to other areas analyzed.

Armenia

This is a small region in terms of economic activity but is the biggest in geographical size of the regions selected in this study. However, most of the economy is based on the same production. As a result, this region shows small fluctuations with respect to the national average and the other metropolitan areas. It is the only region which is located under the national average during the course of the decade in terms of gross inequality. However, the evolution of inequality of opportunities is similar to that exhibited the other regions, and performance is lower with respect to other areas.

Bucaramanga

This region is located in second place in terms of gross inequality in 2002, with a rising trend toward the end of the period. In contrast, the area moved from the highest unfair inequality in 2001 to the lowest inequality. In general performance, Bucaramanga and surroundings are characterized by outstanding performance in mathematics, even above other more developed regions such as Bogotá and Medellín.

As a complementary way to show the relationship between the two types of inequality studied over the document, we plot a scatter for a selected sample of years that allows us to check for correlations between the two types. The results seem to suggest a positive association between them beginning in 2001 (**Figure 3**). Regions such as Bucaramanga (in 2001-2003) and Cali (2008) are located far from the group in the right-upper side of the figures. That is, these are regions with higher values in gross as well as unfair inequalities. Since the methodology employed defines the inequality of opportunities as a fraction of gross inequality, the values found are more disperse among regions in the first years. However, at the end of the period the "distances" among them tend to disappear, excluding the region labeled as "Other".

When two different indicators such as performance and equity are taken jointly, the relationship seems not to be robust. Many authors suggest that increases in quality measured by performance on standardized tests imply changes in equality, but at least for the case of Colombia we do not find evidence of this hypothesis **(See Figure 4).**

The previous graph shows the relationship between average performance in each subject at a metropolitan level and gross inequality per subject. We compare 1997 (right hand) and 2012 (left hand) and find two interesting facts. On the one hand, the average performance in math and sciences, but not verbal scores, is very similar. In this subject, there is more convergence in almost all the regions over the period. On the other hand, with the exception of Cali, the remaining areas exhibit similar inequality levels and most of

them are under the national average, which could be a consequence of the size of the control area (Other).

These results are very interesting due to the implications for regional development and future quality of life. The challenge for regional governments is finding the most efficient way to reduce unfair inequalities, leveling the playing field for all the social groups and increasing the chances of a better future.

In order to obtain a more detailed picture of this phenomenon, the total index of inequality was decomposed between factors related to household and schools. In almost all the regions – with the exception of Armenia - in 1997 the home-related circumstances explain a larger fraction of the total inequality than the school-related circumstances. This difference is more pronounced in Cali than in other places, as the unfair inequality indicator explained by the education of the parents is 8% in mathematics, while 0,8% is explained by the school's characteristics in all the subjects (in reading and sciences 6,4% and 9% is explained by the home issues, respectively). This may be occurring due to the unique calendar and private nature of the schools of the region. Nevertheless, Armenia is the only place where the inequality derives from the scholarship effects, although in 2012 this ceases to occur in all subjects.

In 1997, Barranquilla presents the greatest total inequality in all the regions. In mathematics, this city surpasses Bucaramanga, the less unequal region in that proof, by 12,2%. During this period the difference between the inequality among all the regions and in every subject became more pronounced. This is true in total inequality as well as in the fractions explained by the home-related and school-related factors. By the end of the period, these fractions tended to be more similar.

At the end of the period, we obtain that the household factors continue to explain the larger part of the inequality[7], although the school-related factors have a major participation at the beginning of the sample. This suggests that the increase in the levels of inequality in the last years is due to scholarship factors. Also, the household-related factors have a similar behavior for every subject, where Bogotá is the most unequal city with 16,2% and Armenia the least unequal (12%) in all the knowledge areas. Although no area presents a higher level of inequality than the average of all the regions, the increasing trend is evident in each of these. At the beginning, Barranquilla was the region with the greatest inequality although, it has kept its rate constant over the entire sample (20,5% to 21% in 15 years). On the contrary, Bogotá doubled its level by 2012, with a growth of 12% in the mathematics test (7,8% explained by the household-related

[7] With the exception of Bucaramanga in the reading test.

characteristics and 4,2% by the school-related issues). However, there are many differences between the knowledge areas and it is not possible to affirm which region is more or less unequal in all the subjects. For example, Cali has the greatest inequality in mathematics but in reading it has less inequality (24% and 17%, respectively).

We also decomposed EOp for all the states. Although this measure at state level is not comparable with that of metropolitan areas level, it is important to note the differences in levels of inequality and its decomposition between departments (state). Contrary to the finding in the analysis at the metropolitan level, there are departments where the only inequality is explained by characteristics related to households. Most of these are part of the Orinoco and Amazon regions, which often have the lowest educational provision in the country. However, among these same departments differences in inequality levels are evident. Guainía reaches a 32% level of inequality in the mathematics test at the end of the period, while Guaviare displays the least amount of inequality, 3,9%, for the same test. This indicates that there is significant heterogeneity in levels of parental education. In contrast, at the school level there are no differences, possibly due to low educational supply in these regions. In addition, we observe that there are large differences between knowledge tests during the study period. The most extreme case is still Guainía, whose math test is the most unequal in the whole period. It also turns out to be one of the regions with lower inequality in 2012 in reading and science. This confirms the fact that for most of the departments for which inequality is explained solely by parental education, there was a reduction in overall inequality at end of the period.

Finally, as in the analysis between metropolitan areas, at the departmental level we find that the decomposition of inequality follows the same pattern: the levels of inequality have increased in most departments and this increase is mainly due to the characteristics of the schools. These results allow us to highlight the dual structure of the provision of basic education. Private schools can react faster to changes in demand preferences or technical change than public ones. Thus it is possible that most of the inequalities come from the institutional arrangements and parental preferences toward education.

5. Discussion

We provide new evidence about the evolution of recent inequalities in academic achievements at a regional level. Given that economic development is very unequal across the country, we undertake a different and subjective division. In our approach, we choose six metropolitan areas surrounding the highest and more developed cities. The most important finding of this study is the rising level of inequality of educational achievement

in all the metropolitan areas. In some cases, such as Bogotá and Cali, the increase in inequality was higher than 100% during this period. Although the choice of the set of circumstances is always questionable, it is clear that in the case of this document a lower bound of the inequality has been obtained. The available set of explanations is wide and ranges from institutional to educational factors. From the institutional point of view, income inequalities have encouraged the segmentation of educational markets to such a level that the choice of school is used in some cases for locating socioeconomic segment. Private schools can be seen as “clubs” or means to strengthen “social networks”. As a result, the incidence of students with highly educated parents in public schools decreased monotonically, generating higher differences in the quality of educational services between students from low income households and those from middle and high income families. In addition, most of the external investments and benefits of economic growth have been located in a few cities that can capitalize on their public programs.

On the educational side, the freedom of private schools to manage their inputs (teachers, laboratories, schedules, information and communication technologies) allow them to react faster to market changes, but at the same time, they also employ parental commitment to achieve their goals. It is clear that high income is correlated with attendance of private schools in countries such as Colombia, but this is not a choice in some medium and small cities. The explanation is that in these cities, the absence of competition among public schools does not give them an incentive to increase inequality of opportunities. For this reason, the set of explanatory variables includes parents, schooling, type of schools and size of the city. It is important to state that we are not saying that private schools are better than public schools. What we can say is that revealed preferences by parents are incorporated more quickly into the production function of private than public schools. The analysis of the relative importance of each circumstance on the size of inequality of opportunities is out of the scope of this study and is one aspect that deserves future research.

There is not enough evidence to provide policy recommendations designed for reducing these unfair inequalities, but it is clear that a set of national and local policies are necessary. From the national point of view it is necessary to reduce demand barriers and to promote competition among schools using teacher policies focused on encouraging their initiatives and rewarding their achievements. This strategy could reduce the consequences of the inertial behavior of public schools. The structure of the public supply of education might be more flexible in terms of student capabilities and interest. Some exceptional students should have access to more specific tools that it can be offered by private as well other public institutions.

The local authorities also play an important role in this crucial task. The first step is to increase the expected value of education for all the agents involved (principals, teachers, parents and students). Second, the use of public resources to incentivize performance among those who face higher income barriers is one way to level the playing field. A revision into the scheme of payments could be modified in order to promote higher effort and continuous training for teachers from public schools. It is clear that inequalities are common in areas such as education, but the main concern in the Colombian case is the widening of the gap.

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Tables and Figures

Table 1. Summary of Database

		1997				2012			
Area	**Cities and Small towns**	**Population**	**% of total pob.**	**Students**	**% of total Saber 11**	**Population**	**% of total pob.**	**Students**	**% of total Saber 11**
1	**Bogotá**, Soacha, Mosquera, Chía, La Calera	6.362.728	16,85%	40.435	19,80%	8.216.883	18,13%	33.315	16,65%
2	**Medellín**, Envigado, Rionegro, Copacabana, Itagüí, Bello	2.731.530	7,23%	14.323	7,01%	3.452.881	7,62%	12.415	6,21%
3	**Cali,** Palmira, Dagua, Candelaria, Jamundí	2.428.650	6,43%	15.098	7,39%	2.928.958	6,46%	10.845	5,42%
4	**Barranquilla,** Malambo, Baranoa, Sabanagrande, Soledad	1.488.375	3,94%	6.574	3,22%	1.844.993	4,07%	5.074	2,54%
5	**Armenia,** Circasia, Quimbaya, Calarcá, Pereira, Belén de Umbría, Marsella, Santa Rosa de Cabal, La Virginia, Dos Quebradas	1.135.008	3,01%	6.658	3,26%	1.265.519	2,79%	5.435	2,72%
6	**Bucaramanga,** Piedecuesta, Zapatoca, San Vicente de Chucurí, Floridablanca, Girón	874.233	2,32%	6.363	3,12%	998.203	2,20%	5.085	2,54%
Other	Other municipalities	22.741.132	60,22%	114.762	56,20%	26.608.838	58,72%	127.895	63,93%
Total		37.761.656	100,00%	204.213	100,00%	45.316.275	100,00%	200.064	100,00%

Note: In order to test the sensitivity, it was added one municipality to each Area (Funza, Marinilla, Yumbo, Sabanalarga, Santuario and El Carmen de Chucurí, respectively) and it was extracted one from the baseline definition (Mosquera, Copacabana, Palmira, Baranoa, Belén de Umbría and Zapatoca, respectively)

Table 2. Equality of Opportunities Index – All subjects (Ferreira & Gignoux)

year	Bog	Med	Cali	Bquilla	Arme	Buc	other	Total Areas	Country
A. Math									
1997	0.1230	0.1590	0.0887	0.2048	0.1431	0.0781	0.0751	0.1118	0.1100
1998	0.1197	0.1366	0.0720	0.1868	0.1186	0.0736	0.0641	0.1036	0.0970
1999	0.1107	0.1859	0.0927	0.1678	0.1148	0.1021	0.0763	0.1115	0.1080
2000	0.1819	0.0586	0.0878	0.0696	0.0458	0.0526	0.0474	0.1136	0.0840
2001	0.0746	0.0876	0.0331	0.0747	0.0697	0.1048	0.0426	0.0688	0.0670
2002	0.0917	0.1271	0.0735	0.0870	0.0968	0.1158	0.0748	0.1129	0.1170
2003	0.1034	0.0663	0.0846	0.0591	0.0380	0.0820	0.0316	0.0735	0.0640
2008	0.2653	0.1419	0.2106	0.2418	0.1459	0.1476	0.0993	0.1734	0.1560
2009	0.2505	0.1851	0.2200	0.2197	0.2008	0.2052	0.1151	0.1982	0.1880
2010	0.1994	0.2159	0.2211	0.1921	0.1900	0.1840	0.1243	0.1966	0.1890
2011	0.2183	0.1577	0.2530	0.2233	0.1794	0.1911	0.1161	0.1995	0.1890
2012	0.2377	0.2051	0.2397	0.2095	0.2006	0.2195	0.1203	0.2158	0.1970
B. Verbal Reading									
1997	0.1179	0.1644	0.0723	0.2038	0.1120	0.0719	0.0747	0.1079	0.1200
1998	0.1283	0.1645	0.0638	0.2066	0.1175	0.0820	0.0779	0.1044	0.1110
1999	0.0877	0.1703	0.0732	0.1653	0.0935	0.0852	0.0762	0.1025	0.1200
2000	0.0896	0.1414	0.0948	0.1194	0.1113	0.1251	0.1014	0.1374	0.1530
2001	0.0947	0.1308	0.1076	0.1244	0.1167	0.1258	0.0850	0.1173	0.1360
2002	0.1247	0.1604	0.1226	0.1397	0.1282	0.1325	0.1023	0.1412	0.1580
2003	0.1104	0.1351	0.1448	0.1650	0.1567	0.1428	0.1097	0.1539	0.1750
2008	0.2153	0.1109	0.1477	0.2102	0.1088	0.1266	0.0912	0.1626	0.1550
2009	0.2214	0.1040	0.1546	0.1968	0.1006	0.1463	0.0897	0.1610	0.1520
2010	0.2087	0.1450	0.2391	0.1954	0.1298	0.1845	0.0885	0.1860	0.1690
2011	0.1421	0.1232	0.1354	0.1478	0.1161	0.1612	0.0982	0.1345	0.1630
2012	0.2342	0.1655	0.2865	0.2302	0.1930	0.2011	0.1275	0.2208	0.2280
C. Sciences									
1997	0.1357	0.1993	0.0966	0.2019	0.1683	0.0880	0.0909	0.1317	0.123
1998	0.1432	0.2087	0.0914	0.2053	0.1666	0.1054	0.0982	0.1296	0.125
1999	0.1388	0.2373	0.1144	0.1894	0.1397	0.1160	0.0931	0.1388	0.13
2000	0.2351	0.2181	0.1961	0.1987	0.1845	0.1820	0.1405	0.1975	0.197
2001	0.2043	0.2224	0.2127	0.1746	0.2009	0.1846	0.1334	0.1902	0.189
2002	0.1723	0.2225	0.1553	0.1525	0.1817	0.1604	0.1376	0.1720	0.187
2003	0.1917	0.1907	0.1877	0.1738	0.1840	0.1618	0.1316	0.1776	0.19
2008	0.2376	0.1846	0.2222	0.1996	0.1368	0.1548	0.1077	0.1955	0.177
2009	0.2368	0.1818	0.2130	0.1745	0.1583	0.1947	0.1107	0.1955	0.175
2010	0.2386	0.2259	0.1995	0.2156	0.1772	0.2225	0.1414	0.2159	0.207
2011	0.2152	0.1819	0.2191	0.1979	0.1739	0.2110	0.1214	0.1984	0.193
2012	0.2914	0.2289	0.2832	0.2454	0.2462	0.2548	0.1603	0.2590	0.249

Figure 1. Average Performance

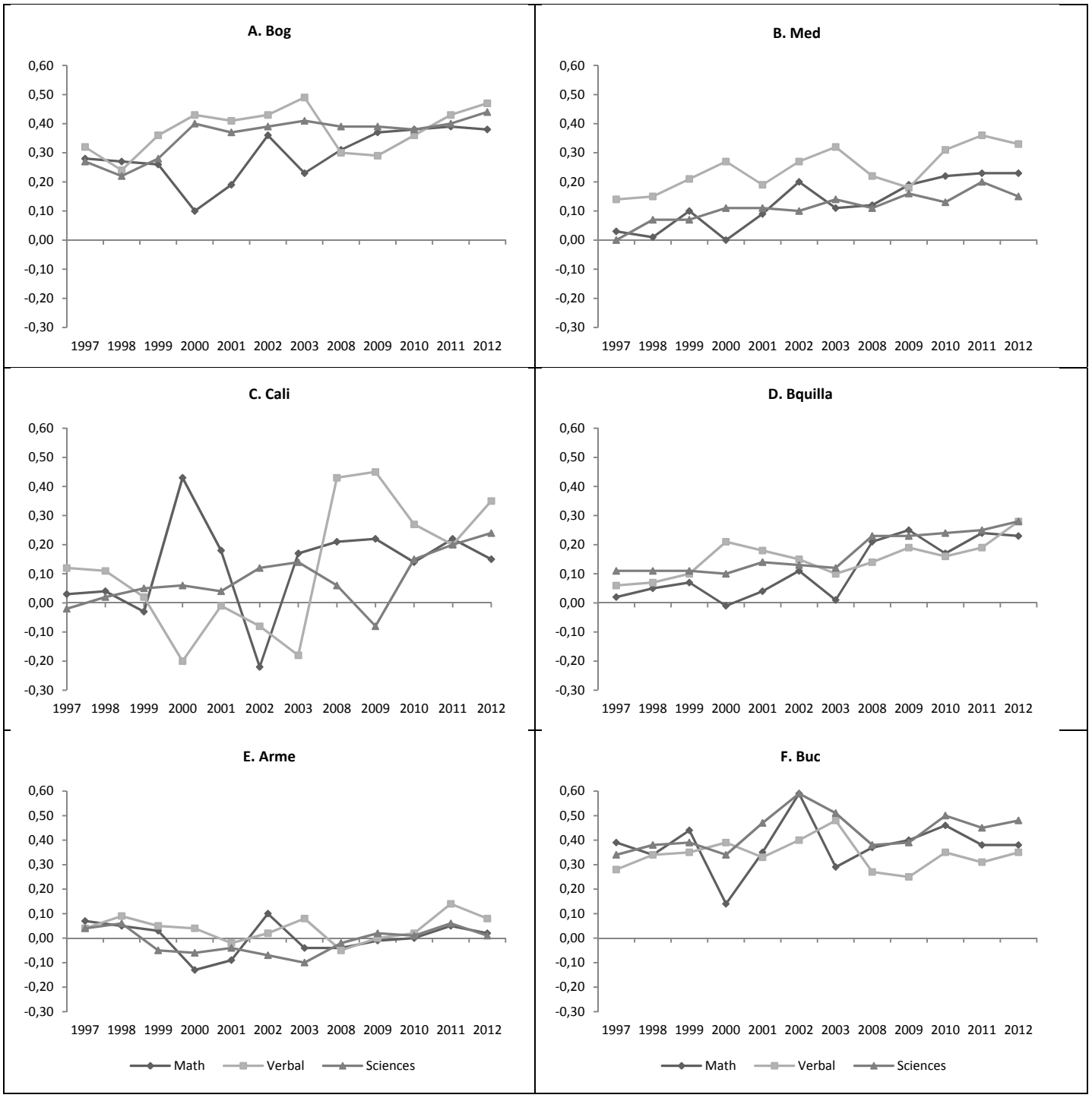


Figure 2. Gross inequality on Education

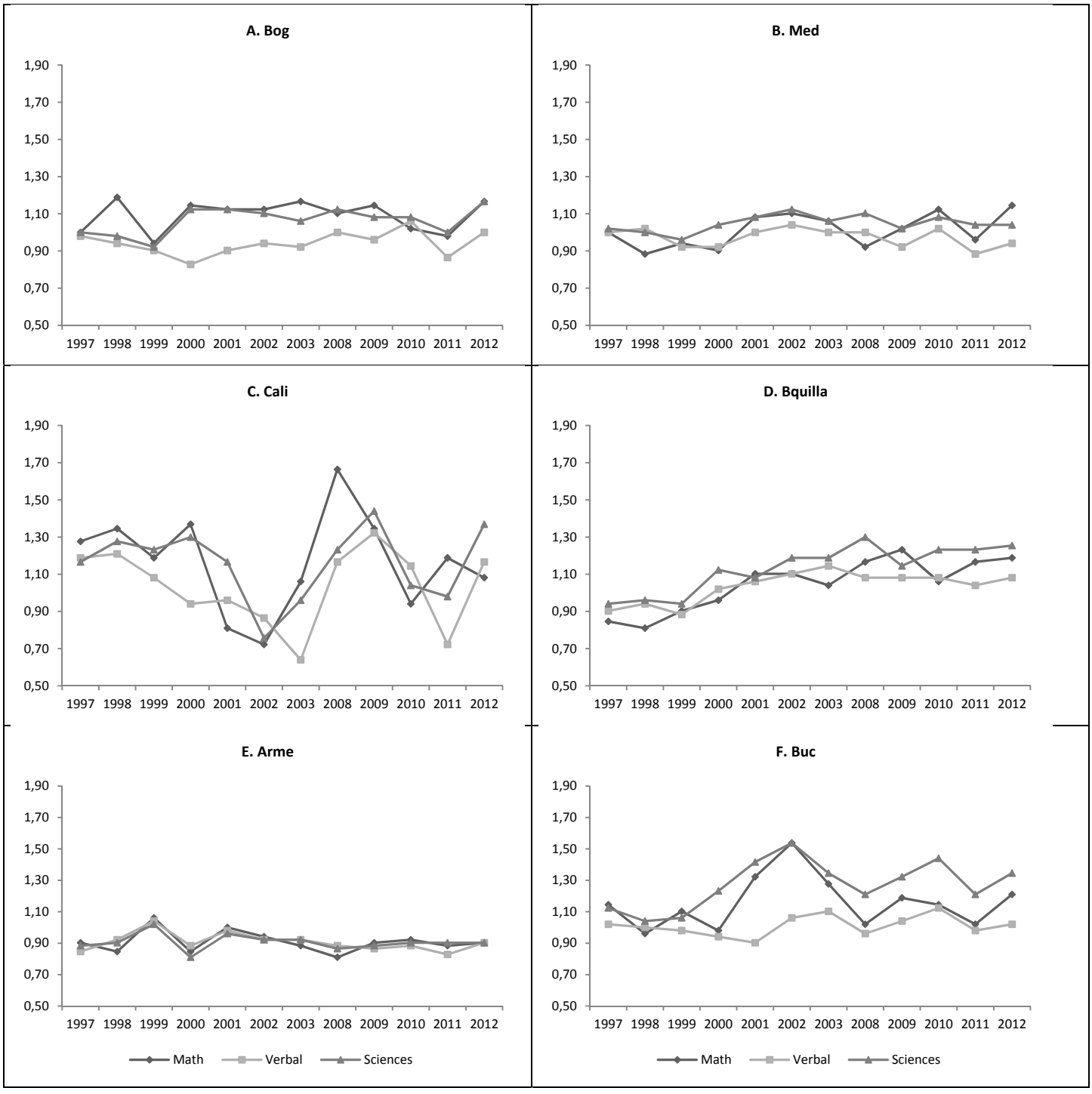
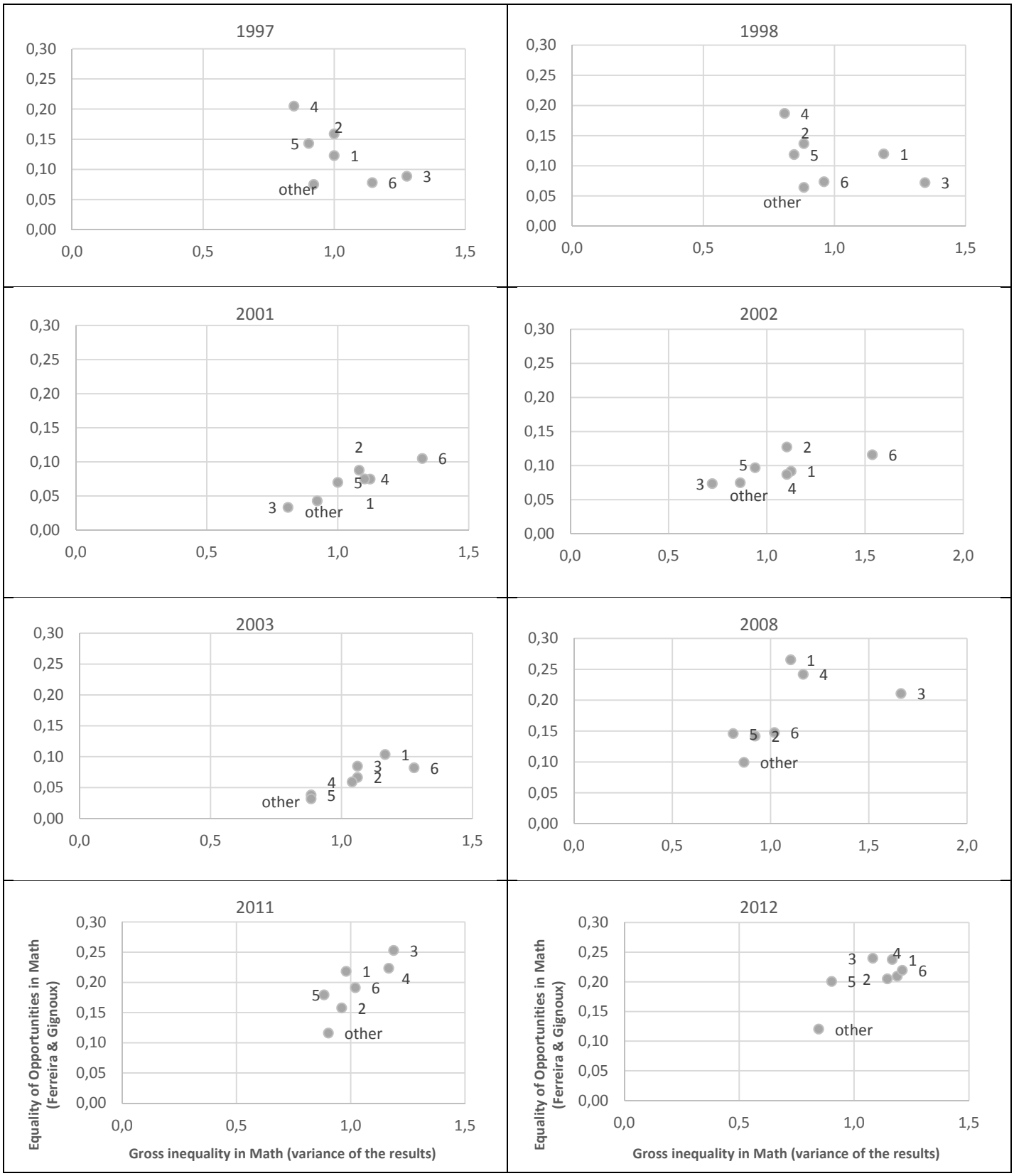
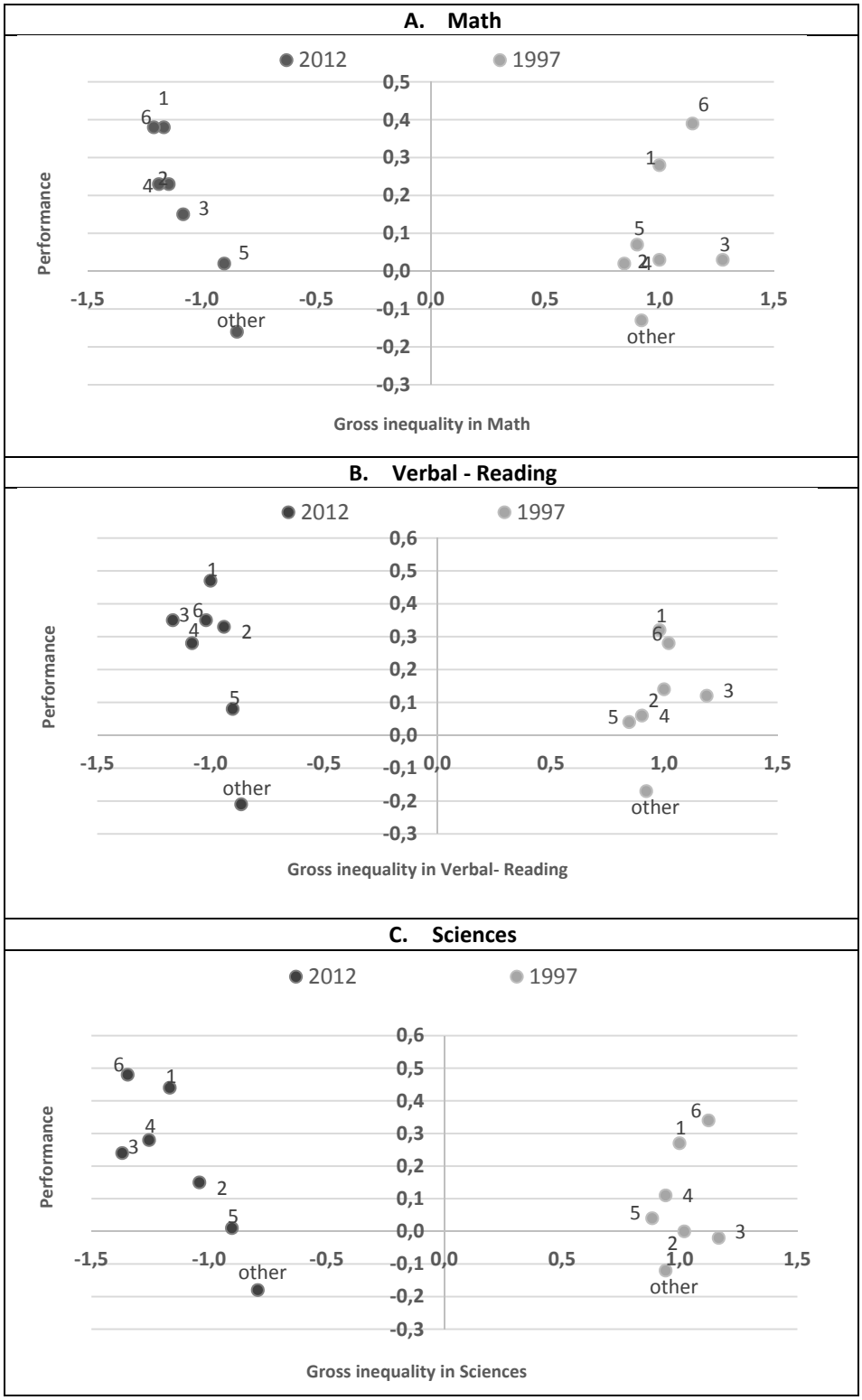


Figure 3. Equality of Opportunities (Ferreira & Gignoux) -vs- Gross inequality in Math



Note: 1=Bogotá 2= Medellín, 3=Cali, 4=Barranquilla, 5= Armenia 6=Bucaramanga

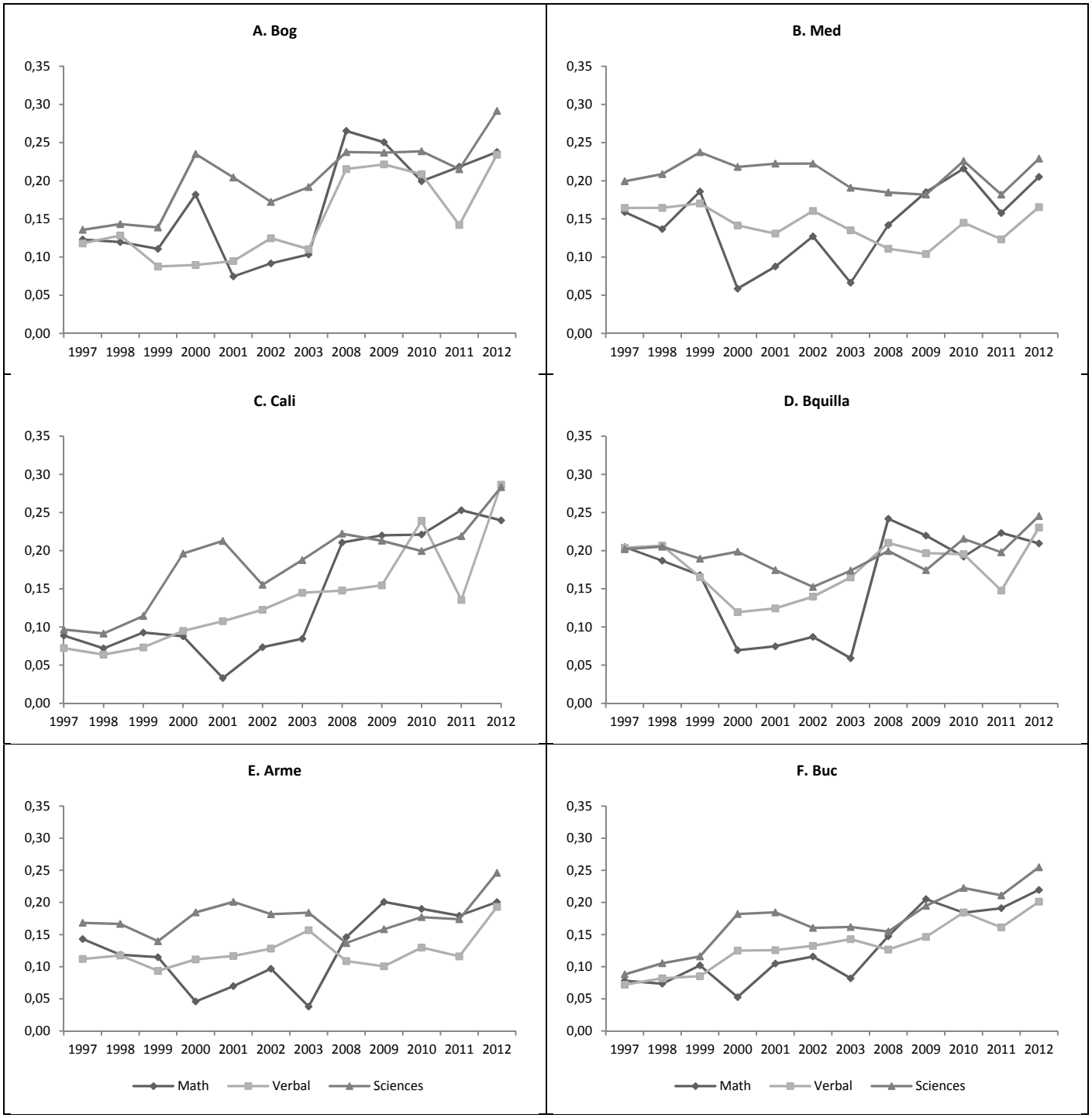
Figure 4. Performance (Mean) -vs- Gross Inequality



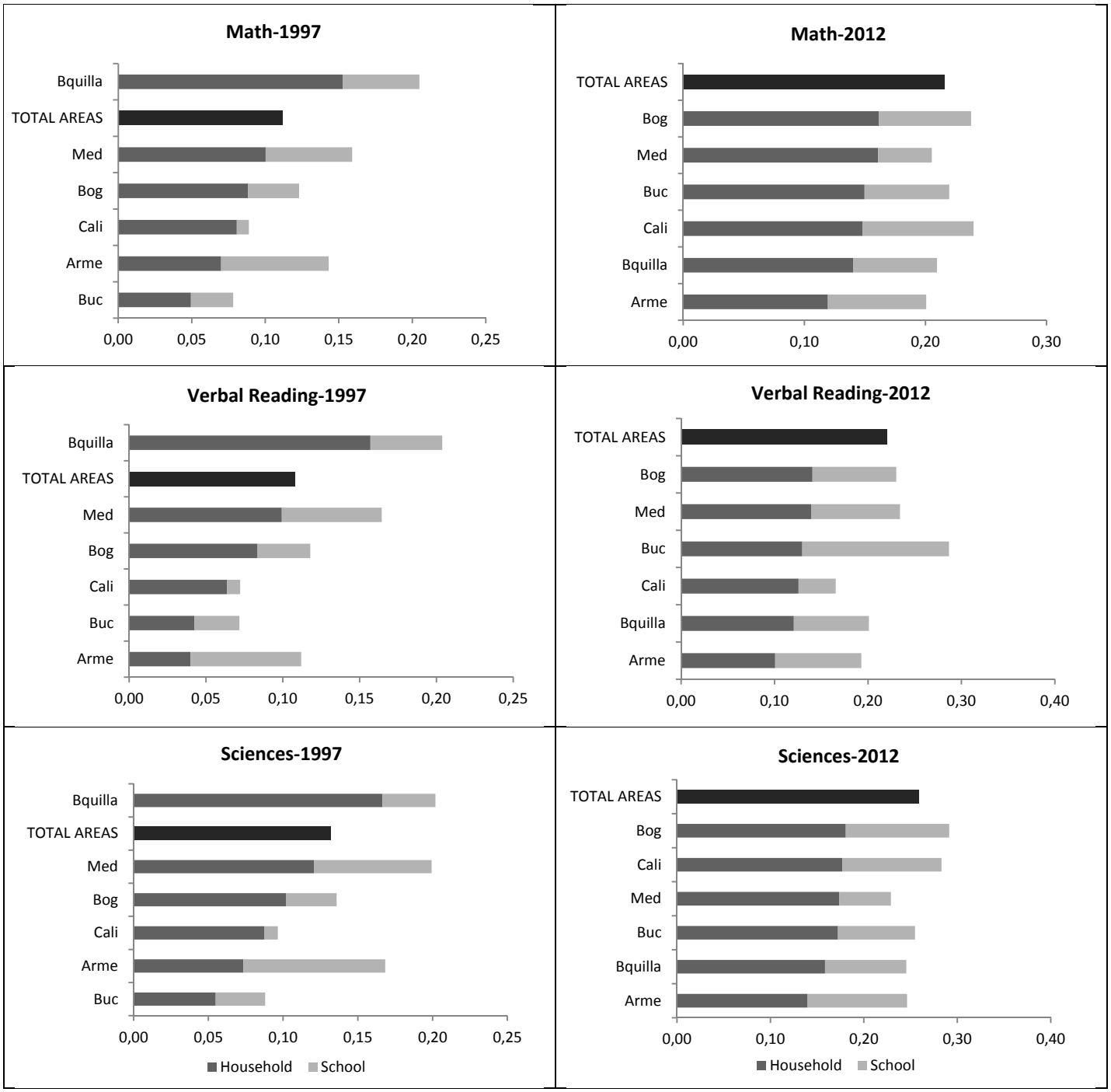
Note: 1=Bogotá 2= Medellín, 3=Cali, 4=Barranquilla, 5= Armenia 6=Bucaramanga. Other includes the remaining cities of the country

Appendix

A.1 Equality of Opportunities Index – All subjects (Ferreira & Gignoux)

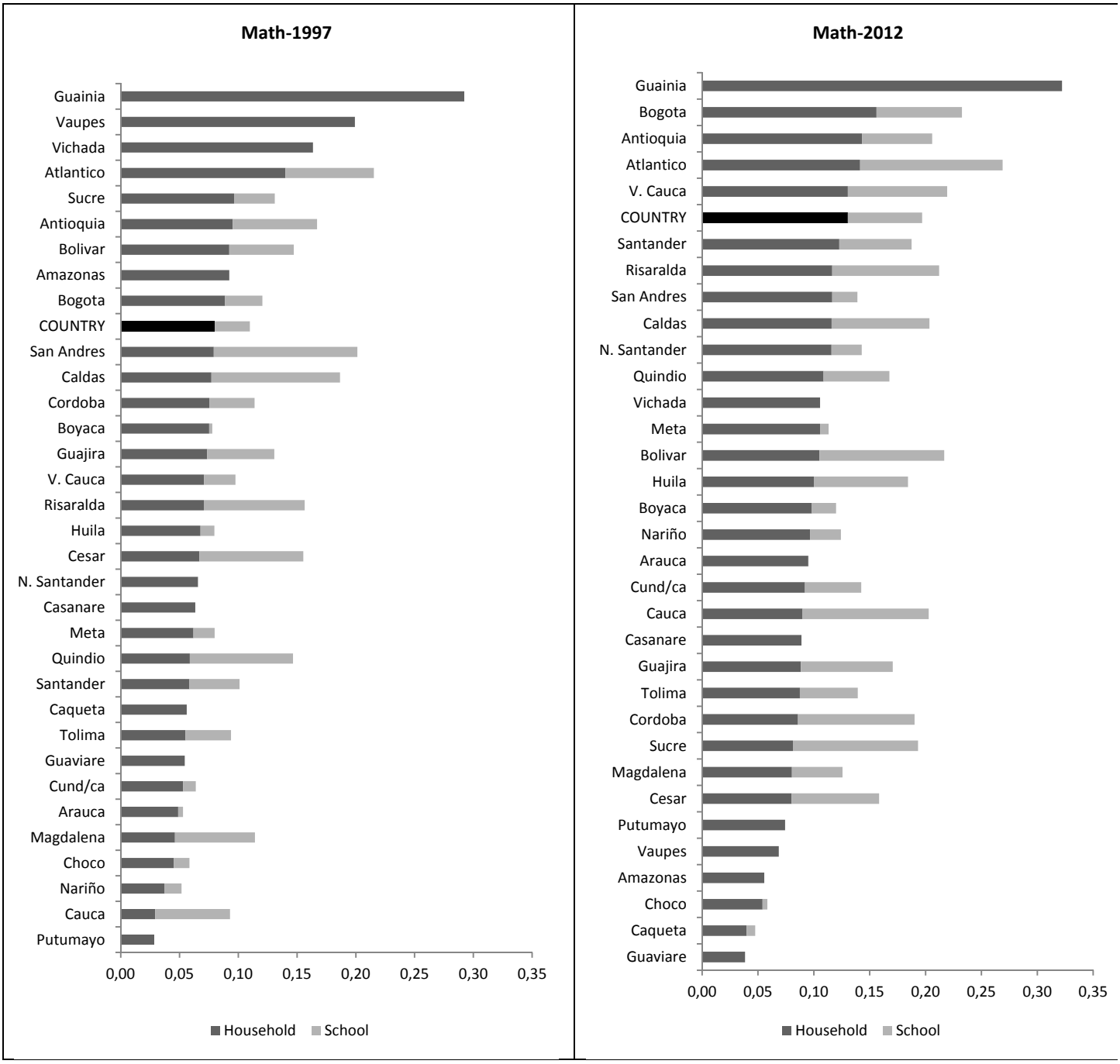


A.2. Input Variables EOP by Areas

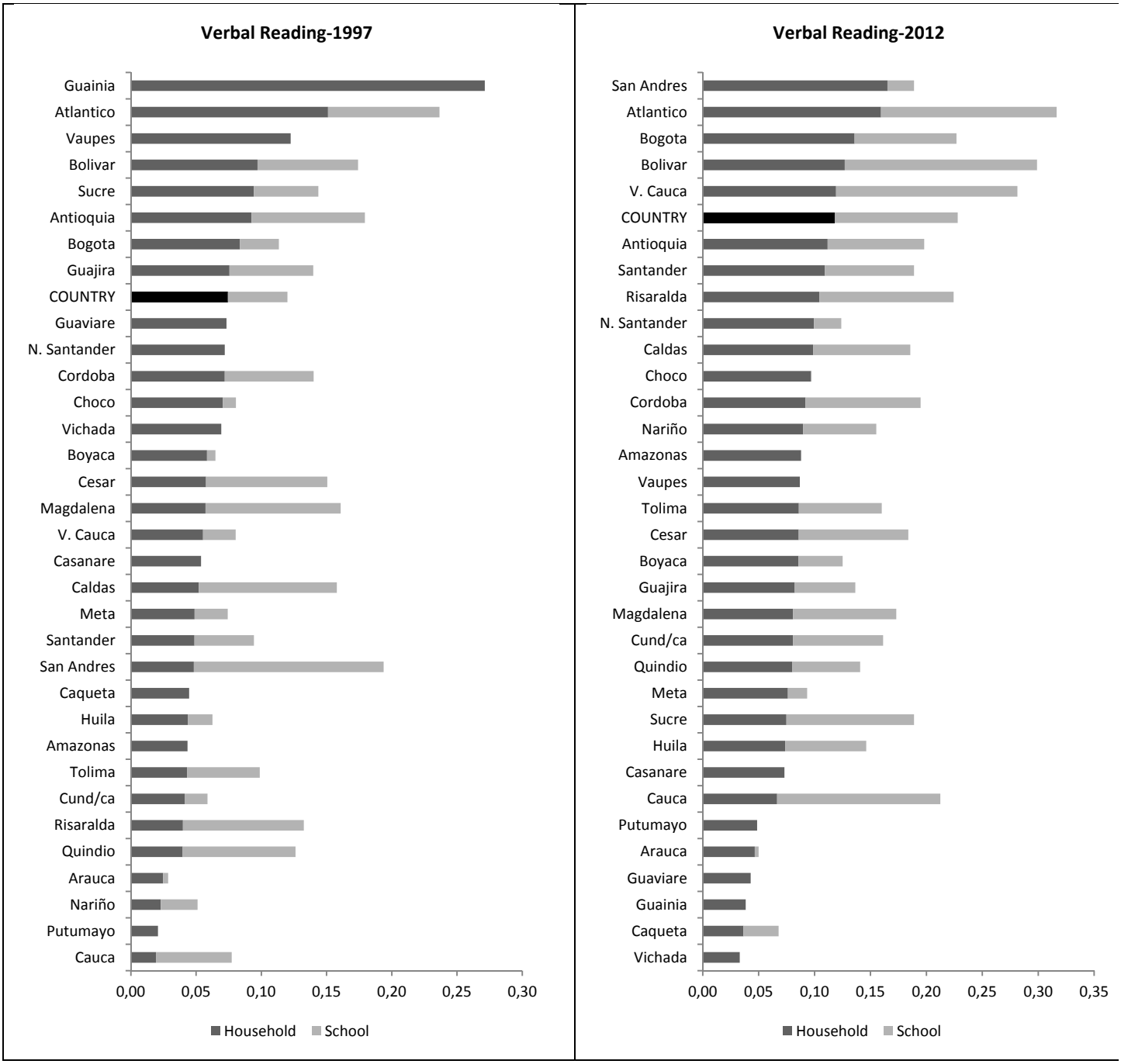


A.3. Input Variables EOP by Dpto

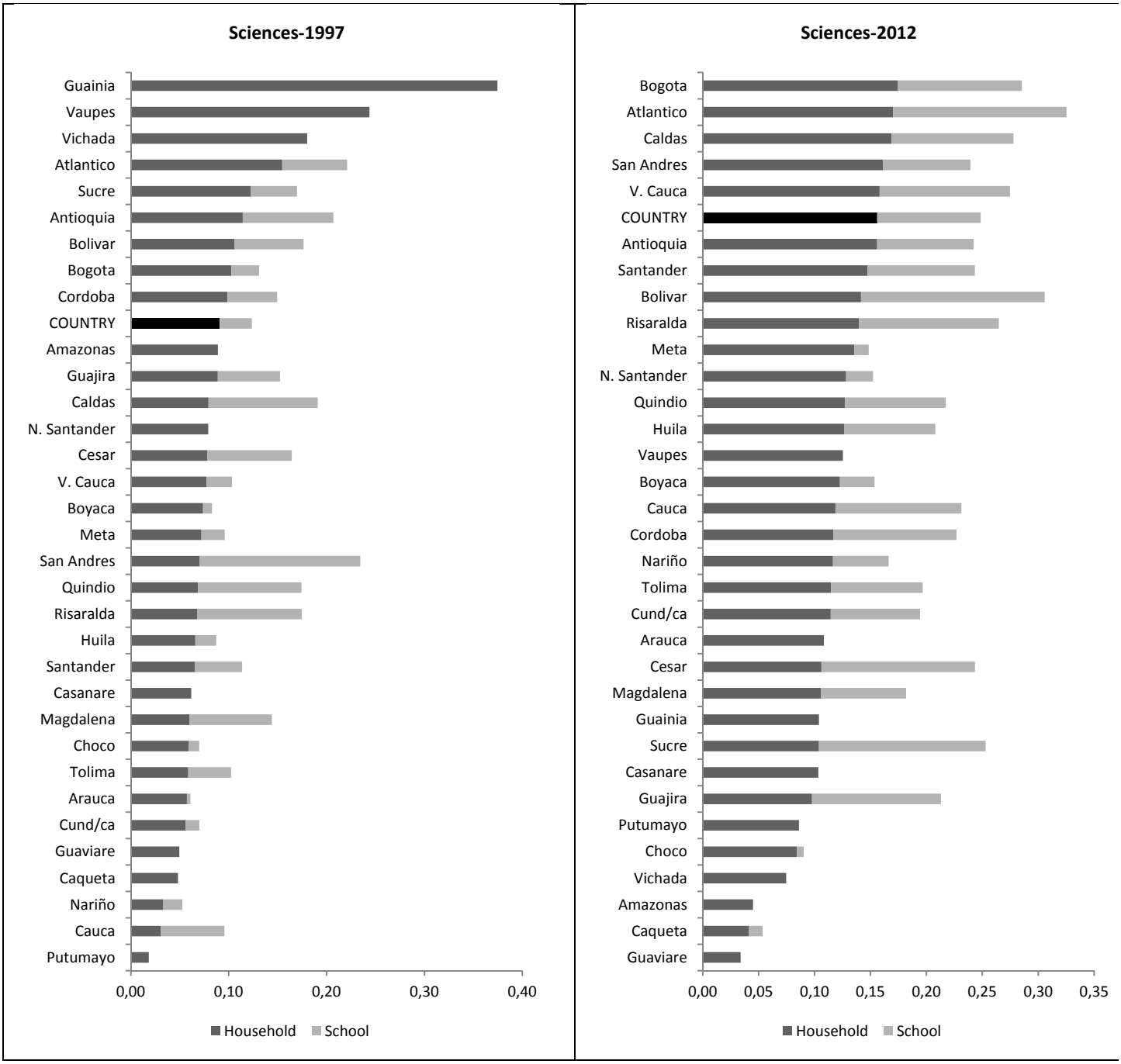
A.3.1. Math



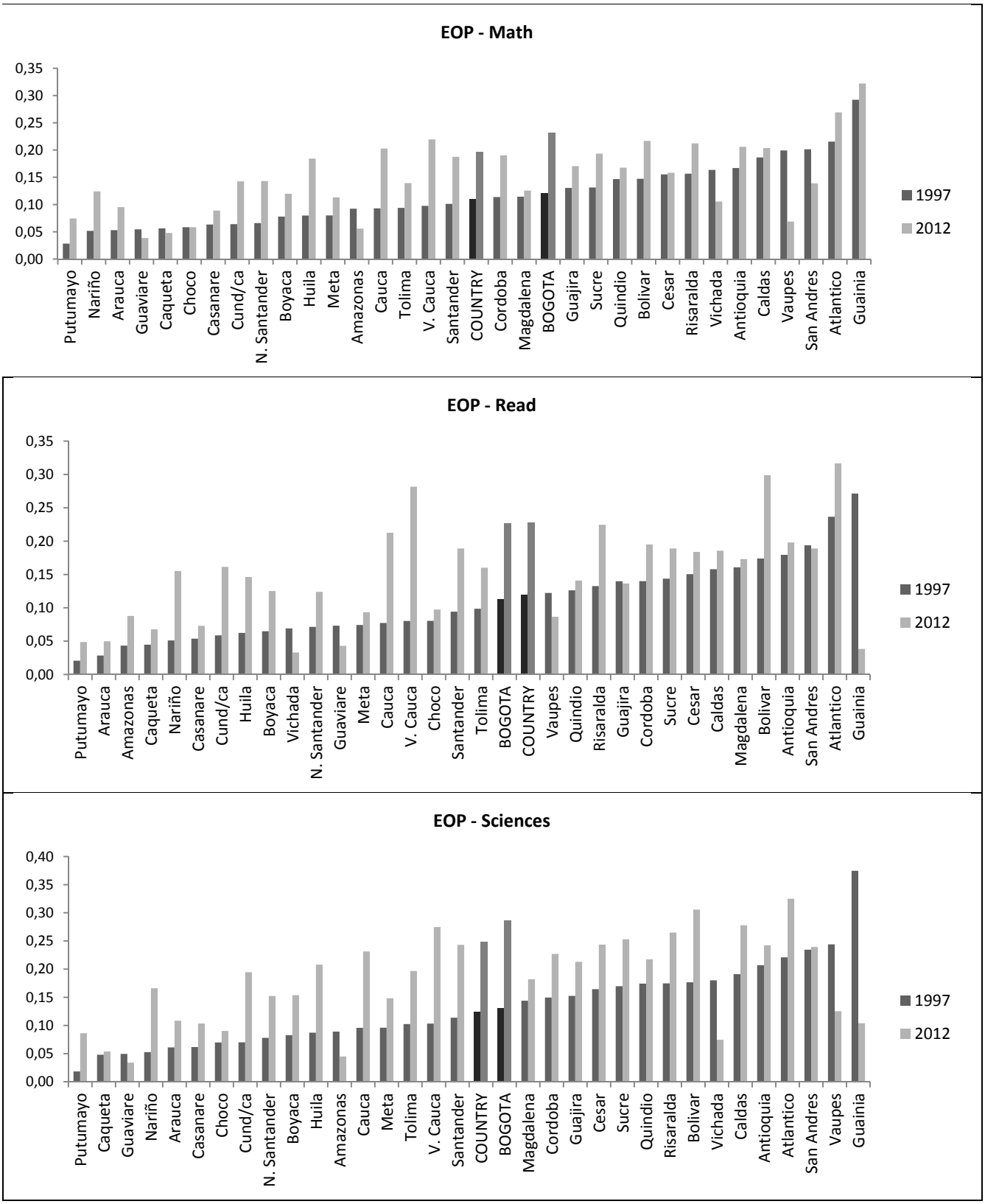
A.3.2. Verbal Reading



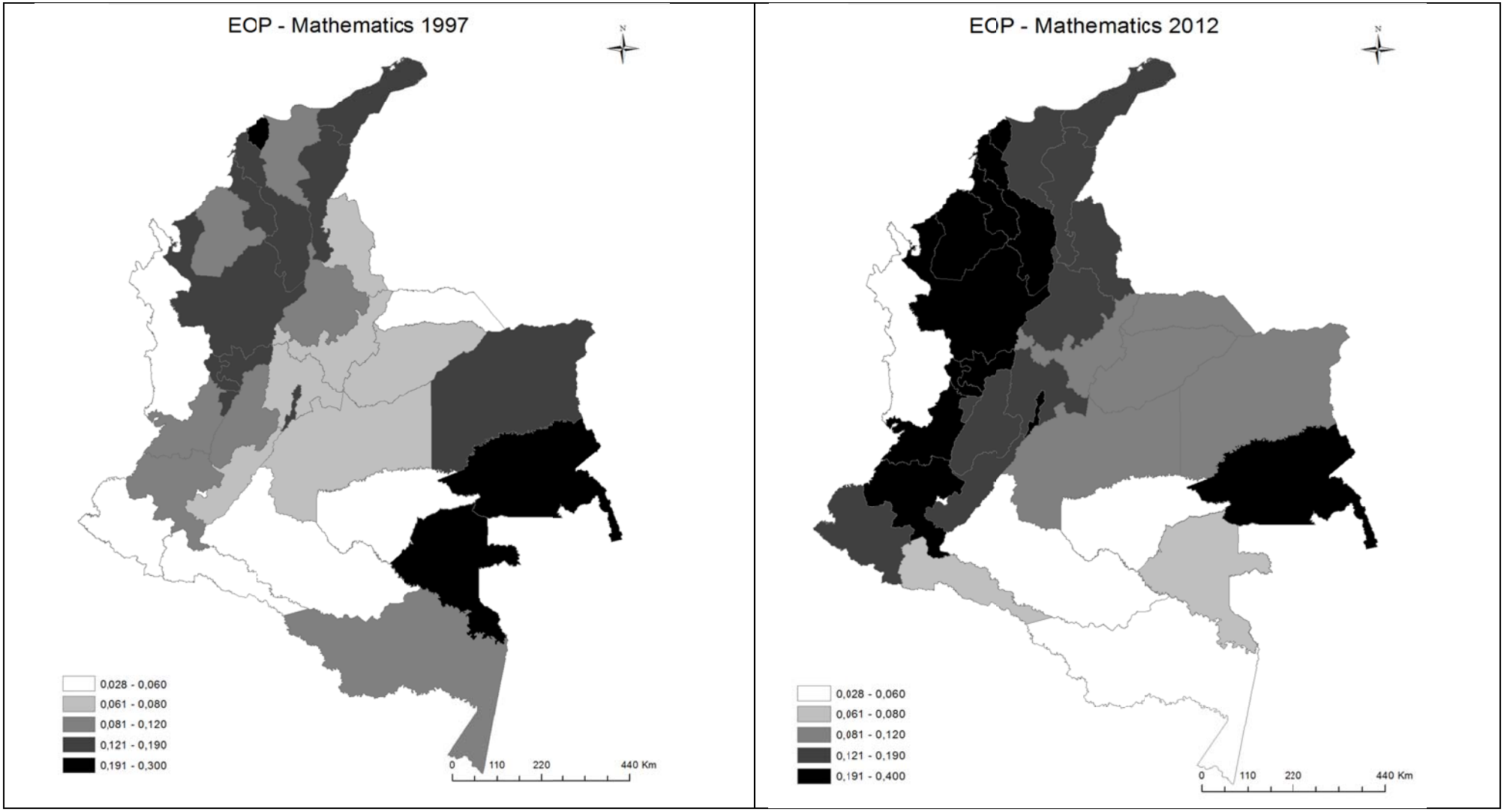
A.3.3. Sciences

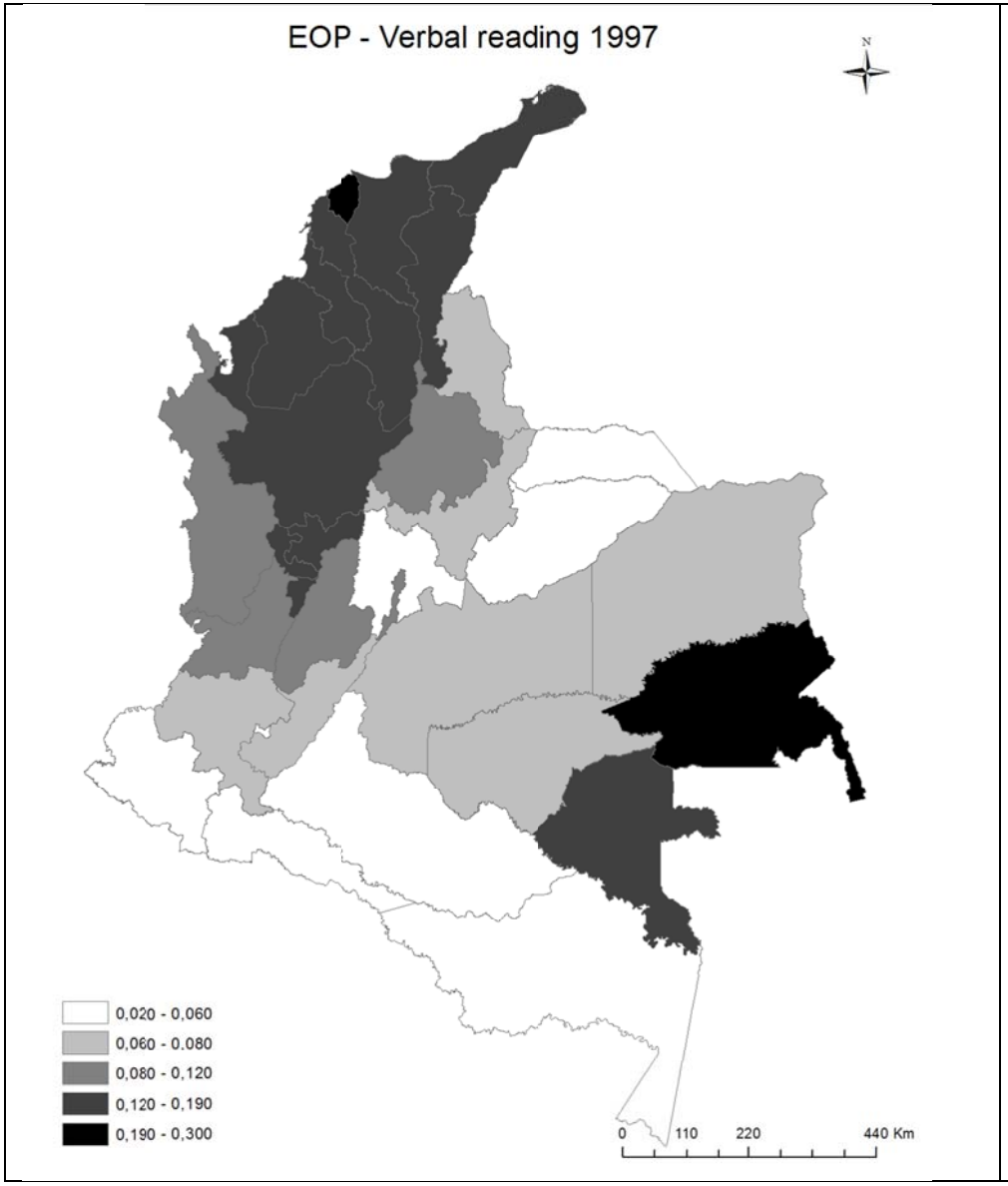


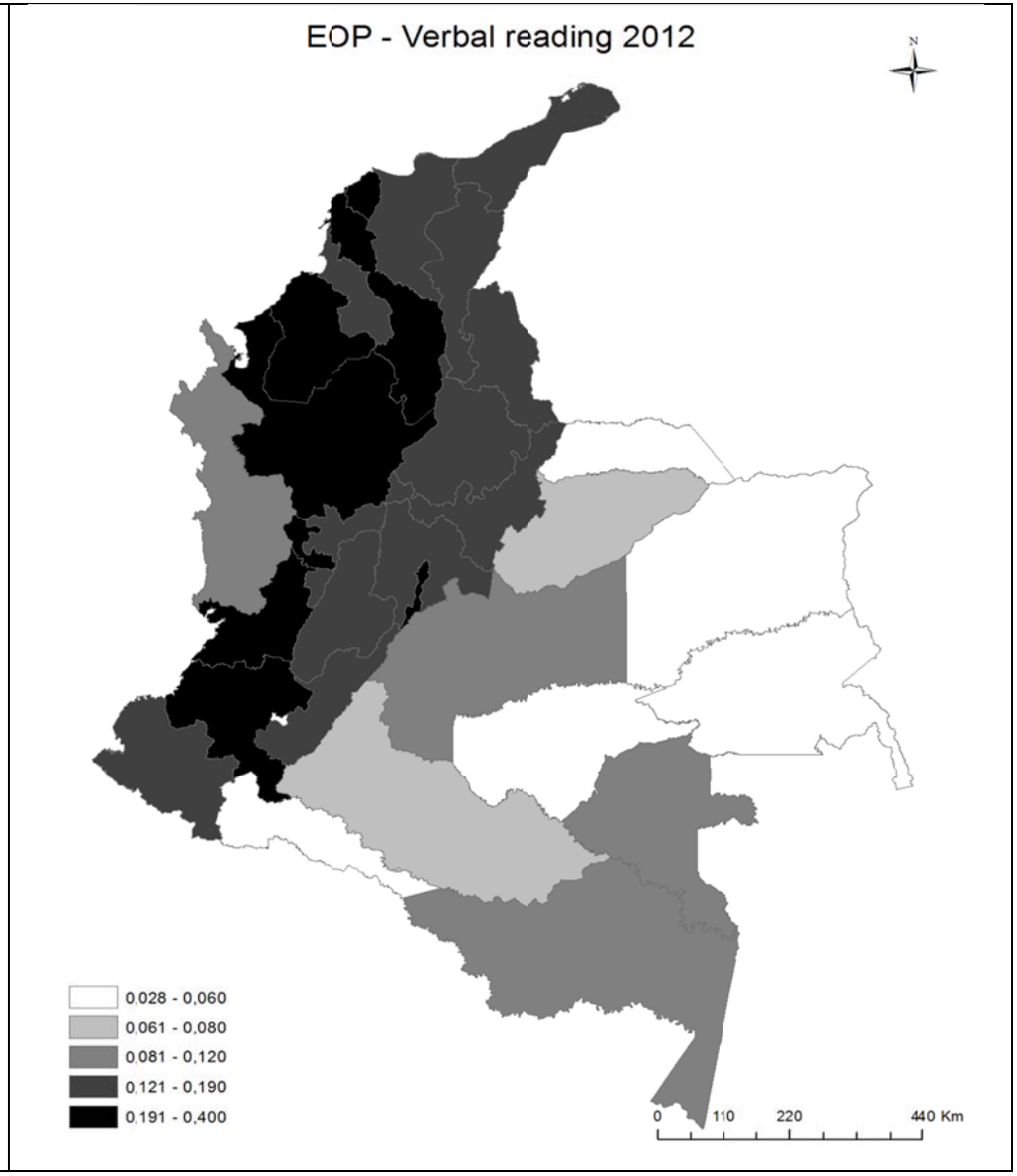
A.4. EOP by Department

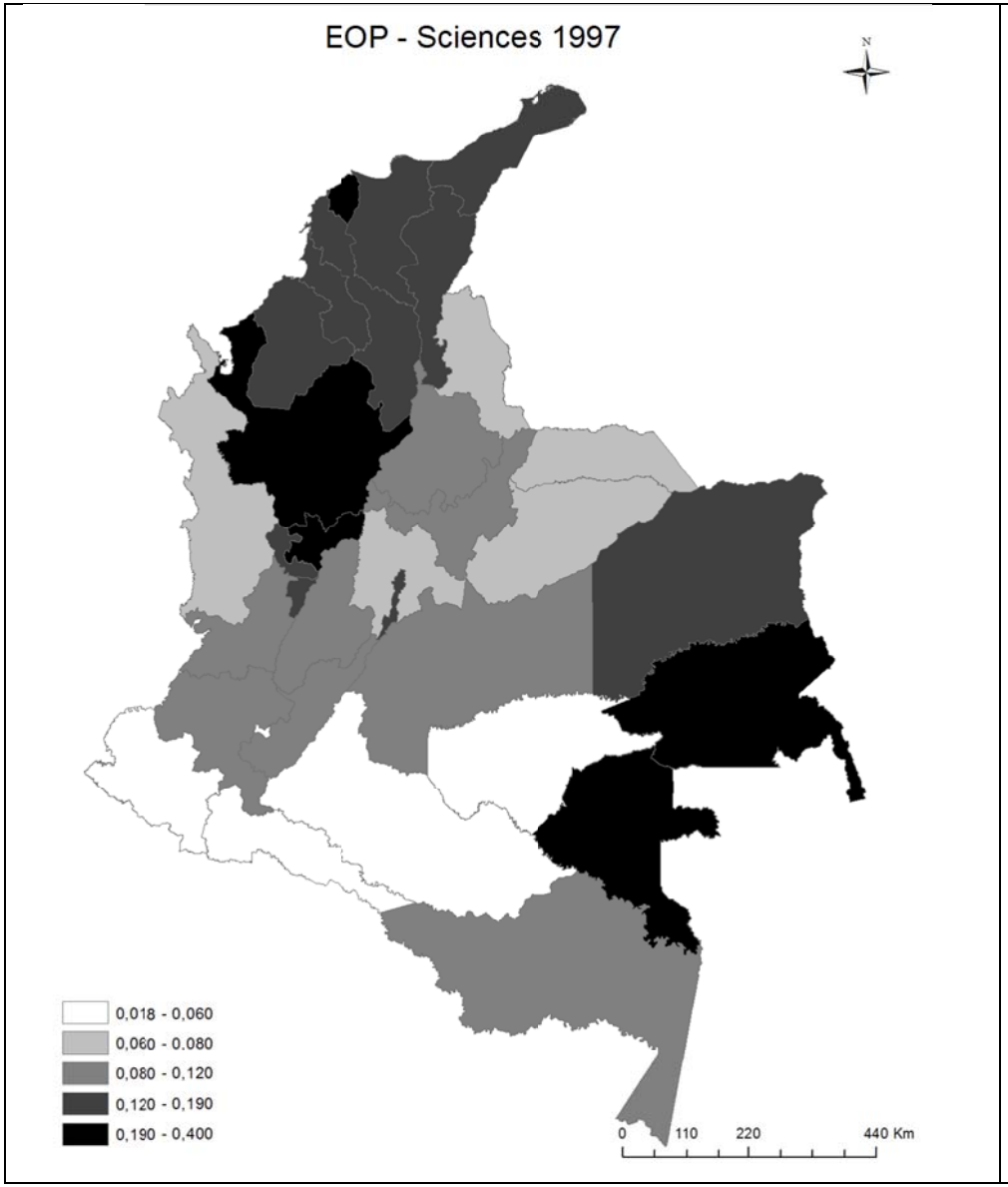


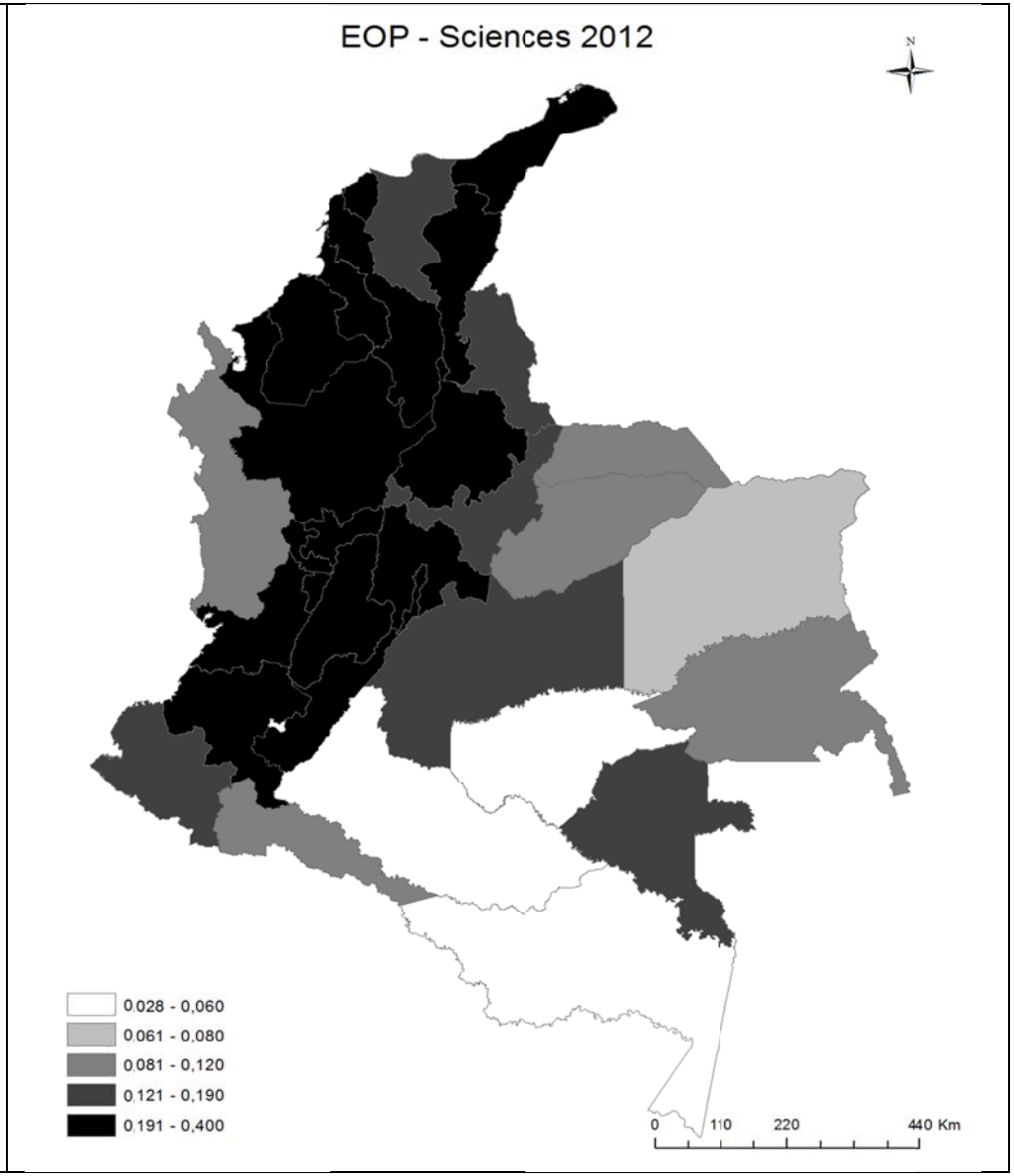
A.5. Maps of EOP by Department



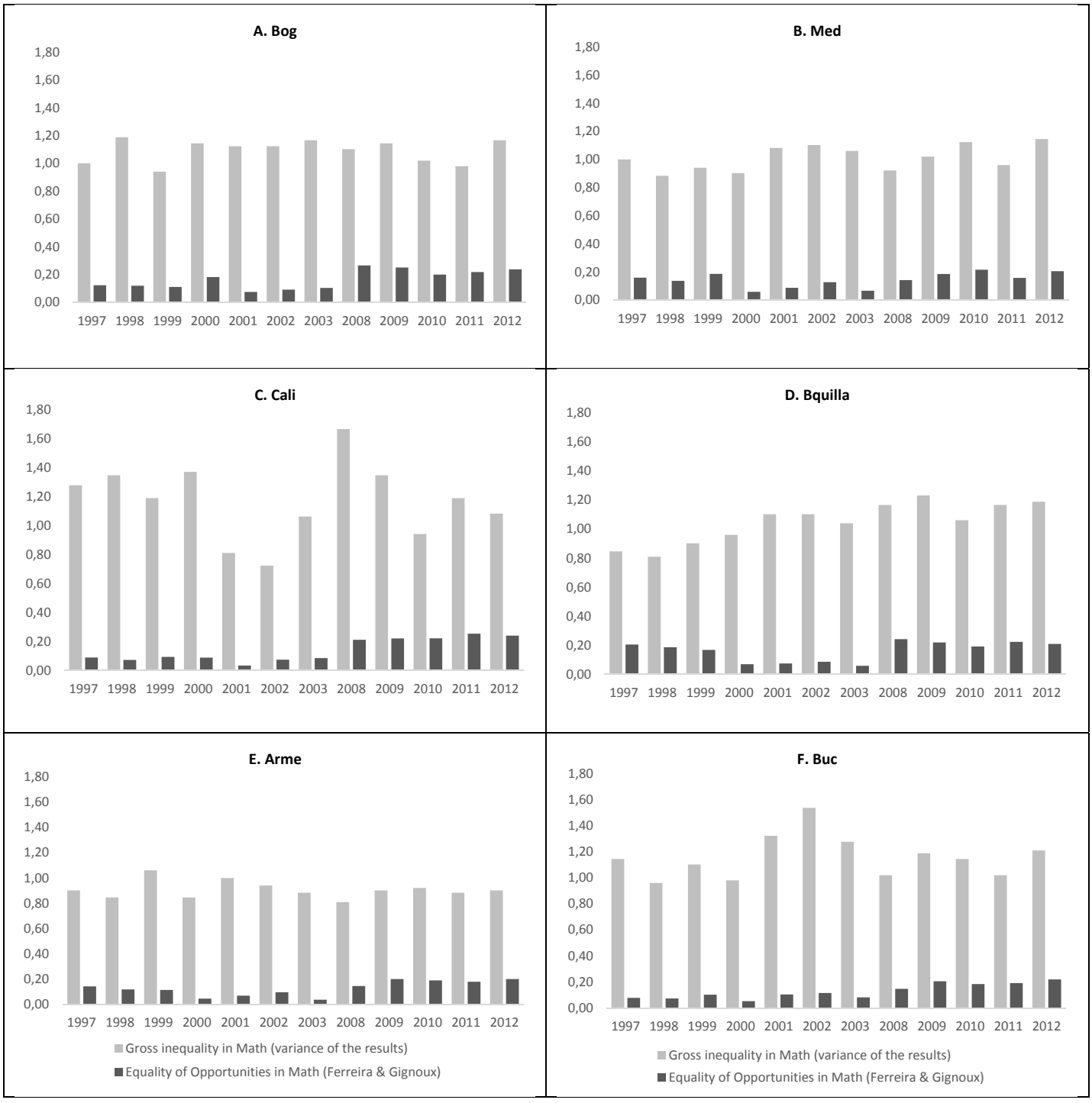

EOP - Verbal reading 1997
N
0,020 - 0,060
0,060 - 0,080
0,080 - 0,120
0,120 - 0,190
0,190 - 0,300
0
110
220
440 Km


EOP - Verbal reading 2012
N
0,028 - 0,060
0,061 - 0,080
0,081 - 0,120
0,121 - 0,190
0,191 - 0,400
0
110
220
440 Km


EOP - Sciences 1997
N
0,018 - 0,060
0,060 - 0,080
0,080 - 0,120
0,120 - 0,190
0,190 - 0,400
0
110
220
440 Km


EOP - Sciences 2012
N
0,028 - 0,060
0,061 - 0,080
0,081 - 0,120
0,121 - 0,190
0,191 - 0,400
0
110
220
440 Km

A.6. Equality of Opportunities (Ferreira & Gignoux) -vs- Gross inequality in Math



A.7. Robustness in Equality of Opportunities – Ferreira & Gignoux

Math							
A. Without 1 small-town							
	Bog	**Med**	**Cali**	**Bquilla**	**Arme**	**Buc**	**Other**
1997	0.12	0.16	0.09	0.20	0.14	0.08	0.08
1998	0.12	0.13	0.07	0.19	0.11	0.07	0.06
1999	0.11	0.19	0.09	0.17	0.11	0.10	0.08
2000	0.18	0.06	0.09	0.07	0.05	0.05	0.05
2001	0.07	0.09	0.03	0.07	0.07	0.10	0.04
2002	0.09	0.13	0.07	0.09	0.10	0.12	0.08
2003	0.10	0.06	0.08	0.06	0.04	0.08	0.03
2008	0.27	0.14	0.21	0.24	0.15	0.15	0.10
2009	0.25	0.18	0.22	0.22	0.21	0.20	0.12
2010	0.20	0.21	0.22	0.19	0.20	0.18	0.13
2011	0.22	0.16	0.25	0.22	0.19	0.19	0.12
2012	0.24	0.20	0.24	0.21	0.21	0.22	0.12
B. With 1 small-town							
1997	0.12	0.16	0.09	0.21	0.14	0.09	0.07
1998	0.12	0.14	0.07	0.19	0.12	0.09	0.06
1999	0.11	0.18	0.09	0.17	0.12	0.12	0.08
2000	0.18	0.06	0.09	0.07	0.04	0.05	0.05
2001	0.07	0.09	0.03	0.08	0.07	0.11	0.04
2002	0.09	0.13	0.07	0.09	0.10	0.13	0.07
2003	0.10	0.07	0.09	0.06	0.04	0.09	0.03
2008	0.27	0.14	0.21	0.25	0.14	0.15	0.10
2009	0.25	0.18	0.23	0.22	0.20	0.22	0.11
2010	0.20	0.21	0.23	0.20	0.19	0.20	0.12
2011	0.22	0.15	0.26	0.23	0.18	0.21	0.11
2012	0.24	0.20	0.24	0.21	0.20	0.23	0.12

Verbal Reading							
A. Without 1 small-town							
	Bog	**Med**	**Cali**	**Bquilla**	**Arme**	**Buc**	**Other**
1997	0.12	0.16	0.07	0.21	0.11	0.07	0.08
1998	0.13	0.16	0.06	0.21	0.11	0.08	0.08
1999	0.09	0.17	0.07	0.17	0.09	0.08	0.08
2000	0.09	0.14	0.09	0.12	0.11	0.12	0.10
2001	0.09	0.13	0.11	0.13	0.12	0.13	0.09
2002	0.12	0.16	0.12	0.14	0.13	0.13	0.10
2003	0.11	0.13	0.14	0.16	0.16	0.14	0.11
2008	0.22	0.11	0.15	0.20	0.11	0.13	0.09
2009	0.22	0.10	0.15	0.19	0.10	0.15	0.09
2010	0.21	0.14	0.24	0.19	0.14	0.18	0.09
2011	0.14	0.12	0.13	0.15	0.12	0.16	0.10
2012	0.23	0.16	0.28	0.23	0.20	0.20	0.13
B. With 1 small-town							
1997	0.12	0.16	0.07	0.21	0.11	0.08	0.07
1998	0.13	0.16	0.06	0.21	0.12	0.10	0.08
1999	0.09	0.17	0.07	0.17	0.10	0.10	0.08
2000	0.09	0.14	0.10	0.13	0.11	0.13	0.10
2001	0.09	0.13	0.11	0.13	0.11	0.13	0.09
2002	0.12	0.16	0.12	0.15	0.13	0.15	0.10
2003	0.11	0.14	0.15	0.17	0.15	0.15	0.11
2008	0.22	0.11	0.15	0.22	0.10	0.13	0.09
2009	0.22	0.11	0.15	0.20	0.10	0.15	0.09
2010	0.21	0.15	0.24	0.20	0.13	0.20	0.09
2011	0.14	0.12	0.14	0.15	0.11	0.17	0.10
2012	0.24	0.17	0.29	0.24	0.19	0.21	0.13

Sciences							
A. Without 1 small-town							
	Bog	**Med**	**Cali**	**Bquilla**	**Arme**	**Buc**	**Other**
1997	0.14	0.20	0.10	0.20	0.17	0.09	0.09
1998	0.14	0.21	0.09	0.21	0.16	0.10	0.10
1999	0.14	0.24	0.11	0.19	0.14	0.12	0.09
2000	0.24	0.22	0.20	0.20	0.18	0.18	0.14
2001	0.20	0.22	0.21	0.18	0.20	0.18	0.13
2002	0.17	0.22	0.15	0.15	0.19	0.16	0.14
2003	0.19	0.19	0.18	0.17	0.19	0.16	0.13
2008	0.24	0.18	0.22	0.20	0.14	0.16	0.11
2009	0.24	0.18	0.21	0.17	0.17	0.19	0.11
2010	0.24	0.22	0.20	0.22	0.18	0.22	0.14
2011	0.22	0.18	0.21	0.20	0.18	0.21	0.12
2012	0.29	0.23	0.28	0.25	0.25	0.26	0.16
B. With 1 small-town							
1997	0.14	0.20	0.09	0.20	0.17	0.11	0.09
1998	0.14	0.21	0.09	0.21	0.17	0.13	0.10
1999	0.14	0.23	0.11	0.19	0.14	0.13	0.09
2000	0.24	0.22	0.20	0.20	0.18	0.19	0.14
2001	0.20	0.22	0.21	0.18	0.20	0.19	0.13
2002	0.17	0.22	0.16	0.16	0.18	0.18	0.14
2003	0.19	0.19	0.19	0.18	0.18	0.19	0.13
2008	0.24	0.18	0.22	0.21	0.13	0.17	0.11
2009	0.24	0.18	0.21	0.18	0.16	0.21	0.11
2010	0.24	0.23	0.21	0.22	0.17	0.24	0.14
2011	0.22	0.18	0.22	0.20	0.17	0.23	0.12
2012	0.29	0.23	0.29	0.25	0.25	0.27	0.16