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## Abstract

The concept of horizontal inequality is generally used in economics to refer to the unequal treatment of equal individuals by the fiscal system. For example, an economic system can treat unequally two individuals who hold identical levels of production factors. The following note will present a method that allows us to identify the level of horizontal inequality of an economic system.

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# 1 Introduction

The principle of horizontal equality which states that two equal individuals should be treated equally is an ethic principle that can be traced back to the Bible. The commonly known saying of “an eye for an eye” is an example horizontal equality. Furthermore, some founding principles of justice state that similar crimes should warrant similar penalties. Turning now to economics, studies on horizontal equality of the fiscal system have already been undertaken by various authors (see for instance Aronson, Johnson and Lambert, 1994, Aronson and Lambert, 1994 and Aronson, Lambert and Trippeer, 1999). This note however will take a different approach. We propose a method that will allow us to identify the level of horizontal inequality for the whole of an economic system. The underlying basis of our method is that vertical inequality corresponds to the level of inequality due to the differences of individual dotation in production factors. We know that through a complex combination of market mechanisms and public interventions, the economic system allows individuals to transform their dotation into income. Within this framework, vertical inequality is therefore measured by considering the predicted income associated with an individual’s dotation. On the other hand, horizontal inequality is due to the gap between observed income and projected income. The note will be structured as follows. The following section will describe the theoretical framework. There will then be an empirical illustration using Albanian data followed by a brief conclusion.

## 2 The Theoretical Framework

Let us consider a society comprised of  $N$  individuals who each have a vector of socio-demographical characteristics  $x_i$ . This society’s economic system

contains market mechanisms as well as public interventions that will transform these vectors of socio-demographical characteristics  $x_i$  into income  $y_i$ . Let us suppose that each individual's income is a function of their demographical characteristics. We then consider that vertical inequality between individuals is the consequence of inequality within the distribution of these characteristics. However, it is possible that the economic system does not generate identical incomes for two individuals which have identical vectors of socio-demographical characteristics. This difference in generated incomes is considered the horizontal inequality of this economic system.

Lets us now suppose that the economic system allows an individual to transform his vector of socio-demographical variables into income according to the following equation:

$$y_i = e^{x_i\beta + \varepsilon_i}, \quad (1)$$

where  $\varepsilon_i$  is a random variable which is normally distributed with a mean of 0. Let us consider the two following vectors:  $y = (y_1, y_2, \dots, y_N)$  is the vector of observed income for  $N$  individuals and  $\hat{y} = (\hat{y}_1, \hat{y}_2, \dots, \hat{y}_N)$  is the vector of predicted incomes  $\hat{y}_i = e^{x_i\hat{\beta}}$ . If  $I(y)$  is any inequality index based on the observed income vector, it can be decomposed into vertical inequality,  $I^v = I(\hat{y})$ , and horizontal inequality of the economic system,  $I^h = I(y) - I(\hat{y})$ .

### 3 Empirical Illustration

To illustrate the methodology presented thus far, we use the "2002 LSMS survey" of Albania which was constructed by the "Albanian Institute of Statistics" along with technical help provided by the World Bank. This database contains observations from 3600 households. We generate an estimated income vector using a Tobit log-linear regression model. The variables for the regression are defined as follows: *hhsiz*e represents the size of the sur-

veyed household. Regional variables such as *rural*, *urban* (other than Tirana), *coastal*, *central* and *mountain* indicate where the surveyed household resides. *Sec1\_1* indicates whether or not the head of the household works in the primary sector. *Sec1\_2* indicates whether or not the head works in the public sector and *Sec1\_3* indicates whether or not the head works in the secondary sector. The interpretation of *Sec2\_1* to *Sec2\_3* is identical to that of *Sec1\_x* stated earlier except that it indicates whether or not the second income generating individual works in the corresponding sector. Migration was captured using *Migration* which is a dichotomic variable that indicates whether or not the household head has ever considered migrating. Highest education level achieved is represented by *Educ 1* to *Educ 7*. *Educ 1* corresponds to the completion of primary school and *Educ 7* corresponds to the completion of post-university studies. *Educnow* indicates whether or not the surveyed individual is currently attending school. *Health* indicates whether the individual surveyed finds it difficult paying for family health care. Lower values for *Health* indicate a greater difficulty to pay for health care. *Illness* indicates how many years the surveyed individual has been living with an illness or a disability. *Land* represents the surface area of farming (agricultural or livestock) land the surveyed individual owns. *Livestock old* and *Livestock young* indicate how many heads of old and young livestock is owned by the individual. And finally, *Estimated price old* and *Estimated price young* represent the log of the estimated worth of either old or young livestock owned by the individual.

Table 1 presents the Tobit regression results. This econometric model is used to calculate the vector of predicted income  $\hat{y}$ . Figure 1 plots those predicted incomes over observed incomes. To evaluate inequality, we call upon the Gini (1921) and the Atkinson (1970) indices. The latter is evalu-

ated with inequality aversion parameters equal to 0.5, 1 and 2 respectively. Table 2 presents the estimations for total inequality, vertical inequality and horizontal inequality. This table shows that horizontal inequality explains 30%, 52%, 50% and 46% of total inequality when using the Gini and Atkinson coefficients with the latter taking values of 0.5, 1 and 2 respectively as inequality aversion parameters. Within the framework of our model, we can conclude that, in Albania, mere chance can explain total inequality as well as the difference in individual characteristics.

## 4 Conclusion

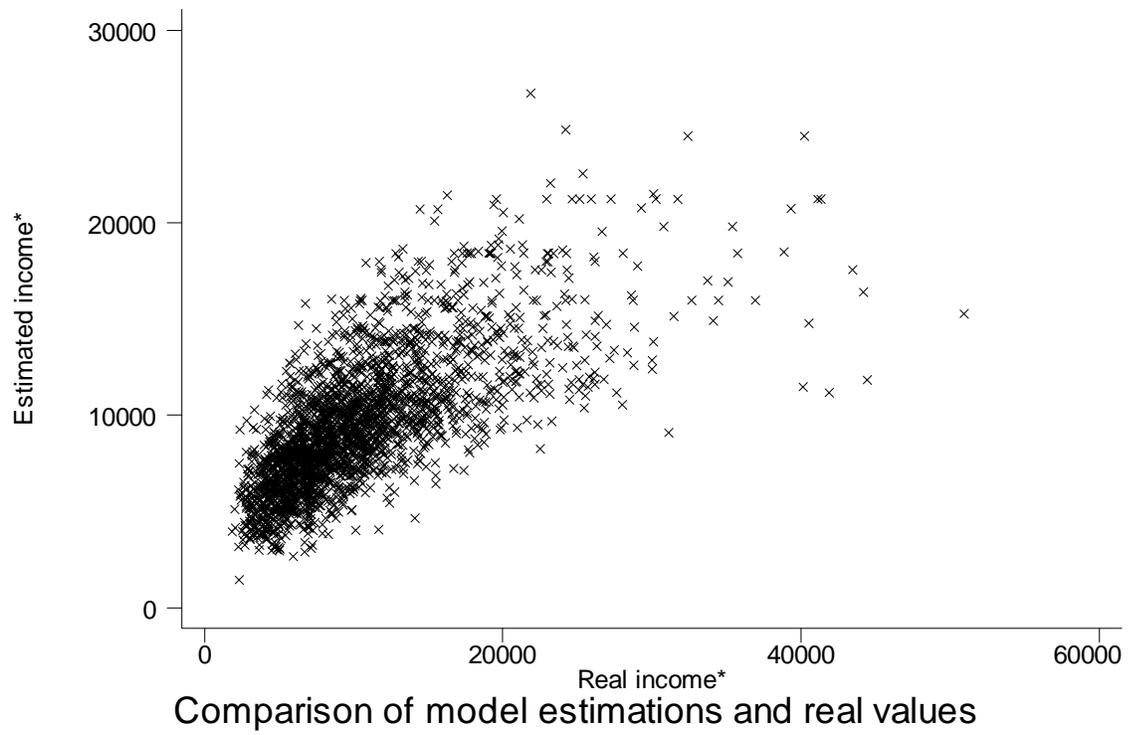
The concept of horizontal inequality is generally used as a tool for the analysis of impacts of redistribution on the fiscal system. This note generalizes the concept of horizontal inequality to the whole of the economic system. The methodology presented is then applied to Albanian data. This empirical example allows us to note that chance can explain almost as much inequality in Albania then can the differences between the levels of individual dotation of production factors.

## References

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**FIGURE 1**



Source : Authors own estimations using 2002 LSMS, Albania.

**Table 1 : Regression Results**

Variable	Coef. (Std. Err)
<i>hhsiz</i>	-0.143** (0.007)
<i>coastal</i>	-0.255** (0.046)
<i>central</i>	-0.358** (0.048)
<i>mountain</i>	-0.396** (0.051)
<i>Sec1_1</i>	-0.194** (0.038)
<i>Sec1_2</i>	0.035 (0.043)
<i>Sec1_3</i>	-0.177** (0.026)
<i>Sec2_1</i>	-0.06* (0.032)
<i>Sec2_2</i>	0.183** (0.093)
<i>Sec2_3</i>	-0.051 (0.036)
<i>rural</i>	-0.078 (0.053)
<i>urban</i>	0.082* (0.046)
<i>migration</i>	0.023 (0.02)
<i>Educ 1</i>	-0.161** (0.067)
<i>Educ 2</i>	-0.067* (0.035)
<i>Educ 3</i>	-0.102** (0.031)
<i>Educ 4</i>	-0.031 (0.042)
<i>Educ 5</i>	0.06* (0.035)
<i>Educ 6</i>	0.18** (0.035)
<i>Educ 7</i>	0.297** (0.143)
<i>Educ now</i>	-0.156 (0.109)
<i>Health 1</i>	-0.161** (0.045)
<i>Health 2</i>	-0.068** (0.041)
<i>Health 3</i>	0.048 (0.038)
<i>Illness</i>	0.004** (0.002)
<i>Land</i>	0.021** (0.006)
<i>Livestock old</i>	0.004** (0.001)
<i>Livestock young</i>	-0.002 (0.001)
<i>Estimated price old</i>	-0.007 (0.005)
<i>Estimated price young</i>	0.002 (0.003)
<i>_cons</i>	10.233** (0.123)

\* : Significant at 90%; \*\* : Significant at 95%. The omitted variable within the regional dichotomy is “Tirana”, for that of education is “vocational school 2 years” and for that of health is “no health care needed”.

**Table 2 : Inequality Indices Estimates**

	Gini	Atkinson (0.5)	Atkinson (1)	Atkinson (2)
Vertical Inequality	0.19812 (70%)	0.03121 (48%)	0.06202 (50%)	0.12269 (54%)
Horizontal Inequality	0,08674 (30%)	0.03334 (52%)	0.06124 (50%)	0.10281 (46%)
Total Inequality	0.28486	0.06455	0.12326	0.22550