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An Application of the Alkire-Foster's Multidimensional Poverty Index to Data from Madagascar:

Taking Into Account the Dimensions of Employment and Gender Inequality

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An Application of the Alkire-Foster's Multidimensional Poverty Index to Data from Madagascar: Taking Into Account the Dimensions of Employment and Gender Inequality

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Abstract

In this study, we build what we call the Malagasy Multidimensional Poverty Index (MALAMPI), which is an augmented-MPI. Here, in addition to the standard MPI dimensions (health, education and living standards), we add an additional and highly important dimension, namely employment, which is generally the sole means of production owned by poor or deprived people. Another shortcoming of the MPI approach is that it does not enable gender inequalities analysis. This is surprising since two out of the three dimensions of the classical MPI are individual attributes. In this study, we also provide a new methodology aiming at computing gender sensitive MPI-type indicators. We use data from the 2012-2013 Malagasy MDGs national survey.

Results show that adding the employment dimension to the MPI framework consistently increases Multidimensional poverty in Madagascar, the poverty headcount moving from 56% to 72%. Using our newly developed gender-sensitive method, we bring to light a significant gender gap (about 7% of increase at the expense of women), while the classical comparison of poverty level between female- headed households and male-headed households would have led to the conclusion that women are not disadvantaged. We also bring to light the fact that the gender gap does not necessary decrease when the household seems advantaged in terms of monetary living standards quintiles or in terms of household professional status.

Key Words: Wellbeing, multidimensional poverty measurement, Identification, MPI, MDGs, SDGs, Madagascar

JEL Classification: B, C12, D63, I32, O, H.

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Introduction

Poverty is always perceived in a broad sense by those experiencing it (Bessell, 2015; Narayan et al., 2000) but has traditionally been measured through a single monetary dimension, using income or consumption expenditures indicators. That is, a basket of goods and services considered as the minimum requirement for living a non-impoverished life is valued within a context and at prevailing prices. An individual or household who does not have sufficient monetary resources for that basket is deemed poor. Of course, the monetary dimension of poverty provides very useful information for stakeholders in order to address poverty. Yet poor households themselves define their poverty much more broadly to include lack of education, health, housing, empowerment, employment, personal security, governance concerns and more. No sole indicator, such as income or expenditure, is uniquely able to capture the multiple aspects that contribute to living conditions. The main drawback of money-metric approaches to measuring wellbeing is that such an approach presupposes an existing market for all factors that contribute positively to welfare, with prices reflecting weighted utility across all households or individuals in a given context. But some public goods or other attributes may be impossible or difficult to purchase because markets do not exist or where they do exist, are imperfect. Income or expenditure are thus a limited reflection of living conditions because none of them really incorporate key dimensions or wellbeing related to quality of life, or "being" and "doings" as they are called in Sen's conception (Sen, 1985). In addition, and in the same line as Thorbecke (2008) and Kabubo-Mariara et al. (2011), we argue that another drawback of the money-metric approach of wellbeing is the fact that households or individuals with a given level of income, or situated above an established poverty line, may not actually use their income to purchase the minimum required basket of basic goods and services. It follows that certain households or individuals can remain deprived of certain basic everyday's life commodities even if they are non-poor in money-metric terms.

Since 1997, Human Development Reports (HDRs) have measured poverty in ways different from traditional income-based measures. In 2010, the UNDP Human Development Report Office, in collaboration with the Oxford Poverty and Human Development Initiative (OPHI), a research center in the University of Oxford's Department of International Development, designed a new index of Multidimensional Poverty. OPHI has computed, and UNDP has published, this Global MPI in every subsequent Human Development Report. Undoubtedly, poverty analysis through the MPI lens leads to an improvement and a renewal of the efforts of poverty understanding, conception and measurement.

MPI includes three dimensions, namely health, education and living conditions. Considering three dimensions is of course better than the classical one-dimensional monetary approach, but it is still insufficient and only justified by the lack of internationally comparable, rich household databases. Hence, in a study on a single country and with a rich data set, it is important to complete Alkire's MPI by taking into account additional missing dimensions that are essential. In this study, we improve over classical MPI on two points: first of all, we add a new dimension of deprivation, namely the employment dimension. The classical MPI does not take into account integration in the labor market whereas labor is generally the only production factor owned by poor or deprived people. Acknowledging the importance of labor, the newly adopted Sustainable Development Goals (SDGs) stresses the key role of decent work (ILO, 2016) in ensuring inclusive economic growth as well as its contribution to enhancing social and environmental outcomes, addressing the three dimensions of sustainable development in a balanced and mutually reinforcing way. From what was previously only a subcomponent of the MDGs on Poverty Eradication, decent work is now brought to the forefront of the new agenda through which SDG 8 aims to promote sustained, inclusive and sustainable economic growth, full and

productive employment and decent work for all, as well as mainstreamed across the post-2015 development agenda (UN, 2015). Since the question of decent work is a universal concern, SDG 8 provides a further impetus to address the root causes of poverty and inequality. In view of the recent trends, the new development agenda is relevant to all countries, including Madagascar where less than 10% of the working population has a decent job. Taking into account the employment issue is of key importance in designing policies against poverty and that is the reason why we choose to add an employment dimension to MPI, leading to our Malagasy Multidimensional Poverty index (MALAMPI).

In a second step, we also take advantage of the fact that most MPI dimensions (health, education, and the newly added employment) can be computed at the individual level to include a gender dimension in MPI. Indeed, when dealing with poverty, one issue which cannot be left unmentioned is gender inequality. Conceptually, there are two ways to include gender dimension in poverty analysis: the first way is to conduct a comparative analysis according to the household head gender (a male-headed household versus female one). The second consists in focusing on poverty at the individual level and then comparing female poverty levels to male ones. The first approach has been overwhelmingly used in the literature on monetary poverty. It led to the conclusion that female-headed households are more exposed to poverty than male ones (Chant 2006, Gupta 1997). But actually, female-headed household leadership in many countries is the result of different processes (divorce, widowhood, men/female migration, etc.) and so these underlying processes are the effective determinants of female households' poverty status. For example, if a woman leads a household because the husband has migrated, the household would be likely to be better off because of remittances. On the contrary contrary, households headed by women following the divorce or the death of the husband are likely to be poorer. In addition, this approach fails to fully capture the scope of gender inequalities which are often contained within the household (Chant 2006, Winsor et al 2014, Bessel 2015). That is, members of the same household can face different hardships, according to their status. In order to move beyond the unitary household poverty status, Winsor et al (2014) and Bessel (2015) developed a new multidimensional poverty index (called "Individual deprivation Measure" -IDM) based on individual attributes and not households' as the MPI. Their indicator also differs from MPI because it includes more gender sensitive dimensions (family planning, violence, time use, etc.), in addition to dimensions (education, health, living conditions) already taken into account by the MPI. The authors deservedly argue that the IDM allows assessing gender poverty inequalities within households. Applying their approach to Philippines, they find that men's IDM is higher than women's, which is counterintuitive. They explain this unexpected result by the fact that Philippine is a rather relatively developed country and that in some less developed the results may be different. This example shows that the application of a rigorous gender-sensitive approach can lead to results others than those expected.

In this study and following the IDM approach, we try, as far as possible to make the MPI capable of capturing gender inequalities within the household. This is feasible since most of the basic variables used in the MPI are individual variables. Hence, we believe that it is surprising that the classical MPI does not give prominence to gender issues whereas this can be easily handled by the MPI methodology. Our study also improves on this point while sticking to the MPI methodology. We define precisely how to fully assess gender inequalities within the MPI framework in the methodological section.

Results show that adding the employment dimension in the MPI framework consistently increases Multidimensional poverty in Madagascar, the poverty headcount moving from 56% to 72%. Using our newly developed gender sensitive method, we bring to light a significant gender gap (of about 7% in head count at the expense of women), while the classical comparison of

poverty level between female-headed households and male-headed households would have led to the conclusion that women are not disadvantaged.

The rest of the paper is structured as follows. In section 1, we present the Malagasy socio-economic context. Section 2 outlines the procedure of multidimensional poverty analysis based on the Alkire-Foster approach, explains how the new dimension on employment is included and how the gender gap is taken into account. It also presents the database. In section 3, we discuss empirical findings and highlight some evidence-based policies advices. The last part concludes and suggests some elements for further research.

1. Context of the study

Madagascar[‡] is a country with about 21 million inhabitants, where about one fifth of whom live in urban area. Its population is very young since around 50% is less than 15 years old and those older than 60 make up less than 5%. This structure results from a high fertility level (total fertility rate of 5 children per woman). Mortality is still high (under five years child mortality rate of 62 per thousand) but has dramatically decreased over the last decade (it was 94 per thousand in 2003). The high fertility rate is due to early marriages (the average age at marriage for women is 19 years), early childbearing (one third of 15-19 year olds are already mothers) and a low contraceptive use (only 27% of sexually active women are using a modern contraceptive method).

Table 1: Some socio-economics characteristics of Madagascar

Demography	Statistics
Total population	21 million
Share of <15 years	50%
More than 60 years	5%
Total fertility rate	5 children per woman
Under 5 years mortality	62 per 1000
Age at first marraige	19 years
Teanage mothers (less than 20 years old)	33%
contraceptive use	27%
Socio-Economic	
Evolution of GDP/C since independence	-33%
poverty rate (monetary) for 2000	70%
HDI/rank	.510 (154/180)
share of employment in agriculture	78%
share of non-agricultural, informal sector	75%

Source: INSTAT, Madagascar (2013)

Concerning economic indicators, Madagascar is an under-developed country and one of the poorest countries in the world. Since independence, its Gross National Product per capita has steadily decreased and lost one third of its value in 2010 compared to 1960 (Razafindrakoto, Roubaud and Wachsberger, 2015). These authors attribute this regression to a lack of sustainable

‡ Figures from this section come from INSTAT, PNLP, IPM, et ICF International (2013) . INSTAT (INSTAT, 2013a, b, c, d, e, f) .

political stability, since any economic recovery has always been hampered by a political crisis. On the other hand, the demographic growth rate has always been high (more than 2.5%) for decades. Constitutional stability was restored in 2014 through resolving the political crisis that has rocked Madagascar since 2009, but the political situation is still characterized by a certain degree of turbulence that undermines national development efforts (IMF, 2015). This poor macroeconomic and political performance is reflected in living conditions: monetary poverty has always been very high in Madagascar with levels above 70% since the beginning of 2000 (INSTAT, 2013b). The Human development index is 0.510, which ranks Madagascar in 154th position among 180 countries (UNDP, 2015). Regarding the labor market and working conditions, three thirds of the Malagasy working population are involved in agriculture, and the large majority (75%) of those working outside of agriculture are in the informal sector (INSTAT 2013g).
This brief statement shows that our research field is very suitable for the application of multidimensional poverty analysis since the Malagasy demographic and socioeconomic environment is very constraining.

2. Methods and data

In this section, we start by concretely describing the construction of the MPI score and the derived MPI indicators. In a second step, we present formulas and how easy it is to including new dimensions in the MPI framework. In the third part, we develop the methodology of gender sensitive MALAMPI and the derived gender gap. We end the section with the presentation of the database and provide motivation for the selection of control variables.

2.1. Alkire's M.P.I

The MPI is a measure of acute global poverty developed by the OPHI with the UNDP's Human Development Report (HDRs) (Alkire and Santos 2010, 2014; UNDP 2015). The index belongs to the family of measures developed by Alkire and Foster (2007, 2011a); Alkire et al. (2015). Its methodology requires identifying the set of indicators which define attributes of wellbeing. For each indicator, a threshold is determined such that households who do not achieve that level are deemed deprived on that indicator, and not deprived above the threshold. Thus, from the set of the initial indicators (W, as wellbeing), we generate another set of new indicators (D, as deprivation), each of the latter taking the value 1 if the household is deprived and zero if not. A weighted sum of all the elements of D is then computed. A household is identified as multidimensionally poor if its deprivation score exceeds a certain cutoff (fixed at 1/3 for the MPI). The proportion of poor people and their average deprivation score (i.e. the intensity of poverty or percentage of simultaneous deprivations they experience) become part of the final poverty measure§. The MPI uses information from 10 indicators which are organized into three equally weighted dimensions: health, education and living standards. These dimensions are the same as those used in the Human Development Index (HDI). The MPI has two indicators for health (nutrition and child mortality), two for education (children school attendance and adult education) and six for living standards (cooking fuel, sanitation, water, electricity, floor, and possession of assets).

§ A formal explanation of the methodology is presented in in Alkire and Foster (2011a) and Alkire and Santos (2014)

Table 2: Indicators of the Malagasy Multidimensional Poverty index (MALAMPI)

	Dimensions			
Indicator	**Health**	**Education**	**Living Standard**	**Employment**
Components	-Nutrition: child Z-score weight for age< Median-2STD -Child mortality: a child has died in the household within the five year interval	-Adults Years of schooling: no adult (15 years and over) has completed at least 5 grades -Children school attendance: any child age 6-14 is not attending school	-Cooking fuel: wood charcoal, cow dung, straw, etc. -No improved Sanitation : no flushing toilet water, ventilated pit latrine -No drinkable water or too far from the house (>30mn) -No electricity -No cemented floor, -No Assets: no more than one between (radio, television, télephone, bicycle, scooter, refrigerator) and no car	-Earning less than minimum wage temporary -seasonal work, -family worker -Child labor: Child aged 6-14 and working
Theoretical justification	It is the basic component of wellbeing. Sen argued in his capability approach in terms of "being".	Being literate/educated or not determine to which extent a poor individual can remain or move out of poverty. Sen speaks of "doings".	The welfarist approach of poverty highlighs living conditions as determinants of the capacity of an individual or households to maintain his living standard in case of any shock. Very early in antiquity Aristote shed light on this view	Everything being equal, one of the three main sources of revenue is labour force in term of physical capital. And depending on working conditions we talk of decent work or not.

Source: Authors

The indicators of the MPI were selected by its initiators after a thorough consultation process involving experts in all three dimensions. During this process, the ideal indicator definitions had to be reconciled with what was actually possible in terms of data availability and cross-country comparisons. The ten indicators finally selected are almost the only set of indicators that could be estimated from demographic and health surveys (DHS), the only existing comparable survey for more than 100 countries. In 2014, for example, MPI estimations were reported for 108 countries among which 37 were Sub-Saharan African Countries.

In a further improvement we include an employment dimension, leading to our Malagasy Multidimensional Poverty index (MALAMPI). Afterwards, we take into account within household gender inequalities regarding deprivations and create two G-MALAMPI indexes (one for females, another for males). The inclusion methodologies of these two aspects are explained below.

2.2 The inclusion methodology of the employment dimension into the MPI index

Let us start by formalizing the general calculation method of the MPI-type index:

Let: D be the deprivation dimensions: D=(D1,..,Di,.....,Dn), where n is the number of considered dimensions. For example, in the case of Alkire's MPI, D=(Health, Education, Living conditions).

Each deprivation item can be decomposed into basic items: Di=(Di1,.., Dij...Dik), where k is the number of basic components of the dimension Di and Dij the deprivations indicators (Dij=1 if the individual is poor in the basic item considered and zero if not). For instance, in the case of Alkire's MPI, the health dimension has two basic items (nutrition and child mortality), education also has two (child education and adult education) while living conditions has six (cf. table 2).
To compute MPI, one starts by computing each individual total deprivation score through the following formula:

$$\overline{D} = \sum_{i=1}^{i=n} \frac{1}{n} \left(\sum_{j=1}^{j=k} \frac{1}{k} D_{ij} \right) \quad (EQ1)$$

By construction, $0 \leq \overline{D} \leq 1$, with $\overline{D} = 1$ if the household or the individual is deprived in all considered basic items and $\overline{D} = 0$ if the individual is deprived in no basic item. It is important to see that (EQ1) is a special case of a weighting system which can be rewritten as follows:

$$\overline{D} = \sum_{i=1}^{i=n} w_i \left(\sum_{j=1}^{j=k} p_{ij} D_{ij} \right) \quad (EQ2)$$

With $\sum_{i=1}^{n} w_i = 1;\ \sum_{j=1}^{k} p_{ij} = 1$ (EQ3)

So from (EQ2), it is clear that including a new deprivation dimension (D_{n+1}) or a new basic deprivation item D_{ik+1} is straightforward. One should just pay attention in rescaling the weights in a way that the sum remains equals to one. We will rely on this property to easily introduce a new dimension (the employment dimension) with four basic items: child labor, earning less than the minimum wage, temporary/casual workers, contributing family worker. The rationale behind the inclusion of these additional indicators is that employment is very important to escape or fall out of poverty, as it is generally the only resource of poor people. Each of the four selected work attributes reflects, to some extent, the paucity of the individual or the household. To comply with the constraints from (EQ3), each w_i is rescaled to $1/4$ and each $p_{.j}$ of the employment dimension is equal to $1/4$.
Once $\overline{D}$ is computed, a subject will be considered multidimensionally poor if his deprivation score exceeds a certain threshold ϱ (in the case of MPI, ϱ =1/3). In this study, we will use this threshold, so that we can compare our findings with UNDP(2015). As for monetary poverty, Alkire and Foster (2011) developed a set of indicators from $\overline{D}$ and ϱ:
Head count (H): the percentage of multi-dimensional poor
Average deprivation of multi-dimensional poor (A): the average of $\overline{D}$ on the sub-set of the multidimensional poor
Poverty intensity or multidimensional poverty index (MPI): product of head count by average deprivation of the poor (MPI=H*A).

2.3 Measuring gender inequalities within the MPI framework

When dealing with poverty, especially the monetary one, researchers generally consider the household as an unitary model, which implies that one cannot explore within-household inequalities. This limitation is due to the fact that data are usually collected at the household level, with no mean to compute living standards at individual level. As shown in table 2, three out of four dimensions of our extended-MPI are related to individual level characteristics: education, health, employment. Only the living conditions items are collected at the household level. So we are able to take into consideration intra-household inequalities, as far as indicators are collected at the individual level. In this study, we deal with gender inequalities.

To take into account the gender dimension in the MPI-approach, we can consider the indicator variable D_{ij} of EQ1 or EQ2 which takes value 1 if the j[th] item(deprivation) of the i[th] dimension is equals to one and zero if not.

Let consider the following subset of events related to : D_{ij}

D_{ij}^{F} : a female member is deprived on D_{ij}

D_{ij}^{M} : a male member is deprived on D_{ij}

Let also consider the two gender specific score equations.

$$\overline{D}^{F} = \sum_{i=1}^{i=n} w_i \left(\sum_{j=1}^{j=k} p_{ij} I\left(D_{ij}^{F}\right) \right) \quad (EQ4)$$

and

$$\overline{D}^{M} = \sum_{i=1}^{i=n} w_i \left(\sum_{j=1}^{j=k} p_{ij} I\left(D_{ij}^{M}\right) \right) \quad (EQ5)$$

(EQ4) and (EQ5) describe separately deprivation scores of women and men respectively.

If deprivations affect only women, then $\overline{D}^{M} = 0$ and $\overline{D}^{F} = \overline{D}$ and the gender gap will be maximal. If deprivation affects females and males equally, then $\overline{D}^{F} = \overline{D}^{M} = \overline{D}$ and the gender gap will be null. The gender gap is given by the G(F,M)= $\overline{D}^{F} - \overline{D}^{M}$. The gender gaps in head count, average deprivation of poor and MPI are similarly defined.

2.4 The Malagasy Data

Our paper uses data from the 2012-2013 national survey for the monitoring of the millennium development goals (MDGs) in Madagascar (NSM/MDG). Data were collected from September 2012 to August 2013 by the National Institute of Statistics (INSTAT) in collaboration with the National Food Office (ONN). NSM/MDG covered all the twenty-two (22) regions of Madagascar, using a sample of 16920 households, both for rural and urban strata, to cover all the MDGs indicators (except the MD N° 8 on donors). A comprehensive questionnaire, including most socioeconomic and demographic characteristics, was developed. Hence, the survey included the following modules: employment, education, consumption, nutrition, poverty, agriculture, fertility, mortality, gender issues, etc. Each item was sufficiently detailed to make it possible to compute all of the MDGs indicators. The data are rich enough to allow us to deploy our approach.

In this study, we use some control variables in order to assess the variation of the MPI, MALAMPI and MALAMPI-gender gap across various socioeconomic characteristics. More precisely, we analyze the heterogeneity of the multidimensional indicators according to the household place of residence, monetary living standards quintiles, head of household professional status, and gender. Using these variables as controls is justified by both theoretical and empirical considerations.

Concerning the household place of residence, the urban/rural dimension is an unavoidable dimension in poverty analysis since a huge gap exists between urban and rural areas. For instance, Alkire *et a*l. (2014b) show that MPI indicators are more three times higher in sub-saharan Africa rural areas compared to urban ones (27% against 74%; 0.131 against 0.424 on the MPI index). Thus, in the case of Madagascar, the unknown question is not whether rural areas are less disadvantaged than the urban ones but to what extent.

As per regard to the household gender, we have already stated the fact that this variable only partially captures the gender gap, as Chant (2006) and Bessell (2014), among others, have shown.

It is therefore used in this study for two reasons: first of all to be able to compare our results to similar approaches in the literature, that is, to simply see if female-headed households are multidimensionally poorer than male ones. A second reason for using this variable is to more specifically test how our new (true) gender gap indicator varies according to the gender of the household head.
Concerning the monetary living standards quintiles, as we stated in the introduction, the multidimensional poverty approach has somehow emerged against the monetary one-dimensional approach. Thus, in this study, and given that our data includes monetary living standards, it is important to analyze the link between the two forms of poverty measurement. This has already been done in the case of rural China by Weng *et al* (2016). These authors question whether monetary poverty should be considered "just" as an additional dimension of MPI or should be considered separately. Theoretically, the last answer is the most appropriated since multidimensional poverty originally deals with "basic capabilities" while monetary poverty deals with "basic needs". In their study, they maintain the two forms of poverty separately and analyze the correlation between them. Their results show that a significant proportion of households which are non-monetary poor are actually MPI poor. Therefore, the objective in this study on Madagascar, a country where monetary poverty is very high (about three quarters of the population), is the reassessment of this relationship. The last variable is the head of household's socio-professional status. This variable is widely used in research on behavior since it synthesizes both economic and cultural constraints faced by households. It shares the same concern as quintiles of monetary living standards, namely how do Multidimensional Poverty Indexes vary across the household socio-professional status? Even more so, are these variations monotonic?

3. Results

3.1 The different basic components of MALAMPI

As stated previously, our MALAMPI uses the same methodology as MPI to depict multidimensional poverty in Madagascar, except that we include an additional dimension, namely employment. In the methodological part we explained the rationale behind this inclusion. Table 3 shows the occurrence of the basic deprivations. We notice that while some deprivations are relatively rare, others appear for almost every household. Thus, 99.1% of households are poor in cooking fuel, and 93.7% are poor in sanitation. At the other extreme, only 3.7% experience the death of a child in a five year period, whereas 23.8% of children are malnourished. The newly added employment dimension is represented by four indicators: child labor, underpaid jobs, family workers, and temporary jobs. Up to 74.3% of households have at least one underpaid person, while 26.3% include a working child.

It is important to stress the fact that it is very difficult to compare the levels of the different basic indicators together (except those for living standards), because they refer to different underlying phenomena.

Table 3: Occurrence of basic deprivations indicators

Indicators	Mean
a child is malnourished in the household	23.68%
a child has died in the household within the five year interval	3.66%
no adult (15 years and over) has completed at least 5 grades in school	31.33%
At least one child aged 6-14 is not attending school	34.45%
No electricity	79.97%
No improved sanitation and environment: no flushing toilet water or ventilated pit latrine	93.67%
No drinkable water or too far from the house(>30mn)	73.65%
No cemented Floor	75.08%
Cooking fuel: wood charcoal, cow dung, straw, etc.	99.17%
No Assets: no more than one between all (radio, television, telephone, bicycle, scooter, refrigerator) and no car	65.99%
A child aged 6-14 is economically working	26.33%
Underpaid: a household member aged 15 years or more is paid less than 100000 Arriary (99.6US$ 2013) a month	74.29%
A household member aged 15 years or more is a contributing family worker	65.39%
A household member aged 15 years or more is a temporary worker	35.77%

Source: Madagascar 2012 national survey for the monitoring of the millennium development goals, authors' calculations

3.2 The Standard MPI index and comparison with UNDP's Findings

Table 4 shows that the MPI index is 0.297, which is slightly less than what has been published by the UNDP (2015) at 0.357. The corresponding headcount poverty index is 56%, against 66,9% for UNDP. The differences between our findings and UNDP's could be due to the fact that different data sets are used, and different reference periods are covered. In this study, we use the MDG-survey of 2012/2013, whereas UNDP datas come from the DHS of 2009. But the decrease in headcount and MPI index is also in line with the evolution of monetary poverty which decreased from 76,5% in 2010 to 71,5% in 2012/2013 (INSTAT, 2015).

Beyond this general evolution, it is important to analyze the socioeconomic variations of the multidimensional poverty in Madagascar. In this study, we consider the household's place of residence and quintile of monetary living standards, the gender and professional status of the household-head. The general findings are what were expected: households with privileged socioeconomic backgrounds are generally less poor than those with poor backgrounds. Hence, the households living in urban areas are far less likely to be poor compared to those from the rural area (14.7% against 64.3% for headcount and 0.066 against 0.343 for the MPI). From the first quintile to the fifth of monetary living standards, multidimensional headcount decreases from 85.8% to 20.9%. The MPI index follows a similar path (from 0. 499 to 0.096). As far as household head professional status is concerned, MPI headcount varies from 4.8% for higher and medium officers to 69.5% for farmers, with intermediate values of 26.3 and 28.9% respectively for office workers or blue collar workers and for the self-employed.

As regards household head gender, results show that households with female heads are a little bit MPI poorer (MPI head count of 57.2% and MPI index of 0.302) than those headed by men (MPI head count of 55.7% and MPI index of 0.295). But as we argued in the introduction, only considering the gender of the household head does not allow to fully account for gender inequalities. Before moving to an accurate measure of gender inequalities within the MPI approach let us first improve the MPI index itself by including an essential dimension which determines wellbeing.

Table 4: Multidimensional poverty indicator (MPI) (headcount, MPI Index and average deprivation of the poor) according to some household socioeconomic characteristics

		Sample size	headcount	MPI index	Average deprivation of the poor
Place of residence	Urban	4121	14.74%	0.066	0.449
	Rural	12791	64.28%	0.343	0.533
	Total	16912	55.99%	0.297	0.530
Household head gender	Male	13071	55.74%	0.295	0.530
	Female	3841	57.18%	0.302	0.528
	Total	16912	55.99%	0.297	0.530
5 monetary living standard quintiles	Poorest	2534	85.81%	0.499	0.582
	Poorer	2715	69.97%	0.373	0.533
	Middle	3123	60.22%	0.306	0.508
	Richer	3745	43.05%	0.209	0.485
	Richest	4795	20.90%	0.096	0.458
	Total	16912	55.99%	0.297	0.530
Head of household professional status	higher and medium officials	457	4.83%	0.019	0.389
	office worker or blue collar workers	2157	26.34%	0.123	0.465
	Self-employed	2198	28.88%	0.139	0.482
	Farmers	10845	69.52%	0.375	0.539
	Unemployed	1255	37.28%	0.189	0.508
	Total	16912	55.99%	0.297	0.530

Source: Madagascar 2012 national survey for the monitoring of the millennium development goals, authors' calculations

3.3 Moving from MPI to MALAMPI

As explained in the literature review, poor people generally rely on their labor force to generate income and resources in developing countries without social welfare systems. Therefore, including the employment dimension in the multidimensional poverty index is essential to improving wellbeing measurement. In addition, the fact that employment characteristics are related to each household member is important in assessing within household gender differences.

Table 5 shows that including employment in the MPI (which becomes the MALAMPI) leads to an important increase in the MPI index: the headcount rises from 56 to 72.8%, representing an increase of about 17% in absolute terms. The MPI index increases from 0.297 to 0.390, which is quite large. It is important to stress the fact that employment indicators (child labor, underpaid jobs, contributing family workers, and temporary jobs) included in the index really reflect features of vulnerability, bad working conditions or lack of control over own work. In reality therefore, multidimensional poverty is more prevalent in Madagascar than suggested by the classical MPI. When we consider the same socioeconomic variables as previously, the general profile of MALAMPI is no different from the MPI: the more advantaged households are generally less poor, whereas those with poor socioeconomic backgrounds are more likely to be poor in MALAMPI. But we should raise an important exception, which is the head of household gender: contrary to the MPI measures, where female-headed households were slightly more numerous in being poor than male-headed ones, the reverse is observed for MALAMPI, with a household

head gender gap of 2% in headcount. This result means that working conditions are a little bit better in households headed by women. But it does not inform on gender inequalities in Malagasy society. We tackle this issue in the next section.

Table 5: Augmented Multidimensional poverty indicators (MALAMPI) (headcount, MALAMPI Index and average deprivation of the poor) according to some household socioeconomic characteristics

		Sample size	MALAMPI head count	MALAMPI Index	Average deprivation
Place of residence	Urban	4121	23.27%	0.103	0.442
	Rural	12791	82.78%	0.447	0.540
	Total	16912	72.83%	0.390	0.535
Household head gender	Male	13071	73.12%	0.392	0.536
	Female	3841	71.43%	0.379	0.530
	Total	16912	72.83%	0.390	0.535
5 monetary living standard quintiles	Poorest	2534	95.59%	0.582	0.609
	Poorer	2715	89.56%	0.489	0.546
	Middle	3123	82.16%	0.422	0.513
	Richer	3745	65.63%	0.314	0.478
	Richest	4795	31.19%	0.141	0.451
	Total	16912	72.83%	0.390	0.535
household-head professional status	higher and medium officials	457	11.79%	0.046	0.386
	office worker or blue collar workers	2157	3638%	0.169	0.465
	Self-employed	2198	38.74%	0.182	0.469
	Farmers	10845	89.88%	0.492	0.547
	Unemployed	1255	45.74%	0.233	0.509
	Total	16912	72.83%	0.390	0.535

Source: Madagascar 2012 national survey for the monitoring of the millennium development goals, authors' calculations

3.4 MALAMPI Gender sensitivity and gender gap

It is important to analyze accurately the gender poverty gap, because the social status of women, especially in the African context, is generally low compared to men. Therefore, the gender gap is an important social issue to pay attention to or to highlight. The MPI methodology being designed at household level, without taking into account within household gender gaps, we proposed, in the methodological section, an adaptation with which to fully capture gender inequality within a household. In this section, we start by describing the gender difference in each basic component of the gender sensitive MALAMPI index (G-MALAMPI), before moving to the interpretation of the gender gap when considering the G-MALAMPI index.

3.4.1 Gender differences in the basic components.

In this sub-section, we consider only basic indicators which were computed using individual-level variables: child mortality and nutrition, child and adult education, child labor, under-paid workers, contributing family workers, temporary workers. We thus omit living conditions components since they are measurable only at the household level.

Table 6 shows that the gender gap is more prominent on labor market indicators than on health and education ones. Indeed, if we consider the four forms of household-poor labor market attributes, women are clearly disadvantaged in two attributes (contributing family workers, underpaid workers and temporary work) whereas for the last one (child labor), there is a balance. The gap is maximal for unpaid family workers where 59% of households have a female contributing family worker against 35.6% with a male in the same work status. Although to a lesser degree, underpaid work is also more frequent when considering women (66.7%) than men (61.6%). As temporary work status is concerned, the gap is small (28.9% against 27%) but still not in favor of women.

In regard to the two indicators of the education dimension, the gap is pro-female for one and pro-male for the other. Actually, there are more households with 6-14 years boys not attending school (22.1%) than girls (20.9%). Even if the difference is low, it deserves to be highlighted because this situation is not common in Sub-Sahara Africa. However, this positive gender gap in child education seems recent because at the adult level, households with non-educated women are still more numerous (44.1%) than those with men (37.2%).

Concerning the health dimension, gender gaps, albeit small, favor girls, both in terms of nutrition (12.4% households have malnourished girls against 13.9% for boys) and mortality (1.8% against 2%).

In summary, if we consider gender inequalities in terms of the number of basic indicators, it appears that globally females are not especially disadvantaged compared to males in Madagascar. Gaps are generally moderated when to the advantage of women and more important when at their expense. Bearing this in mind, we can proceed to the next step by analyzing the G-MALAMPI Gap.

Table 6: Basic components of G-MALAMPI Indicators

Indicator	Female	Male
a child is malnourished in the household	12,4%	13,9%
a child has died in the household within the five year interval	1,8%	2,0%
no adult (15 years and over) has completed at least 5 grades	44,1%	37,2%
At least one child aged 6-14 is not attending school	20,9%	22,1%
A child aged 6-14 is economically working	17,1%	17,0%
Underpaid: a household member aged 15 years or more is paid less than 100000 Arriary (99.6US$ 2013) a month	66,7%	61,6%
A household member aged 15 years or more is a contributing family worker	59,1%	35,6%
A household member aged 15 years or more is a temporary worker	28,9%	27,0%

Source: Madagascar 2012 national survey for the monitoring of the millennium development goals, authors' calculations

3.4.2. Gender inequalities in G-MALAMPI.

As already foreshadowed through the basic indicators, MALAMPI indicators (headcount, MPI and average deprivation) are higher when computed for females than for males. Hence, the headcount indicator is equal to 68.2% when computed for female attributes, against 61.4% when computed for male ones, which leads to a gender gap of 6,8%. The MALAMPI index itself is also more important for females (0.346) than for males (0.307), corresponding to a gap of 0.039 at the expense of women. This result contrasts with what is observed when gender inequalities were measured using the non-gender sensitive indicator and considering the household head gender as

the unique source of male-female difference. But before drawing a definitive conclusion, it is important to go beyond this overall picture and to explore the variation in gender gaps across households' main features. As previously, we consider head of household gender, professional status, the household monetary living standard quintile, and the household place of residence.

Disentangling gender gap according to the sex of the household-head shows that it is maximal in female-headed households, since the headcount gender gap is 19.4%, which is more than 2.5 times higher than the average gender gap, and four times higher than the gender gap in male-headed households. If we consider the MALAMPI index the gap is up to 0.107, which is also more than 2.5 times the average value and four times the gender gap in male-headed households. These results clearly indicate therefore that women deprivations are worse in households led by women: the heading of households by women, instead of strengthening women's status, rather worsens it. When we examine which indicators are at the origin of such deterioration, it appears that adults' education and underpaid jobs are the main drivers. Of course, these two basic indicators are intertwined: women's lower endowment in terms of human capital leads to lower productivity and wages in the labor market. Finally, results found here are in line with Bessell (2015) and Chant (2006) advocacy to scrutinize gender inequalities beyond the gender of the household's head. If we were to ignore the gender differences within the household by considering a gender insensitive MALAMPI, as in table 5, we would have found that households led by women are not disadvantaged and that they are even a little bit better off. Household head professional status also shows important variation in the gender gap and this variation is far from being linear: contrary to what could be expected, the gender gap is not lowest when the head of household holds the highest position, but rather for the working class. More precisely, the gender gap in headcount is about 5.7% for households headed by higher or middle officials, whereas it is two times less for those of simple office and blue collar workers. Yet we also notice that the highest gender gaps (7.6% and 7.8%) are observed for the self-employed and for farmers. We also wanted to explore the relationship between the quintiles of monetary living standards and the gender gap in MALAMPI. Globally, the relationship between monetary poverty and the MALAMPI gender gap is not monotonic. Indeed, gender gap starts by increasing from 6.7% in the first poorest quintile to 8.1% in the fourth quintile, but decreases to 4.1% in the fifth richest quintile.

Thus the evolution of the gender gap according to the socioeconomics variables (household head professional status and household living standards quintiles) tends to prove that inequalities are not necessary lowest in the most advantaged households. When considering household place of residence, however, the gender gap is more prominent in rural areas (7.40%) than in the urban ones. Most studies focusing on the rural-urban gender gap generally also lead to the same findings.

Table 7: Augmented Gender sensitive Multidimensional poverty indicators (G-MALAMPI) (headcount, MALAMPI Index and corresponding gender gaps) according to certain households socioeconomic characteristics

	Cases	Female Head count (1)	Male head count (2)	Female MALAMPI Index (3)	Male MALAMPI index (4)	gender difference in head count : (1)-(2)	gender difference in MALAMP index: (3)-(4)
Total	**16912**	**68.22%**	**61.42%**	**0.346**	**0.307**	**6.80%**	**0.039**
Place of residence							
Urban	4121	18.79%	14.95%	0.080	0.064	3.84%	0.016
Rural	12791	78.15%	70.75%	0.399	0.355	7.40%	0.044
Gender of household head							
Male	13071	68.55%	64.37%	0.349	0.324	4.18%	0.025
Female	3841	66.68%	47.31%	0.330	0.223	19.37%	0.107
Consumption quintiles							
Poorest	2534	93.53%	86.83%	0.525	0.476	6.69%	0.049
Poorer	2715	85.69%	77.92%	0.440	0.394	7.77%	0.047
Middle	3123	76.72%	69.36%	0.375	0.334	7.37%	0.042
Richer	3745	58.69%	50.60%	0.271	0.233	8.10%	0.039
Richest	4795	26.47%	22.38%	0.117	0.097	4.09%	0.020
Profession of household head							
higher and medium officials	457	9.64%	3.89%	0.036	0.015	5.76%	0.021
office worker or blue collar workers	2157	28.92%	2684%	0.129	0.120	2.08%	0.009
Self-employed	2198	33.06%	25.47%	0.148	0.113	7.59%	0.035
Farmers	10845	85.95%	78.12%	0.444	0.396	7.84%	0.048
unemployed	1255	40.61%	36.92%	0.195	0.174	3.69%	0.021

Source: Madagascar 2012 national survey for the monitoring of the millennium development goals, authors' calculations

Conclusion

In this study, our objective was to provide an analysis of MPI-type multidimensional poverty in Madagascar. The MPI emerged from the observation that traditional poverty indicators, especially monetary poverty, were unable to accurately synthesize the whole spectrum of deprivations faced by people. Indeed, monetary poverty fails to take into account the discrepancy between "means" and "achievements". That is why multidimensional poverty approaches aim to fill this gap. There are various methodologies for building multidimensional poverty indicators:

factorial analysis, entropy, fuzzy sets, etc. as well as the Alkire-Foster (MPI method). The latter has gained in popularity and, since 2010, has been adopted by UNDP in the yearly human development reports. This success is due, among others, to the axiomatic robustness of MPI as demonstrated by Alkire and Foster (2011). The simplicity and transparency of the weighting system of its three dimensions (health, education, living conditions) is another strength. In this study, we show that MPI suffers from two weaknesses: the first is that it ignores an important dimension of deprivation in developing countries, which is access to decent work while when labor is the only means of production owned by poor people. The employment issue is so important in developing countries that it has been integrated as a full objective of SDGs. But a prerequisite for being able to integrate a dimension into the MPI is the existence of data for the calculation. The employment variables could easily be included in the DHS/MICS surveys, which are the main surveys used by UNDP for computing MPI indexes. In our study, given that we had employment variables in our survey, we were able to include this dimension in the MPI indicators to create our MALAMPI index.

The second flaw of the classical MPI methodology is that it passes over gender issues within households. This is an important issue in poverty analysis, however, which cannot be correctly tackled by monetary poverty since data on consumption and expenditure are usually collected at the household level. Two (three) out of three (four) dimensions of the MPI (MALAMPI) basic indicators are individual variables, so that gender issues can easily be tackled through the MPI approach. Taking advantage of our rich database for Madagascar, we proposed multidimensional poverty analyses which include the employment dimension and the issue of gender inequalities.

Results show that adding the employment dimension to the MPI framework consistently increases multidimensional poverty in Madagascar, the poverty headcount moving from 56% to 72%. Using our newly developed gender sensitive method, we bring to light a significant gender gap (about 7% in head count at the expense of women), while the classical comparison of poverty levels between female-headed households and male-headed households would have led to the conclusion that women are not disadvantaged. We also bring to light the fact that the gender gap does not necessary decrease when the household seems advantaged in terms of monetary living standards quintiles or in terms of household professional status. Finally, our study offers a powerful tool for designing policies aiming at reducing multidimensional poverty gender gap. We also suggest coupling targeted anti-poverty policies with gender and employment concerns that are at the center of the post-2015 development agenda.

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