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What Makes Africans Happy?

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Abstract

This paper analyses the key determinants of happiness in Africa. Using both Bayesian Model Averaging (BMA), Weighted Average Least Squares (WALS) and Mallows Model Averaging (MMA) approaches to tackle the issue of model uncertainty on a panel datset of 30 African countries over the period 2006-2017, we identify a total of 13 economic, social, cultural, historical, structural and institutional factors which influence the well-being of Africans

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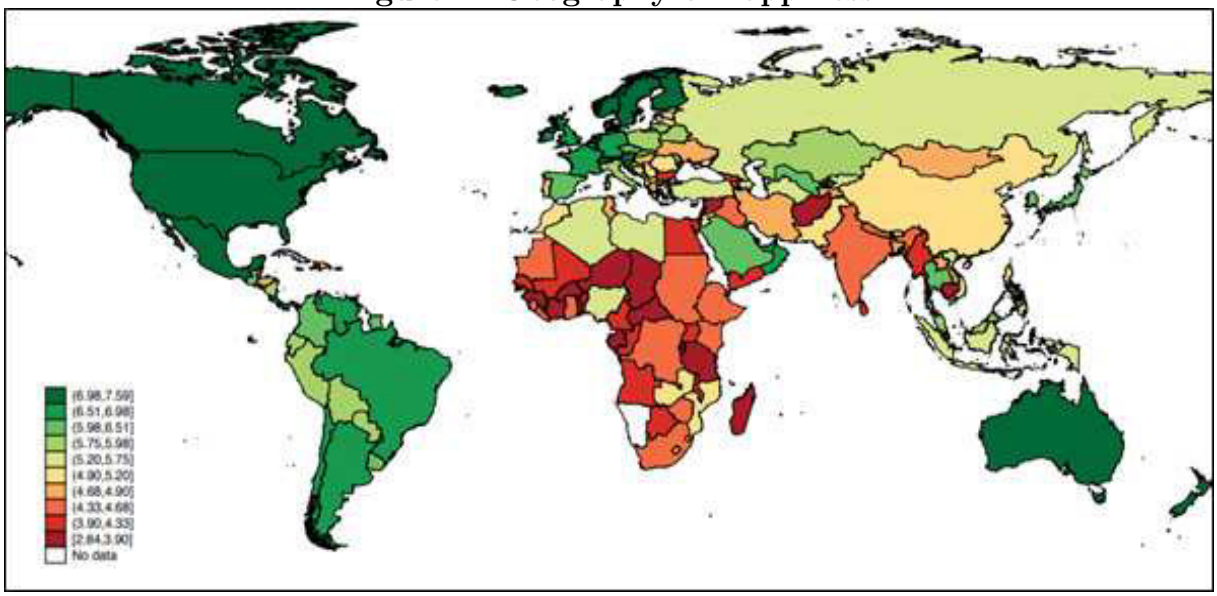
1 Introduction

Africa remains the least developed and least advanced continent in the world (World-Bank, 2019). Although the economic situation is progressing rapidly, the continent continues to witness an increased demographic trend, compounded with escalating unemployment and poverty rate, especially among young people. Similarly, institutional framework remains approximate in most countries and constitutes an obstacle to its economic and social development. According to the 2019 World Happiness Report (WHR), whose objective is to integrate well-being into public statistics, more than 80 % of African countries appear in the second half of the report's ranking (Helliwell et al., 2019). Figure 1 which presents the geography of happiness distribution shows how this index evolves in different countries around the world. The map below demonstrates average national values of the "life ladder" question from 2012-2014 encouraging respondents to value their lives today on a 0 to 10 scale, with the worst possible life index at 0 and the best possible life index at 10.

Figure 1: Geography of happiness



Source: Helliwell et al. (2015). **Note:** The darkest green is for the highest averages, and the darkest red is for the lowest.

From the figure above, it appears that unlike other regions such as Europe and the Americas in particular, the perception of happiness is relatively low in Africa. In general, African countries are mostly located at the bottom of the distribution with a ladder score of less than 5. This glaring prompts an examination of the key factors behind this poor performance.

The objective of this paper is therefore to identify the key determinants of happiness in Africa. This constitutes an important part of existing vast literature which seeks to explain the causes of the subjective well-being of citizens. Indeed, the issue of factors influencing the subjective well-being of citizens, particularly in developing countries, has long been the subject of special attention by international organizations and researchers. The latter have focused on economic factors such as per capita income (Easterlin, 2001; Frey and Stutzer, 2002; Powdthavee, 2010), socio-cultural factors such as religion, education (Powdthavee et al., 2015; Frey, 2018) or institutional factors such as the quality of governance (Helliwell et al., 2018; Frijters et al., 2020). However, it should be noted that these studies mainly focus on the influence of a key factor, and ignores the effects of other variables.

Following from the objective of this work, we use data at national levels from the

World database of Happiness on a panel of 30 African countries over the period 2006-2017 and analyze the impact of 25 potential determinants of Africans' well-being. In doing so, our contribution to the existing literature is threefold. First, to the best of our knowledge, this is the first empirical study which utilizes adopts a broader range of potential determinants of happiness in African countries. Second, we explain happiness in Africa through different groups of factors which are economic, social, cultural, historical, structural and institutional. Third, its originality is above all methodological. Indeed, comparing compared to the existing studies, this paper tackles the issue of model uncertainty in identifying these determinants by using both Bayesian Model Averaging (BMA), Mallows model averaging (MMA) and Weighted Average Least Squares (WALS) approaches.

As a result, we identify a total of 10 factors that promote the well-being of Africans, namely: per capita income, natural resource rents, employment rate, education (primary level), religion (Catholic and Muslim), governance (control of corruption and political stability), electricity and ICT infrastructure. Conversely, we identify 3 factors having a negative impact on happiness in Africa, namely: urbanization, the colonial past and ethnic fractionalization.

After this introduction, the rest of the paper is organized as follows. Section 2 reviews the literature on the determinants of happiness. Section 3 describes the methodology and data. Section 4 presents and analyses the results. Section 5 checks their robustness and section 6 concludes.

2 Synthetic review of the literature on the determinants of happiness

Various studies have focused on identifying the determinants of happiness. Without claiming to be exhaustive, we can group them into two categories, namely economic and non-economic factors.

The relationship between income and subjective well-being has been the object of extensive empirical research. The results are clear: people with higher income unambiguously consider themselves to be more satisfied with their lives than people with low income (Frey et al., 2018). Income, both from a national comparative level across countries (such as income per capita) and the different levels of income in a specific country, has shown that people with higher incomes are happier than people with lesser incomes at a given point in time (Easterlin, 2001; Powdthavee, 2010; Lim et al., 2020). Moreover, cross-national comparisons of income levels and subjective wellbeing suggest that improvements on the basic needs of people living in poorer countries will have a greater impact than income gains in wealthier countries (Diener and Fujita, 1995). Other studies have explored the reverse direction of causality, and found that people with higher happiness levels tend to be more performant in the labor market with a high tendency to earn more income in the future (Graham et al., 2004). Other economic factors that have been largely discussed in the literature are inflation and unemployment. In this line, Di Tella et al. (2001); Frey and Stutzer (2002) show that people appear to be happier when inflation and unemployment are low.

Concerning non-economic factors, some studies have proven that age, children, marriage, education, religion and institutions have a strong relationship with happiness. Michalos (1991) shows that within countries, demographic factors such as age, educa-

tion, socio-economic status and race tend to explain people's well-being. Frey (2018) establishes a clear U-shaped relationship between age and life satisfaction. Regarding Children's effects on happiness, results are mixed. Kohler (2012) shows that the expected happiness gains from children differ specifically from institutional contexts, especially at higher parities. Other studies have shown that changes in happiness after having children varies across countries (Aassve et al., 2005). Dykstra and Keizer (2009); Hansen et al. (2009) show that the effect of having children on happiness is quite small for both males and females in the age range 50–70. Considering the effects of marriage, studies show that married people are happier than unmarried people (Kislev, 2018; Lawrence et al., 2019). Studies however have mixed results on the effect of education on happiness. While Shields et al. (2009); Powdthavee et al. (2015) documented a negative correlation between education and subjective well-being, Nikolaev and Rusakov (2016) argue that the effect of education on happiness depends on the age group.

Moreover, researchers show that subjective well-being differs considerably between countries and cultures. Globally, they argue that religious people have proven to be happier than those who do not belong to any religious community (Frey, 2018; Minkov et al., 2020). Regarding institutional factors, institutional conditions and political systems are a major determinant of human happiness. Bjørnskov et al. (2010) find that, formal institutions increase subjective well-being. Graham et al. (2004) find a strong positive correlation between happiness and preference for democracy. Likewise, Helliwell and Huang (2008); Ott (2011); Njangang (2019); Frijters et al. (2020) show that good governance is a significant determinant of happiness. In addition, many studies prove that political arrangements like trust and freedom have positive effects on happiness (Helliwell, 2003; Layard, 2006).

Given the lack of consensus on the extent of the determinants of happiness, we opt for a global approach to analyze the economic, social, cultural, historic, structural and institutional determinants of happiness in the context of African countries.

3 Methodology and Data

3.1 Methodology: Bayesian model averaging (BMA)

We analyse the key determinants of happiness in Africa using a Bayesian approach, particularly the Bayesian model averaging (BMA). This approach is very useful in addressing model uncertainty in a canonical regression specification. Specifically, it allows us to tackle two major issues that typically arise in empirical studies with a relatively large number of explanatory variables, for which classical regression models do not provide an effective response. These issues are the inclusion of variables in the model and their respective importance[1]. To make this point clear, let us assume that our model is a linear regression of the following form:

$$y = \alpha_\gamma + X_\gamma \beta_\gamma + \varepsilon, \qquad \varepsilon \left(0, \sigma^2 I\right) \tag{1}$$

Where y is the dependent variable (i.e. happiness measure), α_γ and β_γ denote the intercept and the coefficient respectively, X_γ is a matrix of explanatory variables (i.e. potentials determinants of happiness) and ε is an iid error term whose variance is σ^2.

The main question is which variables should enter the matrix X_γ, among a host of potential explanatory variables? In principle, the choice of $X_\gamma \in \{X\}$ to be included in

[1]For more technical details, see Raftery et al. (1996); Fernandez et al. (2001); Magnus et al. (2010).

the model must be based on their relative importance. In the canonical linear regression problem, a single model contains all the explanatory variables, rendering the approach inefficient or even unfeasible with a limited number of observations (see Chipman et al., 2001). The BMA approach tackles this model uncertainty problem by estimating models for all possible combinations of X and constructing a weighted average over all of them (see Feldkircher and Zeugner, 2015). Supposing that X contains K potential variables, the BMA approach assumes to estimate 2^K models, each with a certain probability of being the "true" model.

To do so, the BMA analysis begins by considering a set of possible models, say $M = \{M_1,\ M_2,\ ...,\ M_K\}$, where M represents the model space the averaging will be conducted over. Once this space has been set, the posterior distribution of the parameters of interest from a linear model, β, given the data D, is:

$$P\left(\beta|D\right) = \sum_{j=1}^{k} P\left(\beta|M_j, D\right) P(M_j|D) \tag{2}$$

Equation 2 is the weighted average of the posterior distributions under each model. Using Bayes' theorem, one can rewrite the posterior probability of model M_K as follows:

$$P\left(M_K|D\right) = P\left(D|M_K\right) \frac{P\left(M_K\right)}{P\left(D\right)} = P\left(D|M_K\right) \frac{P\left(M_K\right)}{\sum_{j=1}^{k} P\left(D|M_j\right) P(M_j|D)} \tag{3}$$

$$P\left(D|M_K\right) = \int P\left(D|\beta^{(K)}, M_K\right) P\left(\beta^{(K)}|M_K\right) d\beta^{(K)} \tag{4}$$

Where $\beta^{(K)}$ is the vector of parameters from model M_K, $P\left(\beta^{(K)}|M_K\right)$ is a prior probability distribution assigned to the parameters of model M_K, and $P\left(M_K\right)$ is the prior probability that M_K is the true model. To implement the BMA estimator, we need to choose prior distributions for the parameters of the model and then, based on the data, calculate posterior probabilities attached to different models and, finally, find the parameter distributions by averaging the posterior distributions.

To assess the robustness of each variable, we use Posterior Inclusion Probabilities (PIP), defined as the probabilities of a variable being in a model given the data. It is obtained by summing of the model posterior probabilities of all models containing the parameter β_i:

$$PIP_{\beta_i} = P\left(\beta_i M_K|y\right) = \sum\nolimits_{\gamma,\beta_i M} P(M_K|y) \tag{5}$$

The higher the PIP, the more robust is the explanatory variable in the regression equation. As Jedidi and Pentecôte (2015), we perform 4 million iterations to obtain a sufficiently long Markov chain and excluded the first million simulations to avoid disturbing the prior and to achieve better convergence. All estimations are performed with the R package using the BMS library (Feldkircher and Zeugner, 2012). Following Raftery et al. (1996), a PIP is considered as weak if between 50 % and 70%, positive if between 75 and 95%, strong if between 95% and 99 %, and decisive if above 99 %. Hence, an explanatory variable whose PIP is greater than the threshold of 0.5 is considered as relevant.

3.2 Data

The data used cover 30 African countries over the period 2006 - 2017[2]. The size and

[2]Benin, Botswana, Burkina Faso, Cameroon, Chad, Congo (Brazzaville), Congo (Kinshasa), Egypt,

period of study are limited by the availability of data on the happiness variable. The dependent variable that measures happiness is the average level of subjective wellbeing of the population of country i at period t approximated by the "life ladder" index, one of the most used measures in the literature of happiness (Ram, 2017; Helliwell et al., 2018; Njangang, 2019). This index comes from the *World Database of Happiness* (2017)[3] which ranks 156 countries, measured using the level of happiness perception of their citizens, obtained by inviting respondents to think of their lives as a ladder, with the worst possible life index for them at 0, and the best possible life index at 10.

The independent variables representing the potential determinants of happiness retained in this study are inspired by the empirical literature presented in section. These are grouped into 4 sub-categories: economic, socio-cultural, structural and historical.

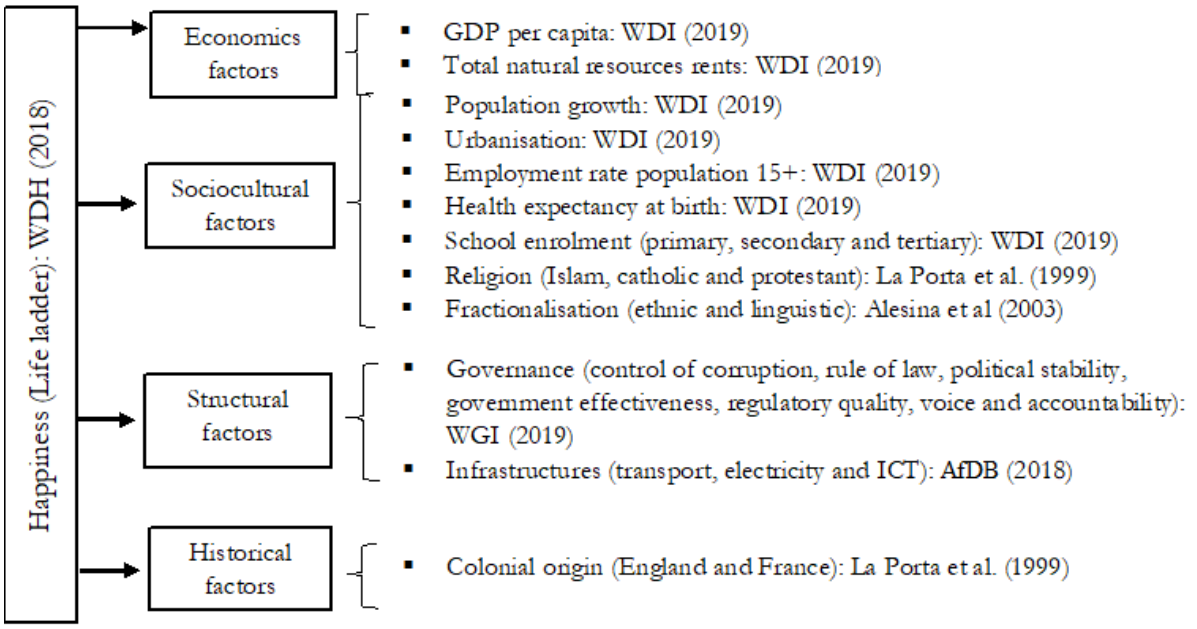
Economic variables : We consider the logarithm of GDP per capita and its quadratic form in order to test the existence of a non-monotonic relationship between economic development and citizens' well-being. Given the relatively low level of per capita income on the continent, it is expected that income level should be negatively associated with happiness. However, there is a threshold at which income improves the perception of happiness. To do this, we suggest the existence of a quadratic relationship between income and happiness. We also test the effect of proceeds from natural resources (of which the continent is very rich) on the well-being of its populations.

Sociocultural variables : The effects of socio-cultural variables on happiness in Africa are assessed through population growth rate, employment rate, urbanization, population life expectancy, education, ethnic fragmentation, and religion (Protestant, Muslim and Catholic). It is expected that some of these variables significantly influence the perception of happiness, especially employment, education and health.

Structural variables : These include the quality of infrastructure and governance. Specifically, we are mainly interested in ICT, electricity and transport infrastructure from the Africa Infrastructure Development Index (AIDI) of the African Development Bank (AfDB). According to the AfDB (2018) report, the development of infrastructure in Africa is critical in fostering economic growth and improving the living standards of Africans, since it contributes significantly to human development, poverty reduction, and the attainment of the Sustainable Development Goals (SDGs). Regarding the quality of governance, we take advantage of the six governance indicators of Kauffman et al. (2009) available in the Worldwide Governance Indicators (WGI) database of the World Bank, namely voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. We hypothesize that structural variables improve people's perception of happiness.

Historical variables : Concerning historical variables, we are particularly concerned with the colonial past of African countries and take advantage of data from La Porta et al. (1999) and consider the categorical variables that capture French and British colonization. The underlying assumption is that historical legal origin shapes Africans wellbeing, our sample being dominated by English-speaking and French-speaking countries. The summary of all the variables as well as the data sources are presented in Figure 2.

Figure 2: variables descriptions and sources



Source: authors' construction. **Note:** This figure presents a total of 25 variables that could potentially explain happiness in Africa. The acronyms WDH, WDI, WGI, AfDB respectively designate the World Database of Happiness, World Development Indicators, Worldwide Governance Indicator and African Development Bank.

4 Results

Table 2 shows the Posterior Inclusion Probabilities (PIPs) of each determinant, the Posterior Mean (PM), and the Posterior Standard Deviation (PSD) of the posterior distribution for the associated parameter. We identify a total of 8 relevant determinants having effect on the well-being of Africans. Specifically, as economic factors, we found a strong quadratic relationship between GDP per capita and the happiness index (PIP value greater than 95 %). In other words, the marginal effect of real GDP per capita induces diminishing returns on the welfare of citizens up to a certain threshold, and later becomes favorable for the latter. This result from a general perspective means that the increase in per capita income has a positive impact on well-being in Africa. This result confirms those obtained by the abundant literature which suggests that people with higher income unambiguously consider themselves to be more satisfied with their lives than persons with low income, because high income seems to raise consumption, health, educational level, and employment. Moreover, as documented by Easterlin (2001), people living in rich countries are on average considerably happier than those living in poor countries, taking into account the cost of living in the different countries. Regarding natural resources, although the effect of their earnings is weak (PIP value between 70 % and 50 %), the latter is positively linked to happiness. This result remains consistent with the wealth of the African continent in natural resources (AfDB, 2018). Thus, a better exploitation of these resources coupled with an equitable redistribution of income could be considered as

Gabon, Ghana, Guinea, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Morocco, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.

[3]The primary source for this database comes from Gallup World Poll surveys which ask the respondents in each country to rate their happiness (subjective well-being) on a 0–10 scale.

an effective mean to fight against poverty and to access happiness.

For the sociocultural determinants, we find that urbanization has a weak but negative effect on happiness in Africa. This result can be explained by negative externalities of urbanization, particularly unsanitary conditions, insecurity in cities and the pollution of the urban environment. On the other hand, education measured by primary school enrollment has a strong and positive effect on happiness. Our finding is coherent with those of Cuñado and de Gracia (2012); Chen (2012) who claimed that education leads to a better quality of life, which results from relative higher income and stable job status. Another concern was to study the impact of religions on happiness. If the coefficients associated with the three categories of religion considered (Catholic, Muslim and Protestant) are all significant, indicating that globally religious people seem to be happier than those who do not belong to a religious community, only the Catholic religion is relevant.

Table 1: Determinants of happiness in Africa: BMA results

	Dependant variable : life ladder		
Determinants	**BMA PIP**	**PM**	**PSD**
GDP per capita	**0.99848475**	**-1.609729e-02**	**3.166891e-03**
GDP per capita2	**0.95420250**	**1.600926e-01**	**6.849211e-02**
Natural resources rents	**0.50641600**	**7.212744e-03**	**7.976810e-03**
Health	0.12438475	-2.780620e-04	8.711183e-04
Employment	0.45666300	1.896036e-02	2.344300e-02
Population growth	0.43345050	2.489986e-02	3.185833e-02
Urbanisation	**0.50641600**	**-7.212744e-03**	**7.976810e-03**
Primary education	**0.98812825**	**5.627069e-02**	**1.466411e-02**
Secondary education	0.46320225	1.206494e-03	1.444722e-03
Tertiary education	0.21811850	-1.842993e-03	4.226003e-03
Protestant religion	0.20345425	4.161106e-03	9.475441e-03
Muslim religion	0.45673950	5.734606e-03	7.092745e-03
Catholic religion	**0.63258200**	**8.641137e-03**	**7.759892e-03**
Language fractionalization	0.45673950	-5.734606e-03	7.092745e-03
Ethnic fractionalization	**0.74091725**	**-1.164867e-02**	**8.478323e-03**
French colonisation	0.49609500	-7.384180e-03	8.340625e-03
Britannic colonisation	0.17989750	-1.378325e-03	3.344230e-03
Control of corruption	**0.54111207**	**6.142917e-03**	**7.695999e-03**
Government effectiveness	0.09935150	9.660148e-04	3.521775e-03
Political stability	0.09438325	1.470050e-04	5.648740e-04
Regulatory quality	0.17989750	1.378325e-03	3.344230e-03
Rule of law	0.13112275	2.893034e-04	3.128881e-03
Voice and accountability	0.27340995	4.161106e-03	8.125441e-03
Transport	0.42223150	4.134906e-03	7.092745e-03
Electricity	**0.50188200**	**1.099136e-03**	**1.344300e-03**
ICT	0.19592525	2.562569e-03	5.933781e-03

Source: authors' estimates. **Note:** With 2^{25} potential models, the correlation between the analytical and MCMC posterior model probabilities turns out to 0.9157, indicating a good performance of the algorithm. Simulations are based on uniform information prior. Statistics in bold are those for which the posterior inclusion probability is greater than 50%.

As shown by authors like Lim and Putnam (2010); Hout and Greeley (2012), a religious community offers access to support structures or enables individuals to cope with stress and or to adapt preferences or aspirations, offers a sense of meaning and purpose, and acts

as a moral compass in present life as well as the "after-life". Besides the religious aspect, we also find that ethnicity is a relevant determinant. The coefficient associated with the ethnic fractionalization variable which measures the probability that two randomly selected persons from a given country will not belong to the same ethnic group being negative. This result means that the proliferation of ethnic groups in developing countries is a factor of socio-political instability and poor governance, resulting from exclusion that certain groups may suffer in the management of revenues from natural resources or from the affairs of state.

Concerning structural factors, particularly the quality of governance, if all the indicators of the latter have positive coefficients on happiness, only the control of corruption is relevant. The well-being of the population depends on political decision-makers, especially on the perceptions of the extent to which public power is exercised for private gain, the credibility of the government commitment to such policies including corruption and the stability of government. These results are congruent to those of Njangang (2019) suggest that, improving governance quality can significantly enhance the happiness of African populations. As for the influence of the quality of infrastructure, we find that electricity, although weakly, promotes happiness. Thus, as recognized by the Sustainable Development Goals (SDGs) defined by the United Nations Agenda, access to electricity, one of the major factors of production, is a decisive issue for the continent because the lack of power strongly hinders economic development.

5 Robustness check: alternative approaches to BMA

In order to ensure the robustness of our results, we compare the BMA posterior means and standard deviations of these determinants with recently developed model averaging methods, namely Mallows Model Averaging MMA Hansen (2007,0) and Weighted Average Least Squares WALS Magnus et al. (2010).

The MMA approach is one of the most widely weighting schemes[4] used in the Frequentist Model Averaging (FMA)[5] . Introduced by Hansen (2007), it has the particularity of taking into account certain limits attributed to the BMA approach. According to the author, the fact that BMA approach relies on priors over the class of models and over the parameters in the models means that this method suffers from the arbitrariness which is inherent in prior specification. Otherwise, it is developed under the assumption that the truth is one finite-dimensional parametric model out of a class of models under consideration. However, the goal which is to find the "true" model out of this class is inherently misspecified and misguided, as it is more appropriate to think of models as approximations, and that the "true" model is more complex than any of the models in the explicit class. At this point, Hansen (2008) shows that the goal is to forecast mean-squared error and then evaluate methods based on this criterion, without assuming that we necessarily have the correct model. In doing so, he uses the MMA introduced by Mallows (1973) in order to tackle this issue by obtaining the set of weights which minimizes the mean-squared error over the set of feasible forecast combinations. The generalized Mallows criterion is therefore an estimate of the mean-squared error and mean-squared forecast error, and the weights which minimize this criterion are asymptotically optimal in some settings.

[4]See Moral-Benito (2015) for a detailed discussion on different weights selected choice.

[5]Compared to its Bayesian counterpart, the studies on FMA are mostly of recent vintage and need not specify any prior distribution.

The WALS approach introduced by Magnus et al. (2010)[6], is a Bayesian combination of frequentist estimators, which takes the required prior probabilities from the Laplace distribution and generates bounded risk, unlike standard BMA estimators (which typically deploy normal priors). This approach is claimed to be theoretically and practically robust than standard BMA. According to Magnus et al. (2010), it is theoretically more interesting because it treats our ignorance about the priors in a different manner, thereby obtaining a better risk profile and, in particular, avoiding unbounded risk; and it is practically superior because (as the MMA approach), the space over which we need to perform model selection increases linearly rather than exponentially in size. Thus, with twenty five regressors to search over, time of standard BMA is of the order 2^{25}, while computing time of WALS is of the order 25.

Table 2: Robustness check: WALS and MMA results

	Dependant variable : life ladder			
	WALS		**MMA**	
Determinants	**Coef.**	**t-ratio**	**Coef.**	**t-ratio**
GDP per capita	**-0.005 (0.005)**	**-1.00**	**-0.015 (0.007)**	**-2.14**
GDP per capita2	**0.039 (0.020)**	**1.92**	**0.041 (0.021)**	**1.95**
Natural resources rents	**0.011 (0.007)**	**1.51**	**0.027 (0.011)**	**2.45**
Health	0.107 (0.166)	0.64	0.108 (0.161)	0.67
Employment	0.097 (0.101)	0.96	**0.103 (0.102)**	**1.01**
Population growth	-0.086 (1.627)	-0.05	-0.111 (1.876)	-0.05
Urbanisation	-0.068 (0.072)	-0.95	-0.069 (0.072)	-0.96
Primary education	**0.006 (0.003)**	**2.00**	**0.011 (0.010)**	**1.10**
Secondary education	0.366 (0.726)	0.50	0.422 (0.730)	0.67
Tertiary education	0.075 (0.144)	0.52	0.099 (0.146)	0.67
Protestant religion	-0.007 (0.011)	-0.64	-0.007 (0.010)	-0.07
Muslim religion	**0.004 (0.004)**	**1.04**	**0.005 (0.004)**	**1.25**
Catholic religion	**0.019 (0.009)**	**2.08**	**0.021 (0.010)**	**2.10**
Language fractionalization	-0.003 (0.007)	-0.39	-0.003 (0.005)	-0.60
Ethnic fractionalization	**-0.729 (0.450)**	**-1.62**	**-0.927 (0.477)**	**-1.94**
French colonisation	**-0.261 (0.209)**	**-1.25**	**-0.265 (0.209)**	**-1.26**
Britannic colonisation	-0.008 (0.017)	-0.50	-0.012 (0.019)	-0.63
Control of corruption	**0.166 (0.100)**	**1.66**	**0.221 (0.104)**	**2.125**
Government effectiveness	0.015 (0.310)	0.05	0.015 (0.307)	0.04
Political stability	**0.461 (0.266)**	**1.73**	**0.501 (0.270)**	**1.85**
Regulatory quality	0.006 (0.008)	0.77	0.006 (0.007)	0.85
Rule of law	-0.003 (0.005)	-0.61	-0.011 (0.016)	-0.68
Voice and accountability	0.001 (0.138)	0.01	0.010 (0.140)	0.07
Transport	0.002 (0.006)	0.41	0.002 (0.007)	0.28
Electricity	**0.294 (0.258)**	**1.14**	**0.299 (0.260)**	**1.15**
ICT	**0.773 (0.285)**	**2.71**	**0.794 (0.301)**	**2.63**

Source: authors' estimates. **Note:**Statistics in bold are those for which t ratios>|-1|. WALS and MMA refer to the Laplace priors on the parameter space and Mallows model averaging respectively. Model averaging standard errors are in parentheses.

The results obtained are summarized in Table 2. Columns (1-2) reports on the one hand the model average estimates and standard deviations, and on the other hand the

[6]See Magnus et al. (2010) for a detailed discussion on the implementation of the WALS estimator.

associated t-ratio using the WALS estimator of Magnus et al. (2010), while columns (3-4) reports the corresponding model average estimates using the MMA estimator of Hansen (2007). Following Amini and Parmeter (2012). Following Amini and Parmeter (2012), for both approaches, regressors are considered to be robustly correlated with the happiness measure if the t-ratio on its coefficient is greater than one in absolute term.

Generally, results with both the WALS and MMA approaches are in perfect harmony with the results of the BMA approach and retaining the same signs (except for urbanization which had a positive effect on happiness with the BMA approach, become insignificant) reflecting the robustness of our selected determinants. In addition, beyond the 8 determinants estimated with the BMA approach, we also identify the Muslim religion, French colonization, political stability and ICT as relevant determinants. Regarding the impact of the colonial past of African countries on their contemporary well-being particularly, our results suggest that the colonization of African economies would have left a legacy that today could have effects on the various dimension of well-being such as post-colonial political development (Lange, 2004), democracy (Olsson, 2009) and the agents' trust in their relative and institutions (Nunn and Wantchekon, 2011).

Furthermore, moving to comparisons across the two averaging methodologies specifically, although overall the results are consistent in sign and significance, a notable difference is still observed. Undeniably, the employment variable which does not seem significant with the WALS approach (as with the BMA) is nevertheless significant with the MMA approach. This result goes in the same direction as those of Frey and Stutzer (2002) who established that employment promotes well-being more than any other social factor. The authors also concluded that unemployment in general makes people unhappy, even if people have not experienced it personally. In addition, we also note with the MMA approach that the amplitude of the effects of our determinants seems overestimated compared to those obtained with the WALS approach.

6 Concluding remarks

This paper examines the key determinants of happiness in Africa under model uncertainty by using a BMA framework on a panel of 30 countries observed over the period 2006-2017. We then compare the BMA posterior means and standard deviations of some relevant determinants with recently developed model averaging methods, namely MMA and WALS for robustness purpose. In doing so, the paper brings some new contributions to the existing literature. We identify a total of 13 economic, social, cultural, historical, structural and institutional factors which impact the well-being of Africans, namely: per capita income, natural resource rents, employment rate, urbanization, primary education, religion (Catholic and Muslim), governance (control of corruption and political stability), infrastructure quality (electricity and TIC), colonial past and ethnic fractionalization. Given the development challenges that Africa currently faces, it may certainly take a while before people in Africa join the happiest people on the globe. However, this study intends to contribute to shedding light on the main factors on which political decision-makers should rely in the formulation of policies intended to boost the well-being of African citizens.

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Appendix: Variable definitions and descriptive statistics

Variables	Definitions	Obs	Mean	Std. Dev.
Life ladder	Subjective well-being obtained by inviting respondents to think of their lives as a ladder, with the worst possible life for them as 0, and the best possible life as 10.	297	4,26	0,56
GDP per capita	This variable is obtained by inviting respondents to think of their lives as a ladder, with the worst possible life for them as 0, and the best possible life as 10.	360	7,86	0,84
Natural resources rents	Sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	360	15,32	11,56
Health	Life expectancy at birth.	297	51,17	5,28
Employment	Employment to population ratio, 15+, total (%)	360	63,67	14,15
Population growth	Exponential rate of growth of midyear population from year t-1 to t.	360	2,65	0,65
Urbanisation	People living in urban areas.	360	3,86	1,16
Primary education	School enrolment, primary (% gross).	297	103,03	19,04
Secondary education	School enrolment, secondary (% gross).	217	43,96	22,73
Tertiary education	School enrolment, tertiary (% gross).	235	10,64	9,01
Protestant religion	Percentage of the population of each Country belonging to the Protestant religion in 1980.	360	13,18	12,50
Muslim religion	Percentage of the population belonging to the Muslim religion in 1980.	360	33,94	32,43
Catholic religion	Percentage of the population belonging to the Roman Catholic religion in 1980.	360	18,15	17,16
Language fractionalization	Probability that two randomly selected persons from a given country will not speak the same language.	336	0,68	0,27
Ethnic fractionalization	Probability that two randomly selected persons from a given country will not belong to the same ethnic group.	348	0,69	0,21
French colonisation	Variable dummy for the countries colonized by the French the British.	360	0,50	0,50
Britannic colonisation	Variable dummy for the countries colonized by British	360	0,37	0,48
Transport	Composite index of total paved roads and total road network in KM.	360	8,11	10,06
Electricity	Total electricity production of a given country, including the energy imported from abroad.	360	8,37	16,74
ICT	Composite index of total phone subscriptions, number of internet users, fixed broadband internet subscribers and international internet bandwidth.	360	5,51	9,06
Control of corruption	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption.	348	-0,67	0,49
Government effectiveness	Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	348	-0,74	0,53
Political stability	Perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.	348	-0,63	0,81
Regulatory quality	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	348	-0,62	0,52
Rule of law	Perceptions of the extent to which agents have confidence in and abide by the rules of society.	348	-0,67	0,53
Voice and accountability	Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	348	-0,50	0,60

Source : authors' constructions.