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Review

Gender income inequality and development in Africa: Analysis based on Kuznets' inverted U curve

Mathias Marie Adrien Ndinga

Faculty of Economics, Marien Ngouabi University of Brazzaville, P. O. Box 69 Bayardelle, Congo Brazzaville.
E-mail: ndinga01@yahoo.fr.

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Africa is a continent which faces important inequalities between men and women. In this connection, this article aims to analyze the evolution process of gender income inequality, in the light of Kuznets' theory of the inverted U curve. The analysis is undertaken from a panel data with the estimation of a reduced model first and then an extended model afterwards. The results suggest that income inequalities decrease at the beginning of the development process and increase later on when a country reaches an advanced stage in its development process, thus describing a U curve. This outcome constitutes a refutation of Kuznets' hypothesis in the context of income inequalities geared to gender in Africa. The analysis also shows that gender inequalities in education, inequalities in the country and the poverty rate have a significant influence on gender income inequality. These different results have yielded implications for economical policy.

Key words: Gender, income distribution, development, Africa.

INTRODUCTION

It is a truism that in many developed or developing countries, women and men exhibiting identical productive features earn different levels of wage (Blau and Khan, 2000). This phenomenon, which generates increased interest in the literature on the labor market, is the object of several empirical works among which the first ones to be undertaken in the United States (Oaxaca, 1973; Blinder, 1973), focused on wage discrimination between blacks and whites on one hand, and women and men on the other hand. Since then, the debate which has ensued on the empirical level [see Altonji and Blank (1999) for a review of the relevant literature] is not accepted unanimously regarding the determinants of income inequalities between women and men. However, a better knowledge of the determinants of these inequalities should have important implications in terms of economic policy. Therefore, as several studies have demonstrated, women have a tendency to spend their income differently compared with men. They spend a great deal in the running of the household and provide a more equalitarian allocation of resources between children of both sexes (Blau et al., 2001). Such an allocation of resources is likely to reduce gender inequalities mainly when girls and boys take advantage of the same treatment and schooling.

In Africa, the phenomenon of income inequality exhibits a structural character. Income inequalities are closely linked to poverty and gives rise to an increased interest for development economists, chiefly since the first social assessments of structural adjustment programs. Deininger and Squire (1996) have shown that Africa is on the average almost as inequalitarian as Latin America, whose high level of inequalities has been notorious for a long time. Several factors account for these inequalities mainly gender income inequality. Despite this interest, the gender income inequality in Africa has not been sufficiently studied chiefly in the perspective of verifying Kuznets' inverted U curve.

In fact, the main point is the difference in schooling between women and men. In several African countries, the traditional roles ascribed to each gender may imply that women tend to work less or not at all; partly owing to the fact that they work in the domestic sphere in order to take care of the family (Locho, 1996). Even when they take part in the labor market, they often work in the informal sector of services in which incomes tend to be

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lower compared with those in the formal sector chiefly the manufacturing sector (Pilon, 1996).

This article aims to examine in the light of the theory of Kuznets' inverted U curve, the relation between the income differential between women and men and the level of economic development measured by the gross domestic product per capita. As a matter of fact, from a theoretical model, Kuznets (1965) has brought to the fore a curve having an inverted U form, according to which inequalities are weak at the beginning of the development process of a country, then increase as an increased proportion of the population benefit from the fruit of the growth, and decrease at last at an advanced stage of development. In view of this, the central question of this research work is as follows: does the gender income inequality evolve according to an inverted U curve?

It is worth underlying the fact that the labor market in African countries is characterized by two significant evolutions within the last two decades. There has been an improvement in the schooling rate of girls which has lead to an increased number of qualified women with high productivity and a more and more important women's participation in the labor market. On the strength of these evolutions, it is possible to back up the a priori viewpoint according to which gender income inequality increases at the beginning of the development process, and decreases when the country reaches an advanced stage. In other words, an inverted U curve would account for the evolution of the income gap between women and men in African countries with a reversal point which is very far from the median income because of the weak level of development in those countries.

The article is structured as follows in addition to the introduction: the second section deals with an account of some prominent facts related to gender inequalities in Africa. The third section is devoted to a presentation of the Kuznets' theory of the inverted U curve and to a review of literature. The fourth section focuses on the presentation of the empirical model and the description of the collected data. In the fifth section the estimation method of the model is stated as well as the presentation and interpretation of the achieved results. Finally, the sixth section presents the conclusions and the implications for economic policy.

SOME PROMINENT FACTS RELATED TO GENDER INCOME INEQUALITY IN AFRICA

The gaps in earnings between men and women have generally gone down in the world but they remain high in Africa. They do not result essentially from a weaker level of training nor to the interruptions which often characterize women's career. They are more attributable to factors such as labor market segregation, salaries structure, jobs classification, the weakness or the decentralization of collective negotiations. The prominent facts related to gender inequalities relate to poverty, inequalities in the accumulation of human capital, and inequalities in the labor market.

Gender inequalities related to poverty in Africa

The issue of gender inequalities related to poverty is worrying mainly in developing countries and more specifically in Africa. This issue has been the centre of discussions worldwide mainly during the African women conference (1995), the Beijing World Conference on Women (1995), and the World Conference on Social Development (1995). In 2000, the United Nations General Assembly decided to promote gender equality and the ability for women to become autonomous, as an efficient means to fight poverty.

In fact, particular notice taken of women's situation is not surprising the more so as the year 2000 was characterized by an improved knowledge of the situation and conditions of life of the African populations owing to investigations on a national scale on the continent. The review of the poverty reduction strategies papers in some countries helps justify the increased interest shown in this issue. In this connection, in Ivory Coast (PRSP, 2009), 48% of the population were poor in 2008. Women were more affected with a proportion of 49% against 48.4% for men. But, taking into account the sex of the household head, the level of poverty is higher in households headed by men (49.6%) than those headed by women (45.4%). In the Democratic Republic of Congo (PRSP, 2007), 80% of the population lived under the poverty line, and the data show that women were more affected; 61.2% of women lived under the poverty line against 59.3% of men. Moreover, 61.2% of households headed by women lived under the poverty line against 54.32% of those headed by men.

In Congo Brazzaville (DSRP, 2008), the proportion of the population living under the poverty line was estimated to 50.7% in 2005. Households headed by women are more vulnerable to poverty (58.2%) than those headed by men (48.8%). In Zambia (PRSP, 2006), it was established in 2004 that 68% of the population lived under the poverty line. The effect of poverty was higher in households headed by women (69%) compared with those headed by men (51.9%). In Mozambique (PRSP, 2006), 54.1% of the population were poor. The analysis of the impact of poverty according to the head of the household shows that more households headed by women were poor (62.5%) compared to those headed by men (48.8%). In Egypt (CDSR, 2002), it was estimated that 12.6% of households were headed by women and that this proportion was higher in urban zones. These households are more numerous (14%) in groups of poor families than in non poor ones (10%), 41.6% of these households are among the poorest 20% against 16.9% for men, and in some rural areas, 62% of these

Table 1. Ratio of girls to 100 boys in 1999 and 2007.

	Primary		Secondary		Higher	
	1999	**2009**	**1999**	**2009**	**1999**	**2009**
North Africa	90	95	93	98	74	98
Sub-Saharan	85	92	82	79	67	63
Developing countries	91	96	88	96	82	97

Source: United Nations Report on MDG, 2011.

households are among the poorest 20%. The income of these households represents only 79% of those of households controlled by men.

As one may realize in the light of this brief survey of poverty reduction strategies papers in some African countries, the situation of gender related to poverty reveal important inequalities. Generally speaking, women are more affected compared with men. As a matter of fact, the observation of this general tendency towards the deterioration of the living conditions of women, and to the increase in the proportion of households headed by women with dependent children have suggested the notion of feminization of poverty.

Gender inequality in the accumulation of human capital in Africa

The accumulation of human capital is an important income determining factor (Becker, 2000) and Mincer (1974). However, in Sub-Saharan Africa, the parity between sexes is yet far from being a reality despite some progress made as illustrated in Table 1.

From Table 1, it is evident that Africa has made some significant progress in the context of promoting gender equality in primary education. Yet, this effort should be considered with caution, the more so as the performances of these countries remain under the average of the developing countries. With a ratio of 95 girls per 100 boys in 2009, Sub Saharan Africa is the African region which is far from reaching the objective of the gender parity in primary education.

While a substantial improvement of the ratio of girls to boys can be observed in secondary and higher education mainly in all developing countries and in Northern Africa, Sub Saharan Africa constitutes an exception with a decline in performance. In this part of Africa, the ratio has decreased from 82 girls per 100 boys in secondary education in 1999, to 79 girls per 100 boys in 2009. In higher education, the ratio which amounted to 67 girls per 100 boys in 1999 decreased to 63 girls per 100 in 2009. Nevertheless, it should be pointed out that Northern Africa has made great efforts to reverse the trend as the female-male ratio in higher education amounted to 98 girls per 100 boys in 2009. The continuation of such a tendency will help reduce gender inequality in Northern Africa.

Gender inequalities on the labor market in Africa

In Africa, like in Asia and Latin America, women are still in a disadvantage in the labor market. According to BIT (2010), most African women are less paid than men and run the risk of being more confined to less paid and qualified jobs (often in the informal economy). This situation is the more worrying as since 1994, women's participation in the labor market has declined by 1.6%. Male and female unemployment rates remained generally stable for ten years (2000-2010), being lower for women (7.6%) than for men (9.1%).

In Sub Saharan Africa, the number of women who hold senior posts (members of parliament, senior civil servants or officers) has increased by about 3% during the last ten years to reach 24.8%. Compared with the number of women who hold this type of positions in the world which is estimated at 28%, one may consider that the progress which has been made by women has led to a reduction of inequalities.

KUTZNETS' THEORY OF THE INVERTED U CURVE AND LITERATURE REVIEW

Kutznets' theory of the inverted U curve

In a famous article published in 1955 in the American Economic Review, Kuznets lends support to the viewpoint according to which the reduction of poverty and inequalities result from the development process. Kuznets considers the increase in income inequalities as temporary in the development process. The inequalities should decrease when a certain level of development has been achieved. In fact, according to Kuznets, income inequalities increase at the beginning of the development process, and decrease substantially afterwards with the continuation of the growth, thus describing a curve in the form of an inverted U (Figure 1).

In order to uphold this viewpoint, Kuznets puts forward a theoretical model comprising three fundamental hypotheses. The first hypothesis consists in considering an economy having two sectors of activity, namely the agricultural sector and the manufacturing one.

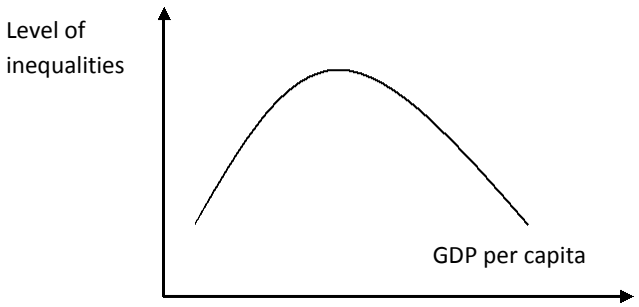

Figure 1. Kutznets' theory of the inverted U curve.

The second hypothesis consists in admitting that the level of income in the agricultural sector is very low, near the level of subsistence while in the manufacturing sector the level of income is high. Finally, the third one postulates that in this economy, the workers are identical from the point of view of their characteristics, and cannot accumulate additional knowledge. Thus, the differences in income are exclusively accounted for by the characteristics of the jobs in different sectors. It is worth pointing out here that income does not depend on the general balance effects stemming from the variation of the size of both sectors. Therefore it is determined in an exogenous manner. In this connection, the income inequality results from two sources. There is an intersectional inequality, and an intra sectional one.

To improve their income, the workers from the agricultural sector will seek to migrate towards the manufacturing sector. Yet this migratory movement has a cost which makes this process a gradual one. The obvious consequence of these migratory movements is the increase in the median income. At the beginning, as the agricultural sector is more important than the manufacturing one, the inequalities will rise. But with the continuation of the migratory movements, the agricultural sector will shrink and eventually, the inequalities may begin to decrease Anand and kanbur (1993), Fields (1993).

More than forty years after, Kuznets' theory (1955) is still a source of several debates mainly at the theoretical and empirical levels. At the theoretical level, the debate focuses essentially on the slackening of the hypotheses which underlie Kuznets' model. In this respect, the study undertaken by Brauke (1993) shows that the inverted *U curves* may be verified even in the case in which the intersectional inequalities decrease along the path of growth. Vicente and Borge (2000) have shown that inequalities may resume their increase under certain conditions following the decline phase, beyond a certain income level. For example, if we consider that labor demand is elastic in both sectors, the migratory movements might make the median income rise in the agricultural sector, and decrease in the manufacturing sector, and thus make the income inequalities go down.

As Giannetti (2003) points out, though the median income decreases with the migratory movements, the direction of the shift in inequalities remains ambiguous.

Another hypothesis may be put forward, when one takes into account the fact that the accumulation of skills is a basic element regarding growth. In this respect, Topel (1999) uses the terminology of the sector with qualified and non qualified workers instead of the agricultural or manufacturing sectors. In this way he considers the migratory process as a process of accumulation of knowledge and shift in the participation in the labor market. In this revision, migration, participation in the labor market, and accumulation of skills must be considered as workers' endogenous decisions in response to income inequalities. As for Aghion and Bolton (1997), they focus on the failure of the capital market which does not enable the poor to invest during the initial stage of development, which results in income inequalities. But, as the economy continues on the path of growth, these failures reduce, and the investment possibilities increase regarding the poor. This new situation is liable to reducing poverty and hence the income inequalities.

Galor and Tsiddon (1996) show that the inequalities may be essential during the first stage of the development process, but may eventually decrease when the benefits of growth reach the lowest segments of society. Galor (2000) also demonstrated that income inequalities increase with growth when the latter is determined by the accumulation of physical capital. The rise of inequalities begins when the accumulation of human capital becomes the driving force of growth.

As it can be realized through this theoretical debate, Kuznets' model is based on restrictive hypotheses. In this respect, Bourguignon (1990) has shown that in a dual development model, growth may constitute the source of inequality or equality; everything depends on prices and the elasticity of the products demand in the traditional sector. Sorger (2000) has demonstrated that the effect of growth on income inequalities might be positive or negative and this depends on an inter-temporal elasticity of substitution. On the whole, the hypothesis of the inverted U curve which associates the level of income inequalities with growth is the source of an important controversy. Consequently, further illumination on the scientific scope of this theory becomes an essential empirical issue.

Review of empirical works in developing countries and in Africa

From an empirical point of view, several works (Anand and Kum, 1993; Ravaillon, 2001; de Janvry and Sadoulet, 2000) have attempted to bring to the fore the existence of Kuznets' inverted U curve. However, it is worth underlining the fact that the studies dealing with income inequalities in the context of Kuznets' hypothesis

have not been many in the case of African countries, and still less those which deal with gender income inequality. The few available studies on gender in the case of developing countries take into account some African countries like Ghana, Ivory Coast, Zimbabwe and Uganda which have been able to undertake some household budget and consumption survey in a more or less regular manner.

Among the studies on gender income inequalities which attempt to verify the existence of Kuznets' inverted U curve in developing countries, one may mention the works by Pampel and Tanaka (1986), and Haas (2007). Pampel and Tanaka's study (1986) aims to analyze the effect of women's participation in economic development. In so doing, they have resorted to a cross-section analysis with a sample of 70 developing countries. The econometric analysis which the authors have undertaken has enabled them to put in prominent position a curvilinear relation between women's participation in the labor market and economic growth. This result suggests that women's participation rate in the labor market decreases during the first stage of development, and increases at a high level of development. From this result, Pampel and Tanaka (1986) back up the idea according to which women's income decreases compared with men's during the first stage of development (increase in inequalities), and rises at an advanced stage of development (reduction of inequalities). Such an evolution regarding the women's participation in the labor market justifies the existence of Kuznets' inverted U curve.

In the study of Acar and Dogruel (2010), the model findings reveal that GDP per capita and female labor force participation have inequality-increasing effects whereas openness has an inequality-decreasing effect on pay inequalities in the selected MENA countries. The positive impact of GDP per capita indicates that these countries were still at the increasing part of the inverse-U curve until the end of the 1990s. Earning inequalities between men and women in favor of men (since men usually earn higher in most parts of the world) may be a source of inequality-increasing effect of female labor participation. Their find also that the openness has a negative effect on income inequality. These results indicate that improving effect of trade integration on formal sector pay distribution should not be ignored. This finding tends to confirm the Kuznets theory in the context of MENA countries while; the main aim is to identify the sources of inequalities.

Haas (2007) has examined the relationship between gender income inequalities and economic development from a cross-sectional analysis with a sample of 121 countries. The results which this author has achieved suggest that the relationship that links the gender income inequalities to the economic development verifies Kuznets' inverted U curve hypothesis. Thus, the results of this study allow us to state that the economic development goes along with an increase in income inequalities between men and women at first, and at an advanced stage of development, these inequalities fall. The study shows also that the human capital is not a significant determining factor of inequalities linked to genre. However, it is advisable to point out that this result is to be considered with caution as the chosen indicator by the author is the literacy rate which is high regarding men and women in a great number of countries. The use of another unit of human capital might lead to another conclusion. It follows also that the general level of inequalities in a country has a positive and significant influence on gender income inequality.

In Africa, Kuznets' hypothesis has been the object of empirical verifications, but not in the context of gender income inequalities. Faced with the difficulty related to the availability of data, the studies have dealt with countries which have at least assessed the level inequalities on two periods. On the other hand, other studies have attempted to verify Kuznets' hypothesis by analyzing the permanent or temporary position of households regarding incomes distribution during the period of growth on the one hand, and studying the migratory movements of these households from the traditional sector (rural sphere) towards the modern sector (urban sphere), on the other hand.

In the first case, Guénard and Dubois (1999) noted that Kuznets' hypothesis that seems to have been confirmed in the 1960 to 1970 period is currently questioned in the light of an analysis of data from different countries. From these solely African data, the existence of such a relationship between growth and income inequalities happens to be confirmed. Concerning the few African countries in which the inequalities are measured in at least two different periods, the following results are reached: in the three countries in which the income per inhabitant has risen, the inequalities have increased (Seychelles, 1978 to 1984), or have decreased (Ghana, 1989 to 1992; Maurice, 1980 to 1991). In the countries which have experienced stagnation in per capita income, inequalities decreased (Mauritania, 1988 to 1995; Tanzania, 1977 to 1993). In countries where the income per capita has declined inequalities have increased (Nigeria, 1986 to 1992; Uganda, 1989 to 1992; Zambia, 1991 to 1996) except for Ivory Coast (from 1985 to 1988). Yet, the analysis remains merely descriptive and these authors' conclusions deserve, therefore, to be confirmed by a more rigorous econometric analysis.

As far as the position of households in the income distribution is concerned, Dercon and Frishman (2000) has observed an important change in the consumption expenses in the rural area in Ethiopia despite the stand-still of the growth observed at a general level. This result is liable to invalidate Kuznets' hypothesis. Gunning et al. (2000) have demonstrated a convergence of the income in rural area in Zimbabwe during the period of strong economic growth. The analysis has enabled them to

show that it is the income of households which belong to the income quintiles of the poorest households which increased most. Grootaert, Kambur and Oh (1977) have separately studied the mobility between the rural and the urban areas in Ivory Coast. They have reached the conclusion that human capital is a determining factor regarding the improvement of well-being in urban area while physical capital, namely land and equipment, are determining factors in rural areas. Deininger and Okidé (2003) have shown that inequalities between agricultural households and urban households were expanding during the period of rapid growth in Uganda. Their analysis which is based on income and expenses has revealed that schooling and the initial allocations were the essential determining factors of mobility at the level of households.

On the strength of these works, it is possible to put forward the idea that mobility is an important phenomenon in the verification of Kuznets' hypothesis. Yet, the data used are different from the point of view of representativeness, size, period, and macro economic situation. Thus, it is not easy, under these conditions, to draw adequate conclusions for the sake of economic policy.

Finally, this literature review suggests that there is no systematic relationship between growth and the evolution of income inequality. In fact, the process of growth may in itself produce different inequality schemes. So, the factor which determines the rise or fall in inequality does not seem to be the economic growth rate or the stage of development, but rather the type of growth achieved.

PRESENTATION OF THE EMPIRICAL MODEL AND DATA DESCRIPTION

The empirical model

In order to achieve the objective of this study which is to verify the existence of the inverted U curve in accounting for the evolution of gender inequality, it is indispensable to use two alternative specifications regarding income inequality determinants. In the first place, it is important to consider the model specification often used to verify the existence of Kuznets' inverted U curve. This first specification may be presented as follows:

$$I_{it} = a_1 Y_{it} + a_2 Y_{it}^2 + c + \mu_{it} \quad (1)$$

In this first specification, *I* stand for an indicator of income inequalities between women and men; *Y* is the approximated income by the gross domestic product per capita. The index i refers to the unit of observation (each sub Saharan African country), t refers to the time period (1998 and 2007). Thus, in the specification Kuznets' hypothesis is verified when a positive sign ($a_1>0$) is assigned to the Gross Domestic Product per capita, and its quadratic term of the negative sign ($a_2<0$). However, as the income inequality is affected by a number of variables other than the Gross Domestic Product per capita, it is important to isolate the effects resulting from these variables by incorporating them in the regression. These variables play then the role of control variables. The alternative specification may be represented as follows:

$$I_{it} = a_1 Y_{it} + a_2 Y_{it}^2 + X\beta + c + \mu_{it} \quad (2)$$

In this second specification, *X* is the matrix of the control variables, β is a column vector of parameters which are associated to control variables, and μ is the error term. Among the control variables, the empirical literature proposes human capital, namely education whose improvement contributes to the reduction of inequality (Sylvester, 2003). However, since only a small part of the population may have access to different levels of the educational system; income inequality will raise leading to increased social inequalities (Sen, 1992). Consequently, it is assumed in this study that the increase in inequality in education between men and women measured here by the quotient of men's combined gross enrolment ratio (primary, secondary and higher) to that of women has a positive impact of income inequality.

The second control variable taken for the sake of this study is the difference in the standard of living between the populations in the same country. One of the appropriate indicators to make sense of the inequality in terms of standard of living in a country is Gini's index which measures the degree of inequality of the incomes distribution in a given society. Yet, this indicator is not available for all countries and for the same year. This is the reason why the quotient of the share of the income by the richest 10% to that of the poorest 10% has been taken as a proxy. An increase of this quotient is associated with an increase in income inequality in the country for it supposes a more than proportional increase of the income of the very rich persons compared with that of very poor persons. Such an evolution may lead to an increase in inequality on the whole, and between men and women in particular. In this connection, the expected sign on the gender income inequality depends on the group on which the income rise rests. So, if the increase in overall inequality results from the decrease of the income of a category of women in the income distribution, all things being equal, then the expected sign will be positive on gender income inequality. If, on the other hand, the increase in overall inequality stems from the drop of the income of a category of men in the incomes distribution, then the expected sign will be negative.

Another important variable in the analysis of gender income inequality is the poverty variable which is measured by the proportion of persons living on less than a dollar per day. The sign of this variable depends on the

Table 2. Descriptive statistics of the different variables.

	GDP per capita (in PPP and in US$)	Proportion of people living with less than 1 US$ per day	Women's estimated income (in PPP and in US$)	Men's estimated income (in PPP and in US$)	Women's combined gross enrolment ratio (%)	Men's combined gross enrolment ratio (%)	Share of income of poorest 10% person (estimation)	Share of income of richest 10% (estimation)
Mean	2683.317	47.36829	1862.171	3513.317	50.25610	56.47317	2.295122	35.66829
Median	1334.000	51.40000	980.0000	1726.000	50.20000	58.30000	2.400000	33.60000
Maximum	15167.00	88.50000	11221.00	19124.00	78.90000	79.80000	4.100000	65.00000
Minimum	298.0000	2.50000	189.0000	387.0000	21.90000	29.00000	0.600000	25.60000
Standards deviation	3421.585	23.83660	2422.870	4501.523	15.54476	11.69447	0.718314	7.704493
Observations	41	41	41	41	41	41	41	41

Source: the author from the results obtained on STATA.9

group which tends most toward poverty when it increases. Thus, when women fall more than men into poverty, the expected sign will be positive. When men fall into poverty more than women, the expected sign will be negative.

Presentation and description of data

Panel data come essentially from the Human Development Report for 2000 and 2009 published by the United Nations Development Program (see Appendix 1). The choice of this type of data concerning the 41 African countries is justified essentially by their availability the more so as the structure of the data is not the same from one report to another. The descriptive statistics on different variables are presented in Table 2.

Table 2 shows that on average the gross domestic product per capita amounts to 2683 US$. This average GDP figure masks important disparities between countries; as the GDP's gap as regard the average amounts to 3421.6 US$. The extreme values of the distribution suggest that the gross domestic product per capita of the most well endowed country represents 51 times that of the least developed ones. This statement is equally valid regarding poverty whose relation between the maximum and minimum value amounts to 35.4. The descriptive statistics of men and women's estimated incomes lead to two statements. The first one deals with the intra gender differences the more so as the two distributions display important deviations from the average. The second one is related to inter gender differences as, on average, men's income represents twice that of women. The same also applies to schooling. On average, men's combined schooling rate in primary, secondary and higher education differs from that of women by 6.217%. Finally, this picture reveals that the share of income of 10% of the rich represents about 15 times of the income of 10% of the poorest in the population.

ESTIMATION OF THE MODEL AND INTERPRETATION OF THE RESULTS

The estimation of the model from the panel data is interesting for several reasons. At first, it allows the identification of effects which are not observable in cross sectional analysis, in particular the evolution of the GDP per capita which is in the center of the analysis of the curve U inverted by Kuznets. Then, the panel data allow improving the quality of the statistical estimation with regard to temporal data thanks to their biggest variability (more precise estimation of the coefficients of the model). Finally, the estimation from panel data allows one to take into account the presence of nor observable heterogeneous-ness which bias the coefficients of the observable explanatory variables correlated to those who not are not observable.

The choice which consists in estimating model (1) is justified by the fact that this first approach enables one to enjoy a greater degree of freedom, and stave off problems of multicolinearity. It also enables one to isolate the gross impact of each control variable on gender income inequality from the framework of the basic analysis of Kuznets' curve.

The application of the technique of ordinary least squared (OLS) to estimate this model led to not biased results, but not efficacy as far as the variance of the endogenous variable can decompose into an interpersonal dimension

Table 3. Results of the estimation of the restricted equation. Endogenous variable: Men's estimated income / women's estimated income.

Exogenous variable	Coefficients	Standard deviation	t-Student	Probabilities
GDP per capita (in PPP and in US$)	-0.33447**	0.0734871	-4.55	0.0000
Squared of GDP per capita (in PPP and in US$)	0.23021**	0.0594681	3.87	0.0000
Constant	-0.28689	0.3365821	-0.85	0.394
R-squared : 0.3058				
Wald chi-square (3) : 1047.36				
Prob > chi-square : 0.0000				
Hausman chi-square (5) : 4.43				
Prob > chi-square : 0.4847				
Number of observations : 78				

****** indicates the significant coefficients at the threshold of 5%. Source: The author, from the result obtained on STATA.

Table 4. Results of the estimation of the extended equation. Endogenous variable: Men's estimated income / Women's estimated income.

Exogenous variable	Coefficients	Standards deviation	t-Student	Probabilities
GDP per capita (in PPP and in US$)	-0.32956**	0.0817092	-4.03	0.000
Squared of GDP per capita (in PPP and in US$)	0.22232**	0.0612066	3.63	0.000
Inequality in schooling	0.42769**	0.2017873	2.12	0.034
Inequality in income	0.02151	0.0374476	0.57	0.566
Poverty	-0.12223**	0.0390543	-3.13	0.002
Constant	-0.32956**	0.0817092	-4.03	0.000

R-squared : 0.6140; Wald chi-square : 10780.26; Prob > chi-square : 0.0000; Hausman chi-square (5) : 9.38; Prob > chi-square : 0.1912; Number of observation : 78 ****** indicates the significant coefficients at the threshold of 5%. Source: the author from the result obtained on STATA.

(between model) and an intra-individual dimension (within model). This situation suggests two other possible estimators in particular the between estimator and the within estimator. It is thus a question of comparing the estimations of the model with random effects to those of the model with fixed effects. The practical test used in that case is the one of Hausman (1978).

The probability of the test being upper to 10%, it is not possible to differentiate the model with fixed effects of the model with random effects from the test of Hausman. But, given that the temporal dimension is reduced to two periods, the model with fixed effects yields less good results than the model with random effects. In these conditions the model with random effects was preferred to the model with fixed effects. The obtained results are summarized in Table 3.

The tests of statistical inference show that the quality of the estimation is acceptable. As a matter of fact, Wald's test indicates that all coefficients are jointly different from zero at the threshold of 5%. The R-squared statistics is weak. It indicates that the gross domestic product per capita and its square account for the variance of gender income inequalities by about 30.58%. This result is normal given that the gender income inequality also depends on other variables which, for some reasons have been willingly omitted; while others cannot be included in cross sectional regression because they are structural. Such is the case of the effects of the structural adjustment programs on gender income inequality.

The magnitude of the coefficients is analyzed by means of the student's t-test. The latter suggests that the coefficients are significant at the threshold of 5%, and does not carry the expected sign. This result does not confirm Kuznets' hypothesis of the inverted U curve; so it is consistent with the conclusions of the empirical works which have already been mentioned, by Guénard and Dubois (1999) Dercon and Krishnan (2000) in the developing countries.

In the second approach, model (2) which has been specified previously has been estimated. One may here recall the fact that gender income inequality has been expressed on the basis of traditional variables related to the estimation of Kuznets' inverted U curve. It concerns in particular the gross domestic product per capita and its quadratic term. To these basic variables we join a vector of control variables consisting of: schooling inequalities (quotient between the men and women's combined gross enrolment ratio in primary. secondary and higher education), inequality in income distribution (quotient between the share of income of the richest 10% and that of the poorest 10%), and the poverty rate. As in model (1), the model with random effects has been preferred for the same reasons which were expressed previously. The obtained results are contained in Table 4.

The validity tests of the model suggest that the exogenous variables jointly play significantly parts in the explanation of the variation of the endogenous variable (Wald Chi-square's statistics is significant at the threshold of 5%). Moreover, compared with the reduced model, the statistics of the R square has improved in the extended model moving from 30.58% to 61.40%. This result may be considered as being satisfactory when one takes into account the fact that Panel data sets are more orientated towards cross section analyses.

As far as the magnitude of the coefficients is concerned, the obtained results suggest that the GDP per capita and its quadratic term do not have the expected signs, and are significant at the threshold of 5%. These results bear out the results obtained with the reduced model and don't verify the hypothesis of this study which states that gender income inequality develop according to an inverted U curve during the development process.

According to U curve obtained here, it is possible to state that in the African countries, the failures of development policies led to the programs of structural adjustment the consequences of which on the labor market were the unemployment and the development of informal sector. From the 1990s, this sector has to represent three-quarters of the non agricultural working population in sub-Saharan Africa, against more than two-thirds around ten years previously (Kanté, 2001). Although the informal employment offers a fall-back solution to keep a minimum standard of living, but in times of crisis the workers of the informal sector undergo the declines of pay afterward of the influx of unemployed coming from the formal sector and from the immigrants going back into their countries. This situation leads to the reduction of gender income inequality the more so the men who lose their jobs in the formal sector join the women who work already for the greater part in the informal sector.

When the situation improves, the opportunities of jobs in the formal sector are favorable to men than women. In this connection, Arbache et al. (2010) found that in a number African countries, women are almost twice as likely as men to be in the informal sector and approximately two times less likely to have a public or private formal job. This situation explains the increase of gender income inequality when the situation of the economy improves. Gender pay gap is high, but varies a great deal among countries. The ratio of average female to male weekly labor income ranged from 23% in Burkina Faso to 79% in Ghana (Arbache et al., 2010).

As far as the control variables are concerned, the obtained results show that inequalities in schooling have the expected sign and are significant at the threshold of 5%. An increase in schooling inequality will lead to an increase in gender income inequality, all things being equal. This result suggests that the reduction of inequality linked to gender necessary depends on a reduction of the schooling gap between girls and boys in Africa. It justifies the commitment of the international community in the promotion of sex equality and the empowerment of women for autonomy which is part of the millennium development goals. Besides, this result confirms the fact that the contrary results obtained in Haas' works (2007) derive from the use of literacy rates which exhibit less differences between men and women than the combined gross enrolment ratio in primary, secondary and higher education.

Concerning the level of poverty in different countries, the results show that this variable is significant at the threshold of 5%. The increase in poverty in different countries leads to a drop in gender income inequality, all things being equal. This result may be accounted for by the fact that an increase in the level of poverty may be due to the reduction in men's living standards compared with women's.

This result may be accounted for by means of the new dynamics which characterize the African societies. In this connection, Adjamogbo and Antoine (2004) point out that intensive urbanization, demographic growth, crisis of unemployment in the economy have lead to important disruptions in households. Among the current changes, the increased participation of women in income generating activities is more important in terms of consequences for the relationships between men and women. If women's work in Africa is far from being a new phenomenon, their domain of participation is widening considerably. This dynamics is so important that Sen (2000) acknowledges the central role of women who are no longer the passive receivers of a reform which affects their status, but actresses of change, dynamic initiators of social transformations which aim to modify not only men's existence, but theirs as well.

Finally, it appears that the level of income inequalities in different countries constitute an aggravating factor of gender income inequality. Yet, this result is not significant at the threshold of 5%, therefore, unlike Blau and Kahn's suggestion (2000), this result suggests that any action which aims to reduce gender income inequality by means of a policy of reduction of global income inequality, mainly by favoring women's income generating activities, will have a marginal influence.

Conclusions and implications for economic policy

In this study, a panel data analysis has been used to analyze the relationship between gender income inequality and the level of development. The obtained results suggest that gender income inequality develop according to a U curve in the development process. This result is confirmed in the reduced model as well as in the extended model. In the light of this result, one may state that the development process progresses at first with less gender income inequality in African countries before rising at an advance stage of development. This finding

rejects hypothesis of this work according to which gender inequality process is describe by the inverted U curve of Kuznets. In fact, the process that governs gender inequality is subject to the period considered, the situation of men and women on the labor market and the economic health of the country or the region.

In summary, the results obtained here break down with the consensus that gender disparities generally decrease as nations develop over time. It is obvious that, in Africa, the paradigm move to men at work and women at home to men at well paid work and women at less paid work. Despite the fact that in the news paradigm women are on the labor market, which is already the improvement of their conditions, but income inequality still remain. As shown by the findings of this study, the development progress tends to widen the gap between men and women in Africa. This essential implication deserves to be placed at the centre of the African decision-makers' preoccupations given the significant role that women play in the improvement of the living conditions of households, mainly the satisfaction of household food security, health and hygiene of the members of the household and children's schooling.

In fact, several investigations show that children are provided a better schooling when the head of the household is a woman as the studies undertaken in Ivory Coast and Ghana (Vreyer, 1993; Lloyd and Gage-Brandon, 1994) Mali (Marcoux, 1994), and Togo (Pilon, 1995). Women who are heads of households invest more than men in their children, whether in terms of time, money or affective support, and this is particularly true in the domain of education. One may suppose that having been victims of a limited schooling on the whole, women perceive better than men the schooling stake (Pilon et al., 1997).

Under these conditions, it is important to promote growth which is not only sustainable, but that which is especially likely to reduce gender inequalities by an emphasis on parity in education for girls and boys, given the role that this strategy plays in the reduction of income gap between men and women. Moreover, policies meant to facilitate the access of women to the labor market in the formal sector as well as in the informal one need to be reinforced and sustained. In the context of employment crisis, this may be viewed as a priority for African countries insofar as by improving women's status and financial situation, worsening poverty would affect more men, hence the reduction of gender income inequality just as this appears in the results of the extended model.

REFERENCES

Acar S, Dogruel F (2010). "Sources of inequality in selected MENA countries". University of Texas, Inequality Project, Working Paper, N°60, October 19, p. 60.

Adjamagbo A et, Antoine P (2004). *" Etre femme « autonome »dans les capitales africaines : le cas de Dakar et Lomé"*. Dial. Document de travail DT /2004/03, p. 13.

Aghion P et, Bolton P (1997). "A Theory of Trickle-Down Growth and Development". Review of Economic Studies, 64(2): 151-172.

Altonji J, Black R (1999). "Race and Gender in the Labor market". In *Handbook of Labor Economics*. Vol. 3C. ed. By O. Ashenfelter and D. Card. Elservier Science. Amsterdam.

Anand S, Kanbur R (1993). "The Kuznets Process and the Inequality-Dvelopment Relationship. J. Dev. Econ., 40: 25-52.

Arbache JS, Kolev A, Filipiak E (2010). "Gender disparities in Africa's labor market". World Bank-AFD, Washington DC, p. 454.

Blau FD et, Khan LK (1996). "Wage Structure and Gender Earnings Differentials: An International Comparison". Economica, 63(250): S29-S62.

Blinder AS (1973). "Wage Discrimination : Reduced Form and Structural Estimates". J. Hum. Resour., 8: 436-455.

Bourguignon F, Morrison C (1990). "Income Distribution, Development and Foreign Trade: A Cross-Sectional Analysis". Eur. Econ. Rev., 34: 1113-1132.

Brauke M (1983). "A Note on the Kuznets' U. Rev. Econ. Stat., 1: 135-139.

De Janvry A, Sadoulet E (2000). "Growth. Poverty. and Inequality in Latin America: A Causal Analysis. 1970-74". Rev. Income Wealth, 46(3): 267-287.

Deininger K, Squire L (1996). "A new Data Set Measuring Income Inequality". World Bank Econ. Rev., 10: 565-591.

Deininger K, Okidi J (2003). "Growth and Poverty Reduction in Uganda. 1992-2000: Panel Data Evidence". Dev. Policy Rev., 21(4): 481-509.

Dercon S, Krishnan P (2000). "Vulnerability. Seasonality and Poverty in Ethiopia". J. Dev. Stud., 36(6): 25-53.

Fields GS(1993). "Inequality in Dual Economy Models". Econ. J., 103(420): 1228-1235.

Galor O, Tsiddon D (1996). "Income Distribution and Growth: The Kuznets Hypothesis Revisited". Economia. Supplement, 63(250): 103-117.

Galor O (2000). "Income Distribution and the Process of Development". Eur. Econ. Rev., 44(4-6): 706-712.

Giannetti M (2003). "On the Mechanics of Migration Decisions: Skill Complementarit, pp. 329-349.

Guénard C et, Dubois J (2001). "Inégalités. croissance et pauvreté en Afrique sub-saharienne. dans G. Winter (dir.). *Inégalités et politiques publiques en Afrique: pluralité des normes et jeux d' acteurs* . Karthala-IRD. Paris.

Gunning JW, Hoddinott J, Kinsey B, Owens T (2000). "Revisiting Forever Gained: Income Dynamics in the Resettlement Areas of Zimbabwe. 1983-96. J. Dev. Stud., 36(6): 131-154.

Haas S (2007). "Economic development and the gender wage gap". In Carrol Round Proceedings: The fifth annual Carrol round: An undergraduate conference focusing on Contemporary International Economics Research and Policy, 2: 126-136.

Kuznets S (1955). "Economic Growth and income Inequality". Am. Econ. Rev., 45: 1-28.

Locoh T (1996). Changements des roles masculins et féminins dans la crise: la révolution silencieuse. In : Coussy J. et Vallin J. (dir). *Crises et population en Afrique*. p. 445-499. Paris. CEPED. p. 580. (Les études du CEPED, 13.

Mincer J (1974). "Schooling. Experience and Earnings". New York: Columbia University Press for National Bureau of Economic Research.

Oaxaca RL (1973). "Male-Female Wage Differentials in Urban Labor Markets". Int. Econ. Rev., 14: 693-709.

Pampel FC, Tanaka K (1986). "Economic Development and Female Labor Force Participation: A Reconsideration". Social forces, pp. 599-619.

Pilon M (1996). "Les femmes chefs de ménages an Afrique: Contribution à un état des connaissances". In Bisilliat J. (dir). *Femmes du sud. chefs de famille,* pp. 235-256. Paris. Karthala. p. 410. (Actes d'un colloque. Paris. 1994.

Sen AK (1992). "Inequality Re-Examined". Oxford (UK): Clarendon Press.

Sorger G (2000). "Income and wealth distribution in a simple model of growth". Economic Theory, 16(1): 23-42.

Sylvester K (2003). "Enrolment in Higher Education and changes in

Income inequality″. Bull. Econ. Res., 55(3): 249-252.
Topel R (1999). ″Labor Markets and Economic Growth″. In Orley Ashenfelter and David Card. eds.. Handbook of Labor economics. Vol. 3C. Amsterdam: Elsevier, pp. 2943-2984.
Vicente J, Borge L (2000). ″Inequality and Growth: Inverted and Uninverted U Shapes″. Appl. Econ. Lett., 8(7): 497-500.
″Why Human security″ (2000). Text of presentation at the ″International Symposium oh human Security. in Tokyo, 28 July, 2000.

Appendix 1.

Pays	Year	GDP per capita (in PPP and in US$)	Women's combined gross enrolment ratio (%)	Men's combined gross enrolment ratio (%)	Women's estimated income (in PPP and in US$)	Men's estimated income (in PPP and in US$)	Ratio (Share of income of richest 10% /share of income of poorest 10%)	Proportion of people living with less than 1 US$ per day (%)
Algeria	2007	7740	74.5	72.8	4081	11331	9.61	6.8
Algeria	1998	4792	64	71	2051	7467	6.10	22.6
Benin	2007	1312	44.5	60.1	892	1726	10.69	47.3
Benin	1998	864	31	53	715	1024	10.68	47.2
Botswana	2007	13604	71.3	70	9961	17307	39.38	31.2
Botswana	1998	6103	71	70	3747	8550	39.40	33.3
Burkina Faso	2007	1124	29.2	36.3	895	1354	10.80	56.5
Burkina Faso	1998	870	16	25	712	1028	10.00	61.2
Burundi	2007	341	46.2	518	296	387	6.83	81,3
Burundi	1998	570	20	25	296	387	5.30	36.2
Cameroun	2007	2128	47.7	56.7	1467	2791	14.79	32.8
Cameroun	1998	1474	41	52	902	2054	14.70	32.8
Cap Vert	2007	3041	69.7	66.6	2015	4152	21.37	20.6
Cap vert	1998	3233	76	79	1931	4731	11.30	21.5
Chad	2007	1477	27.5	45.5	1219	1739	11.85	61.9
Chad	1998	856	20	41	3249	11731	11,80	65.9
Comoros	2007	1143	42.3	50.4	839	1446	61,33	46.1
Comoros	1998	1398	35	42	974	1822	64.30	48.2
Congo	2007	3511	55.2	62	2385	4658	17.67	54.1
Congo	1998	995	58	71	706	1297	19.30	62.2
Congo (RDC)	2007	298	40.5	55.9	189	410	15.09	59.2
Congo (RDC)	1998	822	27	38	590	1060	17.10	72.1
Côte d'ivoire	2007	1690	31.3	43.7	852	2500	19.80	23.3
Côte d'ivoire	1998	1598	32	48	856	2313	26.20	32.3
Djibouti	2007	2061	21.9	29	1496	2627	12.88	18.8
Djibouti	1998	1266	17	24	1496	2627	14.20	22.5
Ethiopia	2007	779	44	54	624	936	6.24	74,7
Ethiopia	1998	574	19	32	383	764	6.70	75.3
Gambia	2007	1225	47.2	46.4	951	1499	18.45	34.3
Gambia	1998	1453	35	48	1085	1828	12.00	53.7
Ghana	2007	1334	54.5	58.3	1133	1531	16.40	30
Ghana	1998	1735	38	48	1492	1980	5.00	78.4
Guinea	2007	1140	41.5	56.9	919	1356	14.33	70.1

Appendix. Contd.

Guinea	1998	1782	19	36	919	1356	7.40	78.3
Guinea Bissau	2007	477	28.8	44.5	301	658	9.66	48.8
Guinea Bissau	1998	616	24	43	401	837	28.00	54.7
Kenya	2007	1542	58.2	61	1213	1874	21.00	19.7
Kenya	1998	980	49	50	764	1195	10.00	26.5
Lesotho	2007	1541	62.3	60.6	1315	1797	39.40	43.4
Lesotho	1998	1626	61	53	982	2291	21.50	43.1
Madagascar	2007	932	60.2	62.5	774	1093	15.96	67.8
Madagascar	1998	756	39	39	562	953	10.20	70.4
Malawi	2007	761	61.7	62.1	646	877	10.63	73.9
Malawi	1998	523	70	79	432	616	12.40	76.2
Mali	2007	1083	37.5	51	672	1517	11.30	51.4
Mali	1998	681	20	31	524	843	12.20	72.8
Marcos	2007	4108	55.1	64	1603	6694	12.30	2.5
Marcos	1998	3005	43	56	1865	4743	7.00	7.5
Mauritania	2007	1927	50.5	50.7	1407	2439	11.84	21.2
Mauritania	1998	1563	36	45	1130	2003	7.40	23.8
Mozambique	2007	802	50.2	59.4	759	848	18.67	74.7
Mozambique	1998	782	20	29	647	921	7.20	79.9
Namibia	2007	5155	68.2	66.3	4006	6339	18.33	49.1
Namibia	1998	5176	84	80	3513	6852	6.20	34.9
Niger	2007	627	22.1	32.3	318	929	15.52	65.9
Niger	1998	739	11	19	541	941	20.50	61.4
Nigeria	2007	1969	48.1	57.9	1163	2777	16.20	64.4
Nigeria	1998	795	38	48	477	1118	12.70	70.2
RCA	2007	713	22.9	34.4	535	900	15.71	62.4
RCA	1998	1118	20	33	856	1395	32.50	66.6
Rwanda	2007	866	52.4	52	770	970	18.00	76.5
Rwanda	1998	660	42	44	535	788	4.00	82.3
Senegal	2007	1666	39	43.3	1178	2157	12.04	33.5
Senegal	1998	1307	31	40	917	1698	7.50	26.3
Sierra Leone	2007	679	37.6	51.7	577	783	12.92	53.4
Sierra Leone	1998	458	37.6	42.5	396	652	57.60	57
South Africa	2007	9757	77.3	76.3	7328	12273	34.54	26.2
South Africa	1998	8488	94	93	5205	11886	22.30	11.5
Swaziland	2007	4789	58.4	61.8	3994	5642	22.67	62.9
Swaziland	1998	3816	70	74	2267	5485	23.90	71.1

Appendix. Contd.

Tanzania	2007	1208	56.2	58.4	1025	1394	8.71	88.5
Tanzania	1998	480	32	33	400	561	6.70	89.9
Tunisia	2007	7520	78.9	73.6	3249	11731	13.17	2.6
Tunisia	1998	5404	68	74	2772	7982	7.80	1.3
Uganda	2007	1059	61.6	62.9	861	1256	13.12	51.5
Uganda	1998	1074	36	44	865	1395	32.50	66.6
Zambia	2007	1358	60.7	66	980	1740	29.92	64.3
Zambia	1998	719	46	53	540	903	13.00	72.6