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THE PROCESSING OF AGRICULTURAL RAW MATERIALS IN IMPROVING HUMAN DEVELOPMENT IN WAEMU COUNTRIES

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Purpose. This study analyses the effects of the conversion of agricultural production on the well-being of the population of the countries of the West African Economic Monetary Union (WAEMU). It also analyses the link between the agricultural sector and the well-being of producers in the eight countries.
Results. The manufacturing agricultural added value representing the variable of interest of the study, has a positive and significant long-term coefficient. This result shows that the added value of agricultural raw material processing industries positively affects the human development index. An increase of one percentage point in the agricultural industrial sector in WAEMU countries leads to a long-term improvement in human development of 0.0017 percentage points. This is due to the investment effect that occurs in the long run, and trade openness has a positive impact on both long- and short-term welfare.
Scientific novelty. The originality of this study is focused on improving human development through the processing of agricultural products in WAEMU countries. The results indicate that the processing of agricultural products has a positive effect on human development in the long term but not significant in the short term. Similarly, the non-manufacturing sector contributes positively to the achievement of human development in the WAEMU zone in the long term.
Practical value. The study concludes by suggesting to the political decision-makers of the WAEMU countries to set up a partnership between producers of agricultural raw materials and processors that can lead to the establishment of a purchase contract. This could improve the well-being of agricultural producers. We propose to subsidise the development of processing enterprises in the union, which will encourage processors to increase production. In addition, a policy of import taxation is proposed to encourage domestic consumption of processed products. In order to provide agricultural and non-agricultural processors with a skilled workforce, governments should encourage education through productive public investment.
Key words: industrialisation, agricultural product, human development, WAEMU.

Introduction. The development of agriculture in Africa still faces many difficulties, one of the most important of which is the processing of agricultural products. This situation worries African governments. This is the cause of the meeting of leaders at the African agricultural show held in Ndjamena, Chad, from March 12 to 15, 2019 and did not fail to sound the alarm on the low level of the processing industry [1]. The countries of the West African Economic Monetary Union (WAEMU) are faced with the problems of transforming agricultural production. The exports of these countries are not very diversified and are essentially composed of agricultural products.

The industrial fabric of these countries is very weak and contributes little to the formation of the gross domestic product varying between 12 % and 27 % [2]. This weakness is the main cause of post-harvest losses in agricultural production, which does not improve the income of producers.

Review of literature. According to World Bank data from 2001, more than half of households live below the poverty line. The poverty rate remains high, and was around 52.2 % in 1981 against 49.4 % in 2010, then 39.6 % in 2017 [3, p. 5–6]. This slight decrease is not due to the agricultural sector.

The WAEMU countries are among the fifty (50) last countries according to the classification of the Human Development Index (HDI) of 2013 carried out by the UNDP. Similarly, social indicators remain relatively weak. Between 2003–2007 and 2008–2012, adult literacy and primary school enrolment rates increased respectively from 35.5 % to 46 % and from 74.9 % to 88.9 %, and as for life expectancy, it went from 53.8 years to 55.6 years [4].

In view of all the challenges mentioned above, it is useful to question the issue of the effects of the processing of agricultural products on the well-being of the rural population.

The first aspect to take into account is the dimension of industrial production in the WAEMU space. The volume of industrial production remains very low. Over the period of this study, the added value of the industrial sector in the area represents on average 19.81 %[1] of GDP. Since 1983, the member countries have initially implemented the cooperation policy aimed at industrial development, followed by the 1987–1991 five-year plan for industrial development, adopted in 1986; of the Industrialisation Master Plan (SDI) for West Africa, adopted in 1994 and then to date the Common Industrial Policy (CIP) adopted in December 1999, the specific objectives of which [5].

From 2004 to 2022, the contribution of industry in WAEMU varies between 18.9 % and 21.1 % of GDP. The manufacturing industry contributes an average of 11.1 % to the GDP. These reflect a lack of processing of raw materials. Agro-industry mainly processes imported intermediate products. The highest processing rate concerns Côte d'Ivoire, which would process 20 % of its produced cocoa. For the other countries, only 2 % of their agricultural production is processed, this is the case for example of Mali, Burkina and Benin where the level of cotton processing is around 3 % [6]. Industrial production is very limited in Guinea-Bissau and contributes below 10 % of GDP.

The issue of poverty reduction in WAEMU countries remains topical. With an estimated population of around 120 million in 2018, WAEMU has an average per capita income of 970 USD[2]. The ranking of WAEMU member states in the 2019 UNDP report on the HDI indicates that all belong to the category of "Countries with low human development" [7]. The average for the WAEMU zone is 0.470 against 0.541 for Sub-Saharan Africa. According to the regional PND/PRS monitoring report

[1] Author's calculation based on World Bank data.
[2] Regional PND/PRS monitoring report focusing on the SDGs /2019–2020.

focusing on the SDGs (2019–2020), in 2011, almost one inhabitant in two (47.4 %) lived below the poverty line at Union level.

According to the results of the "Integrated regional survey on employment and the informal sector 2017–2018" [8], the non-monetary standard of living indicator is a criterion for evaluating economic well-being, which divides the population into five groups through scores called quintiles of well-being. At the regional level, the proportion of the poor population is 34.0 %, of which 16.3 % are poorer. Households headed by women (44.5 %) have more poor people than those headed by men (31.9 %). Poverty is more severe in rural areas (34.4 %) than in urban areas (33.2 %) and is low in the capitals (24.6 %).

The results from the first edition of the Harmonized Household Life Survey (HHLS) in WAEMU with the support of the World Bank and published on July 20, 2020, reveal that Niger is the country of the Union which concentrates the poorest. Indeed, using the moderate international monetary poverty line which designates as poor any person who spends less than 3.2 USD per day, it emerged that 75.5 % of the population of Niger is below this line. As proof, the average annual amount spent by a Nigerian, which stood at 259,009 FCFA, is below the threshold of 290,992 FCFA. On the other hand, at the other extreme is Senegal where at least a third of individuals (32.6 %) would be in a situation of poverty, i.e. the country where the incidence of poverty is the lowest. With a poverty rate of 33.5 %, Côte d'Ivoire is the second country with the lowest concentration of poor people in the region. In Côte d'Ivoire and Senegal, a person spends an average of 510,635 FCFA and 527,800 FCFA per year for poverty lines established respectively at 296,364 FCFA and 298,448 FCFA. Apart from Mali (47.0 %) and Benin (47.5 %), most of the population in the rest of the Union is still below the poverty line, in this case in Togo (50.4 %), in Guinea-Bissau (56.2 %) and in Burkina-Faso (63.0 %).

The problem of industrialisation in an economy can be analysed on three axes. Import substitution industrialisation consists of substituting imports with local manufacturing. This is to promote local industries in a way that reduces imports. This proposed industrialisation strategy by structuralists could accelerate the development of southern countries.

Industrialisation by leading (industrialising) industries consists of building an industrial fabric through state policy. Certain strategic sectors constitute industrial poles and the development in all the other downstream industrial sectors spreads thanks to the ripple effects. Export substitution industrialisation is the export promotion strategy [9].

Several theories have been developed to analyse the link between industrialisation and economic growth and even human development. The idea of applying the economic theories of industrialisation is to extend the stationary state defended by the classics with regard to developed countries, but above all to bring developing countries to stimulate their development. For this, the latter should invest in sectors that can lead to the development of other sectors of activity [10]. To this end, it is considered that the adoption of technologies is essential to poverty reduction since it promotes the

increase in agricultural incomes. These technologies can increase the created added value and the number of jobs [11; 12]. These authors consider that it is necessary to distribute the investments in all the industrial branches to ensure the balance of the economic growth of a country. To this end, Lewis recommends the establishment of companies with low capital intensity which transform local raw materials with the available workforce in order to take advantage of economies of scale [13]. According to Lewis, industrialisation could improve the agricultural sector and by supplying raw materials to the industrial sector. Agricultural industrialisation could have positive effects on economic growth.

To this end, the empirical economic literature shows the effects of industrialisation on poverty reduction and in improving the development index (HDI).

The study by Cadot et al. in 2015, highlights the close link between industrialisation and poverty reduction [14]. It covers the countries of Sub-Saharan Africa (SSA) over the period 1981–2011. These results indicate that a 1 % increase in manufacturing value added would reduce poverty by 1.1 %. Over the period from 1998 to 2008, Hang examined on the one hand the impact of overall growth and on the other hand its sectoral composition on poverty reduction in Vietnam [15]. These results demonstrate that the conversion of agricultural production has had positive effects on poverty reduction. Similarly Rose et al., in 2013 [6] studied the impact of the growth of the three sectors of the economy on the reduction of poverty in Pakistan over the period from 1981 to 2010. Their results demonstrate that the industrial sector significantly affects the level of poverty. In addition, Lekouka et al. (2018), analysed the impact of economic growth on the level of poverty in Congo Brazzaville [16]. Using an Error Correction Vector Model (VCEM), they showed that the manufacturing industry exerts a positive long-term sign. Similarly, Pham and Riedel in 2019, assess the impact of the sectoral composition of growth on poverty reduction in Vietnam during the period of 2010–2016 [11]. They find that the share of the industry sector is positively correlated with the incidence of poverty in Vietnam. Specifically, the 1 % increase in industry structure reduces the poverty level to 0.34 %.

Several empirical studies have analysed the positive effect of industrialisation on economic growth and also on the Human Development Index (HDI).

Benabdelkader tested Kaldor' laws for the Moroccan case using data on economic growth and the manufacturing sector over the period 1980 and 2016 [17]. The results of the estimation from an autoregressive model with staggered lags with error correction and a simple linear model show that a variation of 1 % of the manufacturing value added leads to a GDP growth of 0.3 % of Moroccan gross domestic product, 0.49 % of manufacturing employment and 0.51 % of manufacturing labor productivity. Similarly, Marconi and al., in 2016, found similar results, testing Kaldor's first two laws on a sample of 63 middle-income and high-income countries between 1990 and 2011. The study showed that growth in manufacturing output is necessary to boost economic growth and productivity. The same result was confirmed by Haraguchi et al., in 2017, who showed the key role of the industrial sector in economic and sustainable

growth in developing countries over the past 25 years. They also showed that the decline in manufacturing added value had a negative impact on the level of employment, including in the deterioration of the HDI [18]. According to Marconi et al., growth in industrial production stimulates the overall growth rate of the economy [19]. For Zattler, industrial development is essential for long-term sustainable economic growth, hence the improvement in the HDI [20].

Materials and methods. The objective of this article is to assess the role of the processing of agricultural products in improving the quality of life of households in the WAEMU space. On the one hand, it is a question of analysing the effects of the industrialisation of the agricultural sector on the improvement of the human development index (HDI) and on the other hand of evaluating the effects of other industrial sectors on the HDI.

The methodology used in this study is based on the Pooled Mean Group (PMG) and the mean group (MG) estimators to analyse the link between the conversion of agricultural products on the income of farmers in the long term and short term.

The objective is to present the basic model and to specify the model of the study. Our study is inspired by the work of Abdoul' & Oloufade who worked on state capacity, agricultural productivity and poverty reduction in African countries [21]. In their study, poverty is measured by the infant mortality rate (under 5 years old) and they arrive after specification at the following model:

$$Poverty\ rate_{it} = c + \alpha goveffect_{it} + \beta polstat_{it} + \theta Z_{it} + u_i + v_t + \varepsilon_{it}, \quad (1)$$

where $Poverty\ rate_{it}$ is the poverty rate in country *i* in year *t*;

goveffect is the index of government effectiveness (administrative capacity);

polstat is the political stability (coercive capacity);

Z_{it} represents the set of control variables composed of the gross primary school enrollment rate, the natural logarithm of the inflation rate, the natural logarithm of trade openness and the economic growth rate;

u_i and v_t are country and year fixed effects, ε_{it} is an error term and it is the individual specific effect.

In our case study, we highlight the effects of the transformation of agricultural raw materials on human development. In its functional form, the equation to be estimated can be written as follows:

$$DH = f(IND, INDm, OUV, CH, IDE). \quad (2)$$

In econometric form, the regression model looks like this:

$$DH_{it} = \alpha_i + \beta_i INDm_{it} + \theta_i Z_{it} + \varepsilon_{it}, \quad (3)$$

where *DH* represents human development;

INDm is the manufacturing added value;

Z is a set of control variables;

α_i is the individual fixed effect, ε, the perturbation, i, the individual dimension;

t is the time dimension;

θ is a vector containing the coefficients associated with the control variables;

β is the coefficient associated with the variable of interest *INDm*.

In this study, we use Human Development (HDI) as the main indicator for measuring well-being, which measures the level of development of a country in three areas such as health, knowledge and standard of living. Health is measured by life expectancy at birth. Knowledge is expressed by the combination of the adult literacy rate and the combined gross enrollment ratios in primary, secondary and higher education. The standard of living is defined by the Gross National Income (GNI) per capita (in purchasing power parity of the USD) [9].

In the study, the variable of interest is the added value[3] of the processing of agricultural products. We use the manufacturing added value as a percentage of GDP, which makes it possible to assess the raw material processing capacity of WAEMU countries.

The added value of non-manufacturing industries[4] which is given by the difference between the industrial added value and the manufacturing added value. It represents the wealth produced by other non-manufacturing industries.

The degree of openness (DOO) which measures the importance of foreign trade. It will be measured by the ratio of the total quantity of exports and imports (in % of GDP).

Foreign Direct Investment (FDI) is measured as the net inflow of foreign direct investment as a percentage of GDP.

Human capital can be defined as the set of theoretical and practical knowledge and values acquired by a population.

Results and discussion. The analysis of the results of the descriptive statistics (Table 1) presents the variables with their average, standard deviation, minimum and maximum. Our sample includes 152 observations.

Table 1

Descriptive statistics of the model variables

Indicator	IDH	IND	INDM	OUV	CH	IDE
Mean	0.454461	8.766149	11.04539	0.307658	30.05255	2.196381
Median	0.430500	8.137186	10.88190	0.293671	30.55689	1.706225
Maximum	0.792000	19.18271	18.01895	0.590512	39.50072	18.81778
Minimum	0.253000	1.225302	5.093692	0.153663	18.66143	-3.373610
Std. Dev.	0.129798	4.392195	3.670893	0.082325	4.884792	2.426527
Skewness	1.253607	0.393070	0.198276	0.700316	-0.249134	3.133740
Kurtosis	4.131872	2.441244	1.741512	3.386207	2.437256	18.84856
Jarque-Bera	47.92592	5.891426	11.02663	13.36919	3.578021	1839.569
Probability	0.000000	0.052565	0.004033	0.001250	0.167125	0.000000
Sum.	69.07800	1332.455	1678.899	46.76400	4567.988	333.8500
Sum. Sq. Dev.	2.543964	2912.998	2034.794	1.023391	3603.040	889.0931
Observations	152	152	152	152	152	152

Source: author's research based on WB (2020) and UNDP (2020) data using Eviews 9 software.

[3] According to World Bank, Added Value is the net output of a sector after adding all the outputs and subtracting all the intermediate inputs. It is calculated without making deductions for the depreciation of manufactured goods or the loss of value or degradation of natural resources.

[4] The industrial sector is generally considered to include manufacturing industries and non-manufacturing industries: extractive and construction.

It can be seen that the average added value of raw materials processing industries and non-manufacturing industries are very low and are respectively 11.045 and 8.766 over the period from 2004 to 2022. In addition, the level of average human capital stood at 30.053. The degree of openness appears very low with an average of 0.307 %. Finally, the standard deviations of the variables (IDH, IND, INDm, OUV) are lower than the means, revealing relatively little dispersion of the values around their means.

Pearson's correlation coefficient matrix is summarised in Table 2. The table shows that the direction of the correlations between the endogenous variable (HDI) and the exogenous variables is consistent with our predictions. In addition, the correlations between the explanatory variables are moderate and weak. The strongest correlation is observed between the opening rate (OUV) and the Human Development Index (HDI) with a coefficient equal to 0.5939.

Table 2

Correlation matrix

Indicator	IDH	INDm	OUV	CH	IND	IDE
IDH	1.0000	-	-	-	-	-
INDm	0.2986*	1.0000	-	-	-	-
OUV	0.5939*	-0.1642	1.0000	-	-	-
CH	0.4951*	0.1427	0.4647	1.0000	-	-
IND	-0.1454	-0.5686*	0.1583	-0.3250*	1.0000	-
IDE	-0.1064	-0.3314*	0.2675	-0.0142	0.3698*	1.0000

Note. * denotes the significance of the correlation at the 5 % level.
Source: author's research using Stata 15 software.

This coefficient which is greater than 0.5 (OUV; HDI) can lead to a problem of multicollinearity. In order to avoid a spurious regression, we carried out the VIF test to remove the doubt on the probable existence of multicollinearity, presented in Table 3.

Table 3

VIF test results

Variable	VIF	1/VIF
IND	1.83	0.5451
CH	1.61	0.6211
OUV	1.54	0.6501
INDm	1.52	0.6575
IDE	1.25	0.8020
Average of VIF	1.55	

Source: author's research using Stata 15 software.

Table 3 shows that all VIFs are below 5 and their average below 2. Therefore, the impact of multicollinearity is not large and all the explanatory variables of the model can be kept for the analysis.

After having tested the equality of the coefficients of our model studied in the individual dimension, we retain that of Fisher which consists in making the choice between a pooled model and a model with specific effects. This is a test that makes it possible to justify whether it is appropriate to estimate the model on panel data or whether the model should rather be estimated country by country.

The principle of the test is as follows: $\begin{cases} H_0: \text{pooled model} \\ H_1: \text{model with effect} \end{cases}$

The results of the homogeneity test are: F (5.146) = 37.77 and Prob > F = 0.0000. The p-value associated with the test statistic is less than 1 %, so, we reject the null hypothesis of the absence of specific effects at the 1 % level. So, we have a panel structure.

The dependency test allows us to choose the unit root tests best suited to our study model. Since our study period is greater than the number of individuals, we test the hypothesis of non-dependence between individuals using the Breusch-Pagan test.

The principle of the test is as follows: $\begin{cases} H_0: \text{independence} \\ H_1: \text{dependence} \end{cases}$

The results of the Breusch-Pagan test performed on our model are presented in Table 4.

Table 4

Result of Breusch-pagan test

Test	Statistic	D.f.	Prob.
Breusch-Pagan LM	113.6073	28	0.0000
Pesaran scaled LM	11.43976	-	0.0000
Pesaran CD	0.144040	-	0.8855

Source: author's research using Eviews 9 software.

The p-value associated with the statistic of the dependency test is less than 1 %, so we reject the null hypothesis of independence. It follows that the individuals in the study are dependent on each other. Given the presence of dependence between individuals, the stationarity tests to be applied in this case are second-generation tests.

The results of the Phillipps-Perron (PP) and Hadri unit root test of the series are presented in Table 5.

Table 5

Result of stationarity test

Variables	Level			First difference		Decision
	PP-Fisher	PP. Choi	Hadri	PP-Fisher	PP-Fisher	
IDH	0.80930 (1.0000)	10.4171 (1.0000)	7.53107 (0.0000)**	51.6607 (0.0000)**	-4.58777 (0.0000)**	I(1)
CH	9.62320 (0.8856)	1.57878 (0.9428)	7.86153 (0.0000)**	140.475 (0.0000)**	-9.46365 (0.0000)**	I(1)
IDE	27.9378 (0.0322)**	-2.03445 (0.0210)**	1.64340 (0.0502)	-	-	I(0)
IND	22.3988 (0.1308)	0.89868 (0.8156)	5.11082 (0.0000)**	149.054 (0.0000)**	-10.3127 (0.0000)**	I(1)
INDm	30.8284 (0.0142)**	-2.27024 (0.0116)**	5.61843 (0.0000)**	-	-	I(0)
OUV	6.64681 (0.9795)	1.89113 (0.9707)	4.02162 (0.0000)**	145.628 (0.0000)**	-10.2450 (0.0000)**	I(1)

Note. The values in parentheses are the probabilities, ** means the rejection of the unit root hypothesis at the 5 % significance level. The rejection of the null hypothesis (p-value < 5 %) indicates the absence of a unit root.

Source: author's research.

The PP test shows that at the 5 % threshold, the null hypothesis which confirms the presence of unit root cannot be rejected for all the level variables, on the other hand, the Hadri test confirms the absence of a unit root for all the variables except the IDE variable. When the variables are taken in first difference, they are all stationary. Therefore, there is a presumption of a cointegrating relationship between the different variables (Table 6).

Table 6

Result of the cointegration test of Kao

Indicator	t-statistic	Prob.
ADF	-4.650653	0.0000
Residual variance	6.08E-05	-
HAC variance	4.24E-05	

Source: author's research using Eviews 9 software.

We conclude that the variables are cointegrated and the error correction model is appropriate to estimate the long-term relationship.

The PMG/MG estimators are a methodological innovation allowing heterogeneity in the dynamics of the coefficients.

Regression 1: The coefficients are homogeneous in the long term but heterogeneous in the short term; this is the PMG estimator:

$$\Delta Y_{it} = \phi_i(Y_{it-1} - \theta X_{it}) + \sum_{j=1}^{p-1} \lambda_{ij}^* \Delta Y_{it-j} + \sum_{j=0}^{q-1} \delta_{ij}^* \Delta X_{it-j} + u_i + \varepsilon_{it}. \quad (4)$$

Regression 2: Unconstrained country-by-country equation (the average of the coefficients of which gives the GM estimator):

$$\Delta Y_{it} = \phi_i(Y_{it-1} - \theta_i' X_{it}) + \sum_{j=1}^{p-1} \lambda_{ij}^* \Delta Y_{it-j} + \sum_{j=0}^{q-1} \delta_{ij}^* \Delta X_{it-j} + u_i + \varepsilon_{it}. \quad (5)$$

Note that θ_i' is the vector of long-term coefficients and Δ is the variation operator between two successive dates. The adjustment coefficient, ϕ_i as well as the long-term coefficients, θ_i', constitute the parameters of interest. We expect $\phi_i < 0$ to be significant. We can then conclude that there is a long-term relationship between the dependent variable and the independent variables. The results of equations 3 and 4 are presented in Tables 7 and 8.

Table 7

Results of the long-term equations

Variables	PMG			MG		
	Coef.	Std. error	p-value	Coef.	Std. error	p-value
INDm	0.0017	0.0007	0.015**	0.0034	0.0034	0.541
OUV	0.0524	0.0249	0.036**	0.0998	0.2399	0.677
CH	0.0103	0.0004	0.000*	0.0074	0.0017	0.000*
IND	0.0019	0.0004	0.000*	0.0035	0.0043	0.419
IDE	0.0010	0.0005	0.000*	0.0064	0.0055	0.246
Coef. D'ajust	-0.3288	0.0546	0.058***	-0.1617	0.0725	0.001*

Note. The asterisks *, ** and ***indicate significance at the 1 %, 5 % and 10 % levels respectively.
Source: author's research using Stata 15 software.

In Table 8, we note that in equation 3 with the PMG estimators, no coefficient is significant in the short term except for that of the variable (OUV). Similarly, in

equation 4 with the MG estimators, we see that in the short term, except for the variable (IDE) and the variable (IND), all the other variables are not significant.

Table 8

Results of the short-term equations

Variables	PMG			MG		
	Coef.	Std. error	p-value	Coef.	Std. error	p-value
D1.INDm	0.0015	0.0016	0.335	0.0013	0.0018	0.453
D1.OUV	0.0228	0.0133	0.086***	0.0384	0.0265	0.147
D1.CH	0.0001	0.0012	0.953	-0.00008	0.0018	0.963
D1.IND	0.0006	0.0009	0.471	0.0012	0.0006	0.066***
D1.IDE	-0.0008	0.0008	0.369	-0.0013	0.0006	0.052***
Constante	0.0281	0.0302	0.000*	0.0408	0.0258	0.114

Note. The asterisks *, ** and *** indicate significance at the 1 %, 5 % and 10 % levels respectively.

Source: author's research using Stata 15 software.

Table 9 presents the results of the Hausman test applied to the difference between MG and PMG. The probability of the test is greater than the 5 % threshold.

Table 9

Hausman test result

Variables	Coefficients		Difference (b-B)
	MG (b)	PMG (B)	
INDm	0.0034137	0.0017918	0.0016218
OUV	0.0998848	0.0524482	0.0474366
CH	0.0074661	0.0103064	-0.0028403
IND	0.0035443	0.0019105	0.0016338
IDE	0.0064568	0.0010064	0.0054504
Chi2(5) = (b-B)'[(V_b-V_B) ^ (-1)](b-B) = 8.21 Prob > ch2 = 0.1449			

Source: author's research using Stata 15 software.

The results obtained using the PMG estimators indicate that the obtained coefficients are almost all significant in the long term unlike in the short term, with the exception of the degree (OUV) and the constant, the other variables are not significant. Thus, all the signs are in line with our expectations except that of short-term FDI.

The long-term adjustment coefficient of the results of the estimation of the error-correction model has a negative sign (-0.3288) and is significant at 10 %. This confirms that there is a long-term relationship between the variables. The value of the adjustment coefficient is equal to (-0.3288), this means that any imbalance occurring following a shock is fully corrected after the year following this shock at a rate of 32.9 %.

Over the period of our study, the results of the estimation of the long-term relationship show that the sign of the coefficient relating to the added value of non-manufacturing industries is positive and significant. Therefore, our empirical results validate the positive effect of the industrialisation of the non-manufacturing sector on the welfare of WAEMU countries. A one percentage point increase in the industrialisation of the non-manufacturing sector leads to an improvement in well-being measured by the HDI of 0.0019 percentage points.

The result reveals that the added value of agricultural raw materials processing industries positively affects the HDI. Thus, an increase of one percentage point in the INDm, in WAEMU countries, leads in the long term to an improvement in human development of 0.0017 percentage points, but this contribution is weaker compared to that observed by non-manufacturing industries. Our findings have highlighted the crucial role of the manufacturing sector in economic growth and poverty reduction in developing countries and therefore indirectly in achieving human development.

For countries producing and exporting agricultural raw materials such as the countries of the WAEMU zone, policies should rather be oriented more towards the local processing of agricultural production and also stimulate investment in the agricultural sector to improve productivity.

The results also show that the coefficient associated with the ratio of foreign direct investment to GDP is positive and significant in the long term. Thus, a 1 % increase in FDI leads to an increase in well-being of 0.010 %. FDI appears to be an important source of capital investment. Thus, capital inflows are presented as a catalyst for the economic growth of the countries of the union, which growth generates additional income for the States and the populations of the region through the implementation of budgetary policies and job creation.

With regard to trade openness, we note that it positively and significantly affects long-term well-being. According to our estimates, an increase in the openness rate of one percentage point would lead to an increase in the HDI of 0.6716 percentage points in the WAEMU. The positive impact of openness on the HDI justifies the well-being provided by trade liberalisation and its effects on household income.

Considering human capital, our estimates show satisfactory long-term effects. This result shows that at present, human capital would be favourable to the achievement of human development. Thus, for an increase in human capital of one percentage point, would lead to an improvement in human development of 0.0103 percentage point in the WAEMU zone. According to the author, education catalyses the accumulation of human capital held by the labor force, which stimulates labor productivity and accelerates economic growth and thus indirectly in the achievement of human development.

Then, for the short term, the estimates also reveal that trade openness has a positive and significant effect on well-being. It shows that investment and well-being evolve in the same direction and that a 1 % increase in this variable will lead to an increase in the HDI of 0.0228 %.

Moreover, a surprising result emerges at the level of the industrialisation of the agricultural sector, non-manufacturing industrialisation and short-term human capital. Indeed, these variables are positive but not significant. This result suggests that over the period considered, the industrialisation of the agricultural sector, non-manufacturing industrialisation and human capital were very unfavourable to improving the living conditions of the population of the union.

On the other hand, FDI does not significantly explain well-being but causes a

reduction in it in the short term. This result can be attributed to the high concentration of FDI in the primary sector of the Union and the vulnerability of growth rates to external factors in most countries of the Union. It can also be understood by the fact that the distribution of income from FDI contributes more to the satisfaction of primary needs than to needs related to the quality of life such as education and/or longevity which are the other components of the HDI. It may be due to the existence of constraints related to the lack of quality human resources, the cost and quality of access to energy, the flexibility of tax policy. Socio-economic stability and the attractiveness of the consumer market are also important in attracting FDI.

In addition to the important role that inclusive finance plays in economic growth, it improves the quality of life of producers [22]. This financial inclusion is made possible by information and communication technologies that disseminate information to producers, allowing them to anticipate sales of their products [23; 24]. Improvement in well-being development indicators was also possible thanks to mobile phones, which served as bank accounts. Other research confirms the existence of a long-term relationship between financial inclusion and economic growth, and emphasises the importance of financial inclusion and the informal sector in influencing inclusive growth [25; 26].

The second part of our study is devoted to the econometric analysis of the link between the processing of agricultural raw materials and human development in WAEMU. The study confirmed the positive and significant relationship present between the manufacturing added value which represents the variable of interest and well-being and the positive and significant relationship between the other industrial sectors (the non-manufacturing sector) and the achievement of human long-term development. In addition, it reveals in the long term a positive and significant relationship between human capital and the achievement of human development and between foreign investment and the achievement of human development but not significant in the short term. Finally, trade openness positively and significantly influences long-term and short-term well-being.

Conclusions. The main objective of this study was to assess the driving role of the processing of agricultural products on human development in WAEMU, over the study period. Specifically, it was initially a question of analysing the effect of the industrialisation of the agricultural sector on human development. Secondly, to study the effect of other industrial sectors on human development in WAEMU countries.

The results indicate that the processing of agricultural products has a positive effect on human development in the long term but not significant in the short term. In other words, the transformation of agricultural raw materials is conducive to the achievement of improved well-being. Similarly, the non-manufacturing sector contributes positively to the achievement of human development in the WAEMU zone in the long term.

In terms of economic policy implications, we suggest setting up a partnership between producers of agricultural raw materials and processors that could lead to the

establishment of a purchase contract. This type of partnership could guarantee farmers' incomes and facilitate access to agricultural products for industrialists. In addition, the high cost of certain factors of production such as the cost of water, energy, telephone and transport singularly compromise the possibilities of processing agricultural products on the spot, at competitive prices.

To this end, as recommendations the development of agricultural product processing units in the union should be based on subsidies. This would encourage processors to increase their production. In addition, we propose an import taxation policy to encourage local consumption of processed products. Finally, in order to enable agricultural and non-agricultural product processing units to have a qualified workforce, governments should encourage education through productive public investments.

As a limitation, it is difficult to assess human development through the agricultural sector. other sectors must be taken into account even if they are not representative in the economy of the countries studied. In the next study, we will take into account the three sectors of the economy in the evaluation of human development.

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