The State and Structure of Inequality in the Republic of Haiti

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Abstract

Inequality in the Republic of Haiti is among the highest in the world. Recent data reveal that this country ranks the second highest unequal country in the world only after Namibia. This addresses the issue of inequality decomposition in this country using a regression-based decomposition approach to account for the determinants or the role of different factor components. The approach adopted is for complex survey and differences among geographical regions along with education appear among the most important determinants of inequality in this country. In the meantime, gender differences do not disclose any substantial influence inequality.

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1. Introduction

A lot of water has flowed under the bridge since Kuznets' (1956) groundbreaking paper relating the level of inequality with the stage of development of a country. Kuznet's paper has given rise to the so-called inverted U hypothesis, and a load full of researches ensued either to corroborate it or bring it into disrepute. The debate on the link between inequality level and growth or development process was set in motion and the scope for many an author to submerge into mind exercises was not minute. The inverted U hypothesis has indeed inspired a vast literature. Yet the focus of the majority of the scholarly articles it inspired was on measuring overall inequality within a given country or on performing cross-sectional analyses on a pool of countries to associate their level of inequality with some determinants of each country; those determinants can be the stock of human or physical capital, the GNP per capita, the rate of growth, etc. These types of research to inquire into inequality structure and dynamics so as to acquire more insights on that issue seem to have come of age. Decomposing an aggregate disparity statistics to capture the contribution of each of its components has acquired *droit de cité*. The debate is now on the validity of each of these decomposition approaches.

During the last thirty years the inequality literature has been subject to a proliferation of decomposition methods. These methods have adopted either of the two following stances: subgroup decomposition, where the whole population is partitioned into geographical regions, by population socio-economic characteristics, etc.; or source decomposition, in which each income source in discerned and weighted to determine their association with total inequality. The main objective was the determination of the relative contribution of each subgroup or income source to overall inequality.

The contexts within which applied researchers have implemented these inequality decompositions are vast, albeit the earliest that can be indexed were mostly conducted on less developed countries (LDCs). The most prominent of these earliest decompositions are Theil (1967), Rao (1969), Fei, Ranis, and Pyatt (1976), Kuo (1978), and Fields (1979). The list of new approaches to decomposition has not stopped growing and the

wide range of methods is a *prima facie* evidence of the lack of consensus in the academia about which one is more appropriate. In any event, economists (in particular development economists) have come to recognize the importance of breaking down income into different sources or subgroups in order to determine the influence of each element in overall inequality. Furthermore, the existing decomposition methods have provided applied researchers with greater insights on the description of distributional patterns and this area of research is now regarded as fairly well established. Nevertheless, the inequality literature is under a state of continuous flux and the debate as to best approach to decomposition goes on unabated.

The present research puts at scrutiny the most germane relative inequality decomposition approaches. Subsequently, an application to the Republic of Haiti using a multi-factor components decomposition method is provided. We begin by introducing the preliminary notation and terminology used throughout this paper as well as establishing some basic desirable properties an inequality index should comply with. Section 3 presents a fairly thorough survey of the most popular inequality decomposition methodologies in the literature with a discussion of their strength and shortcomings. In Section 4 we apply a regression-based multi factor components decomposition using the Republic of Haiti Living Conditions Survey data. Section 5 present some final remarks, while Section 6 discusses certain caveats to the present research and suggests some future line research.

2. Analytical framework

2.1 Preliminaries

Consider an $n \times 1$ ordered column vector of non-negative living standards distribution in the Euclidean space $^{n}_{+}$ (which implies that the *n*-tuples origin$[0,0,...,0,0] \in$ ^{n}, i.e. when no individual receive any strictly positive income, is discarded),

$\mathbf{y}:=(y_1, y_2, ..., y_{n-1}, y_n)' \geq 0$. The observations are arranged in increasing order and y_i are bounded below and above by $\alpha = 0$ and $\beta < \infty$, respectively. That is, $y_i \in [\alpha, \beta]$, or equivalently $y_i \in \ _+ := [0, \infty)$, $i = 1, 2, ..., n$. Moreover, let $f(y)$ be the population density function of living standards, then we can posit $F(y) = \int_0^y f(y)dy$ as the probability distribution function, or the proportion of individuals with living standards inferior than or equal to *y*. Accordingly, the p^{th} quantile of individual living standards can be defined as $Q(p) = \inf\{y > 0 | F(y) \geq p\}$, $\forall p \in (0,1]$. Therefore, a Lorenz curve is easily derived as:

[1] $L(p) = \frac{1}{\mu(F)} \int_0^{Q(p)} yF(y)dy, \quad p \in [0,1]$

where $\mu(F)$ is the average living standards defined as:

[2] $\mu(F) = \int_\alpha^\beta yf(y)dy$

Now let $\mathbf{x} := (x_1, x_2, ..., x_{n-1}, x_n)' \geq 0 \in^n$ be another ordered vector of incomes. By extending the Hardy, Littlewood and Pólya Theorem,[1] we can easily establish a strict Lorenz dominance criterion requiring that $\mathbf{x} \succ_L \mathbf{y} \Leftrightarrow I(\mathbf{x}) < I(\mathbf{y})$, where $I(.)$ is a Shur-convex function that summarizes the inequality level for each living standards vector.

2.2 Basic desirable properties of inequality indices

(1) Principle of transfers (Pigou-Dalton principle):

[1] See Hardy, Littlewood and Pólya Theorem (1929).

$$\left(y_1, y_2, ..., y_i, ..., y_j, ..., y_n\right) \prec_I \left(y_1, y_2, ..., y_i + \lambda, ..., y_j - \lambda, ..., y_n\right), \ \ \forall \lambda : 0 < \lambda < \ y_i < y_j$$

This principle, which is of central salience in normative inequality measurement, requires that the index be a Shur-convex function. In other words, it implies that any rank-preserving progressive transfer should reduce the inequality index.[2]

(2) Population independence (or relativity principle):

$$\left(y_1, y_2, ..., y_{n-1}, y_n\right) \ _I \left(y_1, y_1, y_2, y_2, ..., y_{n-1}, y_{n-1}, y_n, y_n\right) \ _I \ ...$$
$$_I \left(\underbrace{y_1, y_1, y_1, y_1}_{m}, \underbrace{y_2, y_2, y_2, y_2}_{m}, ..., \underbrace{y_{n-1}, y_{n-1}, y_{n-1}, y_{n-1}}_{m}, \underbrace{y_n, y_n, y_n, y_n}_{m} \right)$$

By this principle one can read that, if the proportions of living standards accruing to each population segment do not change, the index is invariant to overall changes in the number of individuals.

(3) Scale invariance (or homogeneity of degree zero):

$$\left(y_1, y_2, ..., y_{n-1}, y_n\right) \equiv_I \left(\lambda y_1, \lambda y_2, ..., \lambda y_{n-1}, \lambda y_n\right), \forall \lambda$$

This property implies that the inequality contour map is invariant after a scalar transformation of individual living standards.

(4) Anonymity (or symmetry):

[2] Various authors make a strong case against this criterion, in that a transfer may reduce inequality between the two individuals involved in the transaction but not necessarily over the whole spectrum of the distribution. Also, the way in which people appear to make inequality comparisons seems to not correspond with Pigou-Dalton principle (for an in-depth discussion on this issue see for instance, Amiel and Cowell (1999a, 1999b), and Chateauneuf and Moyes, 2005).

$(y_1, y_2, ..., y_{n-1}, y_n)$ $_I$ $(y_n, y_2, .., y_1, y_{n-1})$ $_I$ $(y_2, y_{n-1}.., y_n, y_1,)$

According to this property, the inequality index remains unaffected if interpersonal permutations of living standards are performed. In order words, the ordering principle makes use only of the information on the living standards and not of some other individual characteristic.

(5) Additive decomposability:

Let $\Gamma := \{\eta_1, \eta_2, ..., \eta_{K-1}, \eta_K\}$ be a collection of finite number *K* reflecting a partition, and let $p(k)$ and $F^{(k)}$ be respectively the proportion of a group $k\{k = 1, 2, ..., K-1, K\}$ in total population and the living standards distribution in group *k*. We may then posit the relative share of living standards of group *k* in the following manner:

[3] $\phi(k) := \dfrac{p(k)\mu\left(F^{(k)}\right)}{\mu(F)}$

$\mu\left(F^{(k)}\right)$ and $\mu(F)$ are the mean income of group *k* and the mean income of the whole population respectively. Thus, group consistency property will require that overall inequality $I(F)$ be an increasing function of each and every living standards distribution of component *k*, i.e. $I\left(F^{(k)}\right)$, which in mathematical term can be formulated as:

[4] $I(F) = \Phi\left\{I\left(F^{(1)}\right), I\left(F^{(2)}\right), ..., I\left(F^{(K-1)}\right), I\left(F^{(K)}\right); p_1, p_2, ..., p_{K-1}, p_K; \phi_1, \phi_2, ..., \phi_{K-1}, \phi_K\right\}$

Therefore, the additive decomposability axiom establishes that:

[5] $I(F)=\sum_{k=1}^{K}\underbrace{s_k I\left(F^{(k)}\right)}_{\text{Intragroup}}+\underbrace{I\left(F^{(\Gamma)}\right)}_{\text{Intergroup}}$, with $s_k=s\left[p(k),\phi(k)\right]\geq 0$ and $\sum_{k=1}^{K}s_k=1$.[3]

(6) $I(F)\in[0,1]$.

The interpretation of property (6) should be self-evident. It requires that the value of $I(F)$ fall within the closed interval $[0,1]$. This makes any inequality index more suitable for inter-temporal or cross-country comparisons.

(7) $I(F)\left[\mu(F),\mu(F),...,\mu(F)\right]=0$

Property (7) naturally implies that the value of inequality be zero when every individual has the average income. Another property, stemmed from a combination of axioms (1), (3), and (5), is that of continuity, which requires that the inequality index be a continuous function of living standards over the whole distribution.[4] Folk wisdom in normative inequality assessment would put it that compliance of an inequality index with these basic properties should increase its appeal for applied work and practical purposes.

3. Brief survey of decomposition methods

3.1 Generalized Entropy

The first attempt to additively decompose inequality indexes catalogued in the literature is the generalized entropy family indices (*GE*), of which the Theil's (1967) index is a special case. The exact decomposition of the generalized entropy into intra (within) and inter (between) group inequality can be formulated as follows:

[3] See Shorrocks (1984, 1988) and Cowell (1998) for further discussions.

[4] As is also evident, axioms 1 and 3 taken together have a corollary axiom: the uniform addition axiom, which implies that, if a transfer of equal size is performed on every individual's living standards, the inequality index decreases. This axiom is for absolute inequality indices, while the rest presented here are for both absolute and relative indices (with the exception of axiom 3, which relates to absolute indices).

$$[6]\quad GE(\theta) := \underbrace{\sum_{k=1}^{K} p(k)\left[\frac{\mu\left(F^{(k)}\right)}{\mu(F)}\right]^{\theta} GE(k:\theta)}_{\text{Intra-group inequality}} + \underbrace{\overline{GE}(\theta)}_{\text{Inter-group inequality}}$$

where $\theta \in (-\infty, +\infty)$ is a parameter that captures the income difference sensitivity or inequality aversion. Except for $GE(\cdot)$ in Equation [6] the other variables are as defined in Equation [3]. Thus, $GE(k;\theta)$ is the observed inequality in group *k*. The first part of the right hand side of Equation [6] represents the intra group inequality while the second part, $\overline{GE}(\theta)$, gives the inter-group inequality assuming that living standards are distributed evenly across individuals in each population group *k*. That is, $y_j = \mu\left(F^{(k)}\right),\ \forall\, j = 1,...,k$. $GE(0)$ and $GE(1)$ are respectively the second (also referred to as the Mean Logarithmic Deviation, MLD) and the first Theil indices. The index, which is based on the Second Law of Thermodynamics, i.e. the entropy or information theory, has been a major breakthrough in the inequality decomposition literature.[5] Since the entropy is positively correlated with the probability of occurrence of the event under consideration, consequently, as the probability of occurrence of an event goes to unity the information it conveys will approach nullity. That is probably the major source of complexity and drawbacks of the Theil index since: a) it is too difficulty to be interpreted intuitively and; b) it does not have an upper bound because its value grows monotonically with the sample size $\{\text{Theil} \in [0, \log n]\}$, which means the bigger the sample for which inequality is to be measured the greater the index will tend to be. These features make the Theil index not very popular in empirical works when it comes to making cross country comparisons, even though it complies with most of the basic axioms of a "well-behaved" inequality index. Besides, with the exception of $GE(0)$, $GE(\cdot)$ decomposition is path dependent in the sense that the different components used in the decomposition are not

[5] Bhattacharya and Mahalanobis (1967) also proposed a decomposition for Gini the same year, but it was later revealed in Bourguignon (1979) that the within component of their decomposition method was mis-specified.

independent from one another, making modifications in inter-group inequality to echo through intra-group inequality. More importantly, it fails to comply with axioms (2) and (6) and any attempt at normalizing $GE(\cdot)$ to make it satisfy this axiom will be at the expense of properties (5).[6] In any event, as is shown by Cowell (2006), subsequent approaches to inequality decomposition share many characteristics with the Theil index and are in fact closely related to it because of its natural decomposability.

3.2 Decomposition of the Gini index

Due to its intuitive interpretation, its Lorenz consistency and, above all, the easiness with which cross country comparisons can be carried out, the Gini index is the most widely used in empirical works.[7] Much effort has been exerted to decompose it into various components. However, as Xu (2003) put it, not very successful conclusions have been reached since it is not very clear what meaningful interpretation each and every decomposed part of the Gini index has. Most importantly, abstracting from Araar's (2006) paper, the earliest decomposition methods have not been able to exactly and additively decompose the Gini index. The earliest decompositions of Gini were proposed by Bhattacharya and Mahalanobis (1967), Rao (1969), Fei and Ranis (1974), and Pyatt (1976), among others. Generally, subgroup decompositions, which assume that overall inequality may be computed from the weight of each population subgroup, their mean income and their respective inequality measure, can be formulated as follows:

$$[7] \quad G = \sum_{k=1}^{K} p(k)G(k) + G_{Inter-group} + R$$

where $G(k)$ is the Gini index for some group *k*. So, the first term on the right hand side of Equation [7] represents intra-group inequality. For the last two components, $G_{Inter-group}$ is the Gini index between groups while *R* is a residual term. This

[6] See Foster and Shneyerov (2000) for further discussions.
[7] See the formulation and related issues on the Gini index in appendix A.

last term has been given various interpretations but no precise and consensual rendition of this residual (most commonly referred to as the interaction or cross-over term in the literature) has hitherto been reached. Its ascription to either the intra or the inter-group inequality has also been much written about and generated heated debate.

Silber (1989) and Silber (1993) introduce an $n \times n$ genetic variance-covariance matrix (the *G*-matrix) to derive in, paraphrasing the authors, a straightforward and intuitive interpretation of *R.*. They make use of this matrix to decompose Gini either by factor components, income classes, or population subgroups. They sustain that it is a permutation term that captures individual re-rankings when the rank of an individual in total income differs from her/his rank in the subgroup *k* to which he/she belongs. In the case of income class decomposition an aggregation term would arise when individuals do not receive every source of income.[8]

Other decompositions of the Gini index have been proposed giving somewhat different interpretations of the various components. Lambert and Aronson (1993) for instance interpret geometrically the residual term as a sub-area of the Lorenz curve when there exists overlapping between subgroup income ranges. This sub-area measure is a between groups phenomenon, an overlapping, generated by inequality within groups (Lambert and Aronson, 1993). The specification the authors propose is as follows:

$$[8] \quad G = 2\int_0^1 \left[q - L_B(q) \right] dq + 2\int_1^0 \left[L_B(q) - C(q) \right] dq + 2\int_0^1 \left[C(q) - L_B(q) \right] dq$$

where *q* is individuals' income ranks, mingled naturally with the subgroups ranks, in a parade. Therefore, it is straightforward that $L_B(q)$ is the Lorenz curve reflecting inequality among the different subgroups while $C(q)$ is the measure of the income that accrues to the first *nq* individuals in the parade, i.e. a concentration curve (See Lambert and Aronson 1993 for more discussion). In Dagum (1997a) in turn, this term is construed

[8] For a full account see Silber (1989) and Silber (1993).

as the intensity of transvariation between subgroups to the total Gini index. Pyatt (1976) and Morkherjee and Shorrocks (1982) go along the same line although they sustained that it is hard, let alone impossible, to accurately define and precisely interpret that residual term. Besides, each of the existing techniques has been proposed either for population subgroups decomposition or income source decomposition. At times one is left with the impression that the different approaches advanced are *ad hoc* or specially tailored techniques for specific problems. The works of Cowell and Jenkins (1995), Jenkins (1995), Bouillon, Legovini, and Lustig (1998), and Bourguignon, Fournier, and Gurgand (1998) give a good account of the many problems these decomposition approaches carry along. Moreover, many of the problems that beset the Theil decomposition impinge on the Gini decomposition as well. Finally, along with the Generalized Entropy, Gini subgroup decomposition tend to exaggerate the relative role of non-systematic factors (as reflected in the intra-group inequality) since the decomposition can only be implemented on discrete categories (Morduch and Sicular, 2002). The authors also reject the Gini decomposition for its non compliance with the uniform additions principle.[9]

3.3 The shapely framework

As is rightly pointed out by Shorrocks (1999), it is commonly recognized that all these decomposition approaches impose constraining conditions on, and by that limit, the class of inequality measures susceptible to be used. Additionally, the interpretation of the contribution of the different factors is not meaningful, let alone intuitive. Another predominant problem is the restriction on the types of contributory factors that can be accounted for in multi-factor decomposition, and the inexistence of a single framework

[9] This principle requires that the addition of a constant to the income of each individual be inequality-reducing.

that allows simultaneous decomposition by subgroups and income sources. In that sense, a turning point in the inequality decomposition literature in particular and welfare assessment in general appears to be the work of Shorrocks (1999). Using the Shapley Value (1953), Shorrocks (1999) developed a unified framework for welfare assessment.[10] The ultimate aim of the decomposition analysis via this method is no different from the previous ones, i.e. gauging the relative importance or contribution of each and every factor component to overall inequality. The only exception is that this method allows an exact decomposition of any aggregate statistical indicator, with no need to appeal to any hazy concept of aggregation, overlapping, permutation, or transvariation term that emerges in other approaches to decomposition.

The Shapley Value is a solution concept from (cooperative) game theory the characterization of which can be done on account of the following premises: Consider a finite set Θ of η players indexed by $\eta \in \Theta = \{1, 2, ..., \rho - 1, \rho\}$ in a game denominated κ, and suppose that the finite set Θ can be split up into Φ non-empty subsets or coalitions of players, with $\eta \subset \Phi \subseteq \Theta$. Now let $\kappa(\Phi)_{|\kappa(\varnothing)=0} \in$ be a function that suitably defines a coalition's total payoff (or power) in the game connivance free with players from other coalitions $(\text{i.e. } \rho - \phi - 1 \notin \Phi)$, where ϕ is an indicator of the size of coalition Φ and is bounded by $\phi \in \{0, 1, ..., \rho - 2, \rho - 1\}$. Assume that the players are ordered in a random fashion and label such an order φ, so that:

[9] $$\varphi = \left\{ \overbrace{\varphi_1, \varphi_2, ..., \varphi_{\rho-1}}^{\phi}, \varphi_\rho, \overbrace{\varphi_{\rho+1}, \varphi_\rho}^{\rho-\phi-1} \right\}$$

[10] Pioneering attempts to massage the Shapley Value into a generalize framework can be found in Aumann and Drèze (1974), and Owen (1977). The application of the Shapley to inequality analysis was previously done by Rongve (1995), and Chantreuil and Channoy (1997). However, these last authors confined their research to solely inequality decomposition by income source and have not realized, as Shorrocks (1999) mentioned, that it could be generalized to any aggregate statistics.

Given that order, now imagine the players file off one by one to collect their payoff. This gives a total number of possible permutations $\rho!$. By the same token, the number of possible permutations for the first ϕ players within a coalition Φ equals $\phi!$. Consequently, the remaining $\rho-\phi-1$ players would yield $(\rho-\phi-1)!$ number of possible permutations. It is straightforward that the number of possible permutations in a scenario where the first ϕ players $\subseteq \Phi$ is $\phi!(\rho-\phi-1)!$. Therefore, we can express the probability that the first ϕ players of φ be all elements of Φ by $\phi!(\rho-\phi-1)!/\rho!$. Ergo, the Shapley Value of player η is $\psi_\eta^\Phi(\Theta,\kappa)$, which is the weighted means of her/his marginal contributions $\kappa(\Phi\cup\{\eta\})-\kappa(\Phi)$ to all coalitions, $\Phi\subseteq\Theta-\{\eta\}$, is given by:

$$[10]\ \psi_\eta^\Phi(\Theta,\kappa)=\sum_{\phi=0}^{\rho-1}\sum_{\substack{\Phi\subseteq\Theta-\{\eta\}\\|\Phi|=\phi}}\frac{\phi(\rho-\phi-1)!}{\rho!}\Gamma(\Phi,\eta)$$

where $\Gamma(\Phi,\eta)=\kappa(\Phi\cup\{\eta\})-\kappa(\Phi)$ is the weighted mean of player η's marginal contributions**.** This is easily extrapolated to distributive analysis where, in lieu of considering players, the ρ_S are construed as contributory factors, which altogether fully account for the observed inequality phenomenon *I* captured by, say, an aggregator function $f_I(\pi_1,\pi_2,...,\pi_{\rho-1},\pi_\rho)\rightarrow\ _+$. So, the value of *I* would be given by the sum of the π_{ks} contributory factors.

Many researchers believe that this approach has revolutionized the welfare decomposition literature in general and the inequality decomposition in particular.[11] However, one important question to beg is the following: if one is interested in determining the impact of eliminating or adding components on the inequality coefficient, in what specific order are these eliminations or additions to be carried out? This is not a trivial question because, depending on the order of the elimination (addition)

[11] There is a synthetic method of Gini decomposition proposed by Mussard (2003) and largely based on Dagum (1997a, 1997b), whereby the author merges the two types of Gini decomposition, viz. by subgroups and sources, and provides an exact decomposition.

of a component from (to) the set of complementary factors, the marginal impact on inequality may be quite different. Besides, the rank of the components is not accounted for under this framework. So, this decomposition procedure takes no heed of the re-ranking potential of a component nor does it leave room for possible interactions between the different components, as is done in the traditional decomposition methods. So, as Araar (2006) put it, the Shapley decomposition may not be the most appropriate when interaction between factors represents the characteristic function (that is, the welfare index). Moreover, the Shapley decomposition is disaggregation-dependent, in the sense that the marginal contribution of a component to overall inequality is negatively correlated with the number of components.

4. Regression-based decompositions

Contrary to the traditional decomposition methods and the Shapley approach just analyzed, regression-based decompositions offer a particular advantage. They enable identification as well as quantification of root causes or determinants of inequality (see Wan, 2004). Moreover, because of the complexities that may arise as the number of components increases, it is most common to observe certain constraints on the contributory factors in, for instance, the Shapley and other traditional inequality decomposition approaches. These constraints are generally imposed with the risk of mis-specifying the income generating process. The earliest attempts at decomposing inequality using regression-based approach are Oaxaca (1973) and Blinder (1973). Various researches that built on these pioneering works ensued (see Juhn, Murphy, and Pierce (1993); DiNardo, Fortin and Lemiux (1996); Deaton (1997); Fields and Yoo (2000); Bourguignon, Fournier, and Gurgran (2001); Morduch and Sicular (2002)). Regression-based decompositions are very appealing to economists and policy-makers as they allow accommodation of endogeneity of income determination and random errors (Wan, 2004). In this section we posit an income-generating-function equation to account separately for the role of multiple covariates in the level of inequality from a single

survey. We follow Fields' (2002 & 2004) methodology to additively decompose inequality for a set of covariates.

4.1 The model

Let y_i be the income of individual *i*, then the income-generating-function may be expressed as follows:

[11] $$\ln y_i = \delta + \sum_j \gamma_j x_{ij} + \varepsilon_i$$

where x_{ij} are covariates that capture individual characteristics, and δ and γ_j are parameters to be estimated; finally, ε_i is the traditional error term for which the usual *iid* hypothesis applies.[12] Equation [11] may be rewritten as:

[12] $$\ln y_i = \sum d_j \Omega_{ij} = \mathbf{d}' \mathbf{\Omega}_i$$

where

[13] $$\mathbf{d} = [\delta \ \gamma_1 \ \gamma_2 ... \ \gamma_{J-1} \ \gamma_J \ 1]$$

and

[14] $$\mathbf{\Omega}_i = [1 \ x_{i1} \ x_{i2} ... x_{iJ-1} \ x_{iJ} \ \varepsilon_i \ ]$$

The decomposition procedure for a single survey is to first take the variance of equation [12] to yield, on the left-hand side, the log-variance as the inequality measure and then proceed by manipulation of the right-hand side to reach the contribution of each and every covariate to that inequality measure.

[12] In that case, subsumed in this assumption is that proper correction for clustering is accounted for.

Appealing to the Mood, Graybill and Boes *Theorem,* define two sets of random variables $\Gamma_1, \Gamma_2, ..., \Gamma_M$ and $\Psi_1, \Psi_2, ..., \Psi_N$. If $\alpha_1, \alpha_2, ..., \alpha_M$ and $\beta_1, \beta_2, ..., \beta_N$ are two sets of parameters, then

$$[15] \quad \operatorname{cov}\left[\sum_{n=1}^{M} \alpha_m \Gamma_m, \sum_{n=1}^{N} \beta_n \Psi_n\right] = \sum_{m=1}^{M} \sum_{n=1}^{N} \alpha_m \beta_n \operatorname{cov}\left[\Gamma_m, \Psi_n\right]$$

And by extrapolating to one set of random variable that allows expressing $\ln y = \sum_{j=1}^{J+2} d_j \Omega_j$, we may then posit:

$$[16] \quad \operatorname{cov}\left[\sum_{j=1}^{J+2} d_j \Omega_j, \ln y\right] = \sum_{j=1}^{J+2} \operatorname{cov}\left[d_j \Omega_j, \ln y\right]$$

The above formulation implies that

$$[17] \quad \sigma^2 (\ln y) = \sum_{j=1}^{J+2} \operatorname{cov}\left[d_j \Omega_j, \ln y\right]^{13}$$

Now dividing [17] by $\sigma^2 (\ln y)$ yields,

$$[18] \quad 1 = \frac{\sum_{j=1}^{J+2} \operatorname{cov}\left[d_j \Omega_j, \ln y\right]}{\sigma^2 (\ln y)} = \sum_{j=1}^{J+2} w_j (\ln y)$$

where

$$[19] \quad w_j (\ln y) = \frac{\operatorname{cov}\left[d_j \Omega_j, \ln y\right]}{\sigma^2 (\ln y)} =$$

[13] Since cov(a,a) = Var(a).

$w_j(\ln y)$ is the relative inequality weight, or the percentage of income inequality attributable to the *j*-th covariate. Additionally, when the stochastic term of [14] is excluded we are left with the fraction of the sample variation in ln *y* explained by the set of covariates, that is the coefficient of determination, R^2, which may be expressed as

$$[20]\ R^2 = \frac{\sum_{j=1}^{J+1} \mathrm{cov}\left[d_j \Omega_j, \ln y\right]}{\sigma^2(\ln y)}$$

Let us recall that, $cor[a,b] = \frac{\mathrm{cov}[a,b]}{\sigma(a)\sigma(b)}$, which allows positing

$$[21]\ cor\left[d_j \Omega_j, \ln y\right] = \frac{\mathrm{cov}\left[d_j \Omega_j, \ln y\right]}{\sigma\left(d_j \Omega_j\right)\sigma(\ln y)}$$

By combining Equations [17], [18], [19], and [21] we have the following decomposition:

$$[22]\ w_j(\ln y) = \frac{\mathrm{cov}\left[d_j \Omega_j, \ln y\right]}{\sigma^2(\ln y)} = \frac{d_j \sigma\left(\Omega_j\right) cor\left[d_j \Omega_j, \ln y\right]}{\sigma(\ln y)}$$

where

$$[23]\quad \sum_{j=1}^{J+2} w_j(\ln y) = 1$$

and

$$[24]\quad \sum_{j=1}^{J+1} w_j(\ln y) = R^2$$

Thus the fraction of the log-variance explained by (or the relative contribution of) the *j*-th covariate is given by

$$[25] \quad p_j := \frac{w_j(\ln y)}{R^2}$$

Sen (1973), and Foster and Ok (1999) suggested that the log-variance does not satisfy the scale invariance property of inequality index, which makes the use of this measure not very suitable from an axiomatic standpoint and calls for more appropriate indices.

If we define an individual's income, y_i, as coming primarily from various sources or factor components *k*, then we can posit

$$[26] \quad y_i = \sum_{k=1}^{K} y_{ik}$$

By definition total number of income receivers is $y := (y_1, y_2, ..., y_{n-1}, y_n)$, for *n* income recipients; while the absolute contribution of factor *k* to total income is $y_k := (y_{1k}, y_{2k}, ..., y_{(n-1)k}, y_{nk})$. If we denote by w_k the relative weight associated with factor *k* in total inequality, it is easily proven that under certain conditions the contribution of factor component *k* to overall inequality can equivalently be given by [14]

$$[27] \quad w_k = \frac{\mathrm{cov}(y_k, y)}{\sigma^2(y)}$$

such that

[14] See Shorrocks (1982) for further insight on the six conditions imposed and the issues involved.

[28] $\sum w_k = 1$

for *any* inequality index that satisfies the anonymity and continuity properties, and for which the index is null when all individuals have the average income. It is easily proven that, by decomposing [26], the resultant is identical to equations [27] and [28], which are reminiscent of [22] and [23], with y_k standing for $d_j \Omega_j$, and y substituting ln y (see Shorrocks, 1982). In other words, the results hold for a wide range of inequality indices satisfying the three conditions enunciated earlier, *viz.*, anonymity, continuity and $I(F)\left[\mu(F), \mu(F), ..., \mu(F)\right] = 0$. Most "well-behaved" relative inequality indices fall within such range. There exist other regression-based methodologies proposed by other authors but Fields' (2002) is proven to be more flexible in that the decomposition is valid for a wide range of inequality measures and multiple explanatory variables (see Fields (2002) and Fields (2004) for further extensions of this methodology and limitations of other methodologies proposed).

The underlying model to estimate equation [11] is generally based on human capital theory. But as of now we discard the use of a standard Mincer-type equation since we are interested in measuring total income (not earnings) inequality. Accordingly, the dependent variable is log of income and the set of covariates are treated in a discrete fashion. A weighted least squares, using the households weight and size as inflation factors, is performed in order to have consistent point estimators. Because of population heterogeneity (e.g. substantial variability across strata), additional corrections to account for survey design, namely stratification and clustering, are also introduced for efficiency. Our estimation procedure is thus for complex survey data.[15]

4.2 Anatomy of income distribution and discussions

[15] For further insight on how to deal with complex survey see Carrington, Eltinge and McCue, (2000).

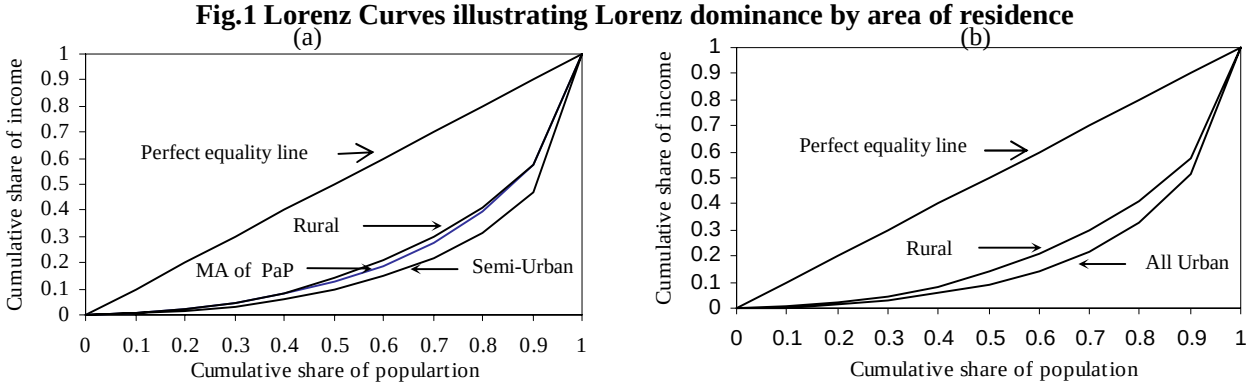
Inequality in the Republic of Haiti is among the highest in the world. At a 95 per cent confidence level the estimated Gini Index lies within the interval $[0.6233, 0.6681]$; our best point estimate is 0.6457 (Std error = 0.0122). As can be observed from Table 1 below, with this Gini Index the Republic of Haiti ranks the second highest unequal country in the world after Namibia. As can be observed by the Lorenz dominance in figure below, where swift action is to be taken to improve income distribution in is the urban areas.

Table 1. Gini index for selected countries and regions

Namibia	0.71
Republic of Haiti*	0.65
Brazil	0.60
Latin America and the Caribbean	0.49
Sub-Saharan Africa	0.47
South-Asia	0.32

Source: World Bank, World Development Indicators 2001, except for *, which is author's own calculations based on the ECVH-2001. *Note*: weighted and proper design-based data. Those indices should be taken cautiously as direct comparison may not be possible on account of different methodologies that may have been used to provide those estimates.

Fig.1 Lorenz Curves illustrating Lorenz dominance by area of residence



Although inequality should not be construed as an evil per se, we can assert however that such an inequality level for the Republic of Haiti is beyond misgivings a hindrance to sustained growth, which is utmost importance to this Caribbean nation. Many could hold that by conventional wisdom high levels of inequality are growth-enhancing because of the alleged higher propensity to save of the rich (or capital owners) relative to the poor (or wage earners). Albeit this allegation is in line with some so-called standard economic theory,[16] besides the conspicuous consumption pattern that is characteristic of the Haitian

[16] This proposition has been formalized first by Kaldor (1955).

economic elite that is not conducive to sustainable growth, there are socioeconomic impacts engendered by that level of inequality that would inhibit the materialization of economic growth. For instance, an overriding channel through which such a high inequality level has apparently affected growth negatively in the Republic of Haiti is via the social tensions it breeds and the ensuing political instability, which do not create an atmosphere for investment and therefore makes growth not forthcoming.

Additional pathways through which this high inequality level appears to have had a negative influence on growth and development prospects in the Republic of Haiti is its strong positive effect on the fertility rate because of the meager share of income that accrues to the evanescent Haitian middle class. Many studies have established an inverse correlation between fertility and growth via the negative impact a low level of education on the former. Inequality is assumed to limit the possibility of investment in education. So, if there exists not public provision for education to all, high levels of inequality will lead to low level of education, which in turn makes place for high fertility rates. So, high levels of inequality lay the foundation for high fertility rates.[17] This has evidently a depressing effect on growth and mortgages any pretension of development planning. Fertility rate in the Republic of Haiti, although it has been declining in the last years, is the highest in the Latin America and Caribbean region with 5 births per childbearing woman as of 2001.[18] That fertility rate, despite the importance of emigration and a high mortality rate, places the Republic of Haiti with one of the highest population growth rate in the region, with over 2 per cent average increase per year. Under such a scenario, real GDP growth per capita would have to be at least 2 per cent to prevent the erosion of the already puny per capita income. Yet, the Republic of Haiti has rather experienced nominal GDP contraction in the last two decades or so.[19]

[17] In that respect, see among others Nelson (1956), Becker, Murphy, and Tamura (1990), Morand (2000), Ahituv (2001), Kremer and Chen (2002), and Ahituv and Moav (2003).
[18] For the same period weighted average fertility rate in the LAC region is 2.6 (see ECLAC 2002-03).
[19] The Haitian economy has experienced a 36 per cent contraction between 1986 and 2000. An additional 10 per cent decline was registered in the wake of the 2000 presidential elections until 2006.

Moreover, it is also very probable that under the credit imperfections that characterize the Haitian financial market, this high income disparity curtails access to capital to the vast majority of the Haitian poor, particularly to entrepreneurs without collaterals. This definitely has a depressing effect on private investment, but it also constrains human capital accumulation so badly needed to unleash the productive potential of the poor and promote growth.[20] Many studies testify to this in the case of the Latin American countries (see among others Larraín and Vergara, 1993 & 1998; Altimir, 1998; Birdsall, Pinckney, and Sabot, 1998). So, it is not unreasonable to sustain that such a high level of inequality would almost surely depress the growth elasticity of poverty,[21] if growth there were. Besides these interactions, and as is suggested by many contemporary studies,[22] high level of inequality normally plays out against the backdrop of very poor institutions, which in turn are pernicious to society's welfare as it promotes rent seeking and insecure property rights that are detrimental to growth. In a dual causality framework, some authors also found that inequality and institutions reinforce each other. But the higher the former is the poorer the quality of institutions.[23] For a survey of the various channels through which inequality negatively affects growth via its impact on certain key social variables such as low level of education and health, high rate of crime, and political conflict, see Thorbecke and Charumilind (2002).[24]

Data unavailability inhibits carrying out a rigorous analysis and deriving a quantitative assessment of these effects for the Republic of Haiti. Nevertheless, the recent developments in this country's political affairs along with the human development index data from various international institutions make the conjectures almost irrefutable.

[20] For further insight into this literature see Perotti (1993, 1994), Alesina and Perotti (1994), Persson and Tabellini (1994), Alesina and Perotti (1996), Perotti (1996), Galor and Zeira (1993), and Galor (2000).
[21] See in that respect Bourguignon (2003), Ravallion (1997), Ravallion and Chen (1997).
[22] See among other Sonin (2003), Hoff and Stiglitz (2004), Chong and Grastein (2004).
[23] See among others Chong and Gradstein (2004) for a dynamic model for a model of causality between inequality and institutions.
[24] Other studies (e.g. Alesina and Rodrik 1994; Deininger and Squire, 1998) disclose no significant effect of income inequality on growth when controlling for land ownership inequality. Also, Barro (2000) noted that inequality has differentiated impact on growth depending on the country's level of development. He sustained that inequality has a positive effect on growth in developed countries, while it affects growth negatively in low-income countries.

Indeed, the instances of the socio-economic impacts of inequality in this country abound. But going into particulars is beyond the scope of the present work. It is worth mentioning however that this country has evidenced how distributional conflict fostered all sort of instability going from riots, macroeconomic instability, violent airing of grievances, to bloody *coup-d'états* in the last two decades or so. Unavailability of data inhibits carrying out a rigorous analysis to certify the above assertion. However, it is worth pointing out that *Cap-Haïtien, Fort Liberté, Gonaïves*, and *Port-au-Prince*, chief-towns of *Départements du Nord, Nord-Est, Artibonite,* and *Ouest,* respectively, are the hottest spots and the traditional epicenters of this country's class conflicts and political upheavals. Incidentally these regions also register the highest inequality levels (see Table A2 in appendix for Gini Index by *Départements*).

So, reducing that level of inequality in the Republic of Haiti should be an imperative *per se*. In that respect, along with the design and enforcement of a progressive tax structure that truly reflects and expresses the sense and spirit of distributive and social justice, the public sector has a major role to play in the design of an education system accessible to all so it can become a lever to reshape the income distribution. In other words, any forward-looking anti-poverty policy and the construction of a society of justice in the Republic of Haiti would have to consider its present state of inequality a concern in its own right.

The decomposition of inequality provides us with a better picture of some relevant factors that affect or help explain the level of inequality in the Republic Haiti. Using the regression-based methodology discussed earlier, we incorporate variables that are deemed relevant to understand the root causes of inequality in the Republic of Haiti. A standard Mincer-type model is generally used for an earning generating equation. But this is discarded in the present analysis since we are interested in measuring total income, and not earning, inequality. Accordingly, the dependent variable is the logarithm of total income including self-consumption and barter.

The set of covariates are treated in a discrete fashion, in particular to relax the assumption of constant marginal returns to education and as such better capture the between educational levels earning differentials. A weighted least squares for complex survey, using the household weight and size as inflation factors, is estimated to ensure consistency of the parameters' estimates. Given population heterogeneity (e.g. substantial variability across strata) additional corrections to account for complex survey design, i.e. stratification and clustering, are also introduced to have efficient parameters (see Carrington, Eltinge and McCue (2000) for the issues involved in such a task). The regression results are presented in Table 2 below. White-Huber-Eicker (Sandwich) standard errors are used in the derivation of each factor's contribution to inequality and Wald test revealed joint significance for all dummies within a category. Except for age profile, the contribution of which to total inequality is negligible, the signs of the parameter estimates are as expected.

Table 2. Results of income function. Depvar: Log of per adult equivalent (WHO-scale) income

Obs 7157	Pop.			
size 8074008				
Number of Strata 9	P > F			
0.0000				
Number of PSUs 496	R^2			
0.3161		Estimate	Robust Std.†	Deff[25]	Contribution (p_j)
Education					**0.3212**
(Reference: No education)					
Primary***		0.3695	0.0469	2.0648	
Secondary***		0.7972	0.0743	3.2423	
Post-secondary or higher***		1.9094	0.1746	2.2546	
Age profile					**0.0029**
(Reference: Age 15-25)					
26-40		-0.0366	0.0616	1.4763	
41-55**		-0.1341	0.0612	1.3654	
55-65		0.0818	0.0729	1.4749	
>65**		0.1429	0.0707	1.1187	
Gender (1 if Female)***		-0.1268	0.0346	1.5616	**0.0112**
Labor market status					**0.0318**
(Reference employed)					
Unemployed (according to ILO)***		-0.4044	0.0798	2.3879	
Inactive***		-0.2451	0.0468	1.5023	
Transfer (1 if household receives transfers from abroad)***		0.5815	0.0473	2.2409	**0.1630**
Agricultural Land Ownership (area in sq. meters)					**0.0595**
(Reference: No land)					
1-1000***		-0.5038	0.1380	3.8696	
1001-5000**		-0.1527	0.0744	2.4412	
5001-10000		-0.1125	0.0757	2.7876	
10001-25000		0.0508	0.0758	2.5045	
>25000***		0.2522	0.0861	2.9764	
Geographic Department					**0.4103**
(Reference: Ouest)					
Sud-Est***		-0.5429	0.1047	3.2090	
Nord***		-0.7374	0.1032	3.6757	
Nord-Est***		-1.6303	0.1397	2.8662	
Artibonite***		-0.7830	0.1454	8.7998	
Centre***		-0.5636	0.1048	3.7333	
Sud***		-0.7146	0.1158	4.7353	
Grande-Anse***		-0.8277	0.1103	3.8053	
Nord-Ouest***		-0.8416	0.1344	4.3088	
Intercept		8.2474	0.1009	3.1313	
Total					**1.0000**

[25] The design effect (Deff) arises from the deviation between the variance of the complex survey design $(\sigma^2_{complex})$ and the variance under assumptions of simple random sampling (σ^2_{SRS}). Since $\sigma^2_{complex} = \sigma^2_{SRS}\left[1+\rho\left(\bar{n}-1\right)\right]$, thus Deff $= \sigma^2_{complex} / \sigma^2_{SRS} = \left[1+\rho\left(\bar{n}-1\right)\right]$, where ρ and $\bar{n}$ are the intra-cluster correlation coefficient and the average cluster size, respectively. Accordingly, Deff > 1 is indicative of a downward bias of the unweighted and OLS standard error for not accounting for the proper design of the survey since it is unlikely that all elements within the clusters are equal (see Lee, Forthofer, and Lorimor (1989) and Deaton (1997) for further discussion).

†Heteroskedasticity-robust standard errors are in the third column. *** implies significance at $p < 0.0005$, and ** $p < 0.025$; no asterisks implies no significance.

As can be observed from Table 2 above, inequality is basically explained by three factors. Neither age profile nor sex explains the level of inequality. The most important factor is the high regional disparity in income generating capability between the different geographic *Départements*, with an absolute contribution of 41%. This regional disparity has as root cause the concentration of public services and to a certain extent the existence of "better infrastructure" in the Metropolitan area of Port-au-Prince, which may be allowing dwellers in that area to put at better use their human capital and skills.[26]

Although it is manifest that there exist dramatic infrastructure deficits all over the Haitian territory, the focus of an equality-reducing policy ought to be on providing the geographic regions, other than *Département de l'Ouest*, with more and better infrastructure as well as greater access to services in order to help these geographic regions converge with *Département de l'Ouest*, while at the same time improving the situation in the latter. If we consider the core-periphery pattern (in terms of economic activities and government services) that already exists between the MA of PaP and the remaining geographic regions, policies of the kind just mentioned could help reduce regional inequality, and would also have considerable spillovers such as stemming the massive rural exodus that leads to an over concentration of people in the MA of Port-au-Prince. The corollary of such an exodus is demographic imbalances, which can have perverse effects on the country's balanced growth and development prospects. Consequently, the need for a cohesive plan of decentralization to narrow the gulf between the rural and the urban area (and particularly between the MA of PaP and the rest of the country) is patent.

Before talking about the contribution of education itself, it is worth mentioning the considerable differences in the return to education for the various education levels. The return to education increases exponentially with the level of education. This may be indicative of a much higher demand for (or simply lack of supply) for higher education or skilled workers in the labor market. Going on now to the contribution of this factor to

[26] Thus, the neologism of 'the Republic of Port-au-Prince' that most Haitians have on their lips may be warranted.

inequality, it ranks second with more than 32 per cent. Instead of being a vehicle for social mobility to appease inequality, the education pattern in the Republic of Haiti seems to be acting as one of the determining factors in reproducing it. The lack of access to education, and particularly the poor quality of education those at the lower tail of the distribution can afford are essential elements that may be explaining the reproduction of inequality via education.[27] The interpretation of such a result ought to be that the lack of education of the great majority of Haitians may be a factor inflating the returns to the educated Haitians due to a high demand for skilled and educated labor.[28] Investment in education represents roughly 1.5 per cent of GDP compared to approximately 4 per cent spent by public sector in other low-income countries of the region for the same purpose. As of today, it represents less than 10 per cent of the national budget. The policy implication is thus straightforward. Substantial effort must be exerted to curb that tendency of under-investing in education and bring it at universal reach to Haitians. In that respect, special attention is to be directed to those at the lower tail of the distribution by attending to their needs and their established right to quality education so as to allow them fend for themselves in productive employment.

Remittances are the third most important determinant with an absolute contribution that is above 16 per cent. Although, compared with countries of the region like Mexico, Nicaragua, or Salvador, the history of migration for the Republic of Haiti is relatively recent, remittances are a very important element in the Haitian economy representing on average more than one third of this country's GDP.[29] Certain authors such as Stark, Taylor and Yitzhaki (1986), or McKenzie and Rapoport (2004), sustain that at the first stages of migration, remittances have a positive effect on inequality. Migration does in fact require onerous expenses that most likely those households close to the upper tail of

[27] Net enrollment rates for primary, secondary, and university levels are 60, 22, and 0.9 per cent respectively (see ECVH, 2003). Roughly one half of the population has access to education, of which 76 percent attend private schools that constitute 89 percent of the totality of schools all over the territory. Concurrently, 58 per cent of the school enclosures are not properly designed for their true purpose, while only 15 per cent of the teachers are qualified to a level deemed adequate by the Haiti Ministry of Education.

[28] There exists hard evidence for many countries that education (or the lack of it) has been contributing much to the observed increase in inequality particularly among the OECD countries. Many sustain that this is due to globalization since it raises the demand for skilled workers.

[29] See World Bank (2006), Inter American Development Bank (2007).

the income distribution will have the means to finance. Accordingly, the ensuing remittances by the migrants to their relatives in the country of origin would tend to exacerbate inequality. What is observed in the case of the Republic of Haiti may be reflecting this pattern.

Despite this observed positive effect of remittances on inequality, the relationship between them is indeed intricate. It may well be that this positive effect (or negative from a distributive justice viewpoint) is more than compensated for via other socioeconomic channels. For instance, the Republic of Haiti imports almost three times as much the value of its exports, so the proceeds of these remittances can be a good source of international currency and reserves to finance imports. This in turn could have a positive effect on the macroeconomic environment, such as avoiding the depreciating pressure on the domestic currency.[30] Most importantly, the credit constraints, to finance human capital for example, that certain sectors of the population could be facing due to the high inequality itself may be curtailed thanks to these remittances, mitigating that way the positive effect on inequality.[31] In the light of these considerations, and before any policy recommendations could be informed, a better understanding of the remittances issue and their socioeconomic impacts in this country is called for. So, more research that would bring to light the relationship between remittances and the other factors mentioned above is required, but data unavailability inhibits such an analysis as of now.

From our model specification, land ownership is the fourth most important contributor to inequality with an almost 6 per cent absolute contribution. Notwithstanding this result, because of this country's patterns of land tenure and a land Gini Index equal to 0.66, land inequality in the Republic of Haiti is the lowest in the LAC region.[32] The low observed land inequality is in the Republic, compared to what prevails in the Latin American region, is accounted for by the successful Haitian slave revolt in the late 18th early 19th

[30] The effect could also be the opposite, that is, an appreciation of the real exchange rate, which would depress exports.
[31] Or they might as well exacerbate inequality, as explained earlier.
[32] The Dominican Republic for instance registers a land Gini Index of 0.74 for agricultural land ownership (see Mora-Báez, 2003). For most of the countries in the region land Gini Index is more or less at this level. Some countries even register a land Gini Index as high as 0.80 (further discussions see Frankema (2006)).

century and the ensuing dispossession of the ancient French masters' plantations redistributed to the freed slaves.[33] In fact, it is assumed that land inequality was much lower before the events that led to the massacres of peasants in *Jean-Rabel* in July of 1987 and in *Artibonite* under the *de facto* military government of 1991-1994, with the consecutive expropriation of their land by *Grandons* (large land-owners). Indeed the life of the Haitian peasant has always been plagued by injustices, however further research is called for in order to understand the direction any agrarian reform ought to go.

In order for a typical Haitian family in the rural area to make a living it would necessitate between 2.5 to 3 hectares of arable land, meanwhile close to 60 per cent of land-owners have less than one hectare (10,000 square meters) and about 83 per cent possess less than 3 hectares. Doura (2001: 81) also reports an average exploitation scale of 1.4 hectares with a tendency of these exploitation scales to diminish through out time. This is due to the continuing parceling out, attributable in part to the equal sharing of bequest imposed on heirs, low productivity and languishing acquisitive power of the rural poor. Concurrently, the typical family structure for the group of land-owners has an average size of 6 members. This means that production can only be made at subsistence level to feed a large number of individuals.[34] Also, the type of technology available to farmers is a determining factor on the farm's productivity. While less than 1 per cent of the farms use mechanical irrigation, more than 70 per cent of them depend on rainfalls and less than 37 per cent of farmers use fertilizers.[35]

These findings are indicative of the need for another agrarian structure and land tenure system. Nonetheless, policy makers should be cautious about the direction and nature of the agrarian reform. As can be observed from Table 2, agricultural land possession only

[33] Specifically, the Act of Independence from France was drafted and read on January 1st 1804.
[34] As a matter of fact subsistence agriculture is prevalent, with more than 80 per cent of cultivated land on small plots les than 0.65 hectares (see Doura, 2001: 67).
[35] It would also be very useful to have series of data in order assess the change in farmers' welfare after the liberalization process that started in the early 1980s when import quotas and tariffs on agricultural goods (in particular rice) were basically brought down to zero, leaving farmers in the impossibility to compete with 'subsidized' imports.

start making a difference in terms of providing higher income with respect to no land possession when it reaches the size of 25,000. Thus, in such a context a sound land reform would probably require that attention be paid not just to an equitable agricultural land distribution that would favor the continuation of subsistence agriculture but to the efficient plot size, inasmuch this can set off a capitalist production structure and provide farmers with enough surplus. This would have the potential effect of increasing productivity in this sector while crowding a number of workers out. So, this type of reform would have to be accompanied by policies that favor alternative investment in employment generating activities and possibly with potential higher returns than in the agricultural sector.

5. Concluding remarks

In the present work we have attempted to identify and quantify the determinants of inequality in the Republic of Haiti. The extent of inequality has been discussed while at the same time we pointed to different socioeconomic manifestations that could be correlated with the observed high inequality level. In particular, the languishing Haitian economy appears to be a corollary of the high inequality level of the Republic of Haiti through its influence on certain variables such as, a high fertility rate and health inequality, a low level of education, low rates of private investment, poor quality of institutions, social conflict and political instability. In this part of the research it may seem that we have hazarded a conjecture since lack of data has prohibited carrying out a rigorous analysis.

The multi-factor-components decomposition of inequality in the Republic of Haiti revealed that inequality is basically explained by three factors: high regional disparity as is captured by the difference between *Département de l'Ouest*, where the Port-au-Prince is located, and the rest of the geographical regions of the country. This calls for a need of decentralization and power delegation to local administrations as they are more able to provide the residents of their respective regions with services in a more rapid and

efficient manner. In the second place comes education that, instead of being a vehicle of social mobility to reduce inequality, seems to be one of the factors contributing to its reproduction. Though there exists the possibility of inverse causality, whereby it is the lack of education of the great majority of Haitians that may be inflating the returns to those skilled and educated due to a high demand for them. In any event, policies that give priority to government investment in that sector, where massive spending is done particularly in basic education are mostly recommended.

In the case of remittances, the relationship between this factor and inequality is quite intricate and more research is required in order to determine its real impact on inequality as there may be a dual causality between these two variables. The last factor the impact of which on inequality is not to be disdained is agricultural land ownership. Indeed, contention over landholdings has been an established fact in the Haitian society and has recently contributed to the increase in the Gini land inequality, especially after the events of July 1987 in *Jean Rabel* and during the 1991-1994 *de facto* military régime in *Artibonite*. Despite the contribution of land ownership to inequality and the recent developments that lead to a greater concentration of land in the hands of the *Grandons*, on account of the historical construction of that nation land inequality there is not high compared to other countries of the region. Moreover, the land tenure system has not permitted the development of large scale or capitalist agricultural production. Rather, subsistence agriculture is widespread. Thus, any development plan the objective of which is to transform the agriculture sector by setting up a production structure that can generate enough surplus for the agro-industry should consider reforming the land tenure system with that aim in mind.

6. Caveats

Inequality decompositions allow useful depictions of patterns that can be a first step in identifying the proximate causes of inequality (Kanbur, 2006). Despite the filters applied to the data in order to ensure efficiency and consistency of the parameters estimates, there

still may be high leverage observations that could affect measured inequality. In such a case, a parametric-tailed estimation (as proposed by Cowell and Victoria-Feser (2001), Cowell and Flachaire (2001), and Davidson and Flachaire (2004)), would be more appropriate to assess inequality as it would help eliminate the influence of the eventual extreme values. Rank correlation decomposition could be an appealing method as well, since decomposition procedures based on Shorrocks (1982) do not provide an answer to the fundamental question as to the role played by the correlation between the different income components or sources (see Burtlees (1999) and Fournier (1999)). Moreover, as can be observed from the regression result in the multi-factor components decomposition in Table 2, by the construction of the model the constant does not contribute to inequality. So, albeit the resulting inequality measure is translation invariant, it would preferable that our model be able to capture the effect of uniform changes on individual's income as such variations are expected to have a greater impact on observations at the lower tail of the distribution than on those at the higher tail, if only because of the greater marginal valuation of uniform changes of the former than the latter. The proposition of a remedy to these possible drawbacks of the present work is left open as future line of research.

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Appendix

The Gini Index

The Gini Index is the most widely used inequality summary statistics in distributive analysis because of the easiness it provides to make cross-country comparison. Most of all, it is Lorenz consistent, i.e. it satisfies the Pigou-Dalton principle of transfers in that a rank preserving progressive transfer will reduce measured inequality, and vice versa.[36] The following equations give some of the many mathematical formulations of Gini.

$$[29] \qquad G = \frac{1}{2\mu} \int_0^{\infty} \int_0^{\infty} |x - y| \, f(x) \, f(y) \, dxdy$$

or in terms of the Lorenz curve

$$[30] \qquad G = 2 \int_0^1 \left[p - L(p) \right] dp = 1 - 2 \int_0^1 L(p) \, dp$$

This index is bounded below by 0 when all individuals in the population have the same living standards, and above by 1 when just one individual captures the totality of resources and everyone else is left with nothing (that is $G \in [0,1]$). One of the many interpretations of Gini is that the expected difference between all pairs of observations within a given distribution is twice the Gini Index scaled up by the mean ($2G\mu$).[37]

[36] Various authors make a strong case against this criterion, in that a transfer may reduce inequality between the two individuals involved in the transaction but not necessarily over the whole spectrum of the distribution (for an in-depth discussion on this issue see for instance, Chateauneuf and Moyes, 2005).

[37] In order words, if computed Gini for a given distribution is (say) 0.35, the difference we should expect between any random pair of observations would be 70% of the mean living standard.

Table A1. World Health Organization Equivalence Scales

Population group	Adult Equivalent
Infant 0-0.5	0.22
Infant 0.5-1	0.29
Child 1-3	0.45
Child 4-6	0.62
Child 7-10	0.69
Male 11-14	0.83
Male 15-18	0.98
Male 19-50	1.00
*Male 25-50	1.00
Male 51+	0.79
Female 11-14	0.72
Female 15-18	0.74
Female 19-24	0.76
Female 25-50	0.76
Female 51+	0.66

Equivalence scales based on information from "Recommended Dietary Allowances, revised - Food & nutrition Board, National Academy of Sciences and Energy and Protein Requirements. Report of a Joint FAO/WHO/UNU Expert Consultation. Technical Report Series 724, World Health Organization. Geneva 1985.

TableA2: Gini Index by *Département*

Ouest	0.60 (0.0171)
Sud-Est	0.52 (0.0209)
Nord	0.65 (0.0283)
Nord-Est	0.70 (0.0480)
Artibonite	0.65 (0.0331)
Centre	0.53 (0.0364)
Sud	0.55 (0.0232)
Grande-Anse	0.56 (0.0176)
Nord-Ouest	0.52 (0.0261)

Source: Author's own calculations based on the ECVH-2001. *Note*: weighted and proper design-based data. Standard errors are in parentheses.

Table A3. Gini coefficient by area of residence

National	MA of PaP	Semi-Urban	All Urban	Rural
0.65	0.57	0.65	0.64	0.56
(0.0122)	(0.0208)	(0.0221)	(0.0160)	(0.0116)