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The Evaluation Of The WAEMU[1]'s Establishment Impact On The Development Level Of Member Countries

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Abstract
This analysis aimed to assess the impact of the establishment of the WAEMU on the development level in member countries using a micro econometric method of ex-post evaluation, the method of matching procedure on propensity score. It appears that besides a convergence process that is not really admitted because of contradictory results obtained by some authors, the establishment of the WAEMU is far from having enabled the initiation of a significant development process in member countries after more than a decade of integration experience.

Keywords: Impact Evaluation, Matching Methods, Development level, Propensity scores, WAEMU

Introduction

The West African Economic and Monetary Union (WAEMU) is a regional economic community established in 1994 and has so far eight members in West Africa. The creation of a customs union alters the flow of international trade by establishing close ties between some partners (Viner, 1961). These modifications are analyzed by distinguishing the trade creation effects, the effects of trade diversion and, finally, the overall effects (Mucchielli, 1993). The creation effects represent an improvement of resource allocation and diversion effects are, at contrary, a deterioration of that allocation. The trade rises within the union because of the removal of barriers to trade. To properly assess the impact of the establishment of a customs union, we must also consider the effects on consumption. These effects also correspond to the effects of creation and diversion. There are two effects of consumption. The first comes from the fact that national consumers will replace domestic products by cheaper products from partner of the union. This substitution results in an increase in consumer surplus due to the lower relative prices. The second effect is caused by the fact that domestic agents consume products from

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partners in the union at the expense of identical products from the rest of the world, which, cheaper, are no longer competitive because of the customs barrier common to the union.

This situation lowers consumer surplus. If we add the effects on consumption to the effects on production, we obtain the overall effects of creation and diversion that can be globally positive or negative for the welfare in member countries. However, a customs union will be more likely to provide beneficial effects to members if certain conditions are satisfied. Firstly, there must be a high degree of complementarity between the partner countries: each country of the union may even better specialize in products for which it has a comparative advantage, and share it with other members; then there will be more trade creation than trade diversion. Secondly, more the rates between countries participating in the union will be high and more the creation gains will be high. Thirdly, more common customs tariff towards the rest of the world will be low and more traffic diversions will be low. Fourthly, the most the customs union will include more members and the most there will be traffic creation instead of traffic diversion, because we will then approach the free trade. Finally, the creation of a customs union may have beneficial effects on the level of development in member countries under certain conditions.

Those conditions allow each of them to enhance the standard of living by improving conditions for the creation of wealth, based on the effects of creation and trade diversion. In another study, it will be about the analysis of the effects of trade creation in the WAEMU. But for now, it is about the assessment of the customs union creation impact on the overall standard of living in member countries.

The analysis of real convergence has been made for the WAEMU by several authors using sigma convergence and beta convergence approaches. These studies also evaluate the impact of its creation on reducing disparities in the income per capita. However, the analysis of the results of many of these studies leads to contradictions as to the real convergence in the WAEMU. Nevertheless, in West Africa, the experience of the WAEMU seems to be successful in terms of business performance and improvement of the overall standard of living in member countries. Facing these contradictions, this analysis aims to assess, by using another methodological approach: matching on propensity score methods, the impact of the establishment of the WAEMU on the development level in member countries.

Thus, the present study is motivated by the apparent contradiction between the conclusions of the analysis of the real convergence on the one hand and, on the other hand, the need to dissociate the actual convergence, which is a simple process of catching up, and the improvement of the overall standard of living due to the WAEMU creation. Therefore, far from adding to these contradictory debates, the proposed methodological approach will allow, so slightly, deciding the question whether or not the creation of the WAEMU has contributed significantly to the improvement of the overall life conditions in the union.

The paper is organized into four sections. The first section reviews the studies of real convergence in the WAEMU showing the contradictory conclusions. The second section presents the methodology used while the third section focuses on the data and the description of the development situation in the union. The fourth section presents the results of the evaluation before the conclusion. Their chances of achieving their goals in real-life cases and provided confidence ratings in their predictions.

1. Literature Review

The analysis of the impact of a free trade area on the welfare in member countries remains a fundamental question in the economic integration theory. It concerns the possibility for the relatively poor economies to catch up with rich countries. This is the catching up of the rich countries by poor countries within an integration area (the concept of beta-convergence). This issue also addresses the concerns of policy makers in the analysis of income inequality and it provides to them ideas and solutions in matter of redistribution policy and income distribution within this group of countries.

Several studies have examined the actual convergence in the West Africa's regroupings. Following methodological approaches, the authors have resulted in conflicting conclusions. This is the case of Jones' works, (2002) on ECOWAS. He showed that these economies converge according to both the beta-convergence approach and the sigma-convergence approach. While Dufrénot et al (2006), using a conditional beta-convergence approach, result in a lack of real convergence within the ECOWAS between 1985 and 2003.

Those authors concluded that it is the heterogeneity of member countries which slows down the real convergence in this union. This result confirms the conclusions of Venables (2003) who argues that a grouping of developing countries leads to the divergence due to strong heterogeneity of development levels of member countries. Taking into account this heterogeneity among member countries, Akanni-Honvo ,(2003) examines the implications of regional trade agreements on the process of convergence (divergence) in developing regions between 1975 and 2000, not only in sub-Saharan Africa. For him, the trade agreements do not automatically imply real convergence within the areas of integration in Africa. It shows that factors such as infrastructure, productive complementarity and capacity of leading countries to exercise training effects are crucial in the process of convergence in Africa, more than the reduction of tariffs within the context of trade agreements despite that the said conditional convergence (structural) is generally low in it.

Analyzing the case of WAEMU countries, he argues that this is a successful integration experience probably because of its high monetary integration. In addition, contrary to other integration areas in Sub Saharan Africa, he shows that countries would converge after a little more than a third of a century (33 years). For Hammouda et al. (2007), the weak convergence of income per capita in Africa and more particularly in the WAEMU is mainly due to three factors: the slow growth of the product, the failure of past economic policies and the relative weakness of the incoming FDI. However, according to them, the WAEMU is experiencing a strong tendency towards convergence per capita income. Disparities within the area of integration, they measure by the volatility of GDP per capita, are lower compared to other integration areas in sub-Saharan Africa. The stability and growth pact contributed significantly to the improvement of the overall standard of living in member countries of the union (Combey and Mally, 2012).

According to the results of those authors, conditional convergence hypothesis cannot be rejected and the adoption of the pact allows a faster convergence of member countries. Plane and Tanimoune (2005) showed in an empirical analysis that the evolution of criteria was certainly favorable but not enough to expect the entry of WAEMU economies in stable phase. Chassem (2012) also shows that there is no real convergence over the period 1992 -2005 in the WAEMU.

On the other hand, Wetta and Yerbanga (2012) from a Bayesian approach lead to a real convergence in the WAEMU on the periods 1980-1994 and 2000-2008. Ultimately, following the methodology approach and the analysis period, the creation of the WAEMU has a mitigated impact on the reduction of disparities in income per capita in the union. The results of previous

analyzes in terms of real convergence lead to contradictions. Does the establishment of the WAEMU significantly improve the level of development in member countries?

In this analysis, it is proposed to assess the impact of the WAEMU creation on the overall standard of living in union using a non-parametric approach: the method of matching on propensity score. In our knowledge, this approach has not yet been implemented in such an assessment concerning the WAEMU. The next section presents this methodology.

2. Methodology

To assess the impact of the establishment of the WAEMU on the development level in space, the method of matching on the propensity score was implemented. Two reasons motivate the choice of this approach. The first, the WAEMU is presented as a successful integration experience despite the absence of significant effects on the level of development of member countries since its creation. Most of member countries benefit from Heavily Indebted Poor Countries (HIPC) and Relief Multilateral Debt (RMD) initiatives. The paired observations technical is one of the quasi experimental methods of impact assessment. The treated group is represented by the countries of the WAEMU and the control group, a set of countries selected among 163 countries, selected according to the criteria described in Section 4.

The second is a nonparametric approach that questions the contradiction of the obtained conclusions using parametric methods of analysis of real convergence. Moreover, about this second aspect, it would not be logical to think that the real convergence does not necessarily imply the improvement of living standards.

2.1. Description of the method

This is an ex-post evaluation intending to determine whether the establishment of the WAEMU has improved the living conditions of the population in member countries or not. Theoretically, Rubin (1974) has defined this type of problem. It focuses on the identification of the causal effect of a reform that is efficient if it can show that it has improved the situation of the beneficiaries, looking at an alternative situation that is the lack of reform.

To ensure methodological rigor, the impact evaluation must estimate the results of what would be the situation of the beneficiaries in the absence of this program: the counterfactual effects. Since it is not possible to observe a single beneficiary in both situations at once, that is to say with and without reform, we must construct a control group that will serve as a reference for the study of the trajectories of reform beneficiaries. For that, data are used on units not affected by the reform to assess but which could enter in it at the same time that beneficiaries and which possess characteristics close to those of the beneficiaries (the control group).

However, we can evaluate the effectiveness of the reform for each beneficiary, but we rather can only put in evidence its average effect on beneficiaries (average effect of the reform on the treated). In addition, control groups are constructed with the aim that on average they have identical characteristics to those of the beneficiaries but they also have elements of unobserved heterogeneity by the evaluator that may affect their participation in the reform evaluated. The issue of selectivity bias that may lead to biased estimates of the effects of the reform (Heckman, Ichimura, Smith, & Todd, 1996). However, we can evaluate the effectiveness of the reform for each beneficiary, but we rather can only put in evidence its average effect on beneficiaries (average effect of the reform on the treated). In addition, control groups are constructed with the aim that on average, they have identical characteristics to those of the beneficiaries but they also

have elements of unobserved heterogeneity by the evaluator that may affect their participation in the reform evaluated. The issue of selectivity bias that may lead to biased estimates of the effects of the reform (Heckman, Ichimura, Smith, & Todd, 1996).

One way to solve this problem is the assessment of "quasi-experimental data" method. This method is to use or build data for beneficiaries and for units in the control group. To control for selection bias, relatively sophisticated econometric techniques are chosen depending on the characteristics of the units (here are countries) and data available. The estimate of the net effect of the measure, including making assumptions about the mechanisms of entry selection (Heckman, Lalonde, & Smith, 1998).

2.2. Principle and application of the matching procedure on propensity scores in this context

The matching method is a nonparametric causal inference method. The advantage of this method is not to base the modeling of the selection process on assumptions too heavy. The Groups of control and processing are likely to have different responses due to differences in their observable features. To control these spurious differences, we choose as a group of matched control group of WAEMU countries, a group of treated, a subset of the control group composed of countries whose observable characteristics are more matched as possible to group of WAEMU countries, the treated group.

The observed characteristics retained for the construction of the counterfactual of WAEMU countries are : life expectancy at birth expressed in years , the level of education measured by the gross enrollment rate at the primary level expressed in percentage , access to health services expressed in percentage : the proportion of the population with access to health services , access to safe drinking water as a percentage : the proportion of the population with access to safe drinking water and the proportion of children under 5 suffering from malnutrition , measured here by the number of deaths of children under five years. These are the variables that enter into the calculation of the Human Poverty Index (HPI) developed by the United Nations Development Program (UNDP). This indicator is used to compare the levels of development of countries and it is a priori independent of membership in any sub-regional organization.

This method, indeed, makes the assumption that the only differences between the two groups of countries come from their individual characteristics on the one hand and the membership or not, the effect of treatment on the other hand. If the differences about characteristics are neutralized, then there remains only the effect of treatment. The access to treatment in this analysis is the membership in WAEMU since its creation. As the counterfactual average of this reform result on the WAEMU countries is not observed, it is important to choose a substitute in order to estimate the average effect of the treatment on member countries. To do that, two assumptions are made: the conditional independence assumption and the assumption of common support.

2.3. Assumption of conditional independence and common support

When we wish to evaluate a program using observational data (non-experimental), we face two populations, beneficiaries and non-beneficiaries that differ in the distribution of observable individual characteristics that probably affect the participation in the program. The independence (unconditional) between the latent result variables (Y_0, Y_1) and the assignment to treatment T is very unlikely. A less restrictive condition consists in considering that there is a set

of observable variables X conditionally that the property of independence between the latent result and the assignment to treatment is verified. This is the assumption of conditional independence of observable characteristics.

$$(\mathrm{Y}_0, \mathrm{Y}_1) \perp \mathrm{T}|\mathrm{X} \tag{1}$$

The condition of conditional independence for the identification of Δ^{ATT} is lower, since it only needs that the independence between the potential results in the absence of treatment and treatment, that to say:

$$\mathrm{Y}_0 \perp \mathrm{T}|\mathrm{X} \tag{2}$$

Concerning the assumption of common support, it ensures that for each individual treated, there are individuals in the control group with the same observed characteristics:

$$0 < P(T = 1|X) < 1 \tag{3}$$

To estimate Δ^{ATT}, this assumption reduces to $P\ (T\ =\ 1|\ X)\ < 1$. Under the two assumptions of conditional independence and common support, the allocation to treatment is random and the results of control subjects can be used to estimate the counterfactual result of individuals treated if left untreated. The principle of the estimation is to use the information available on untreated individuals to build, for each treated individual, a counterfactual.

2.4. Estimation of propensity score and common support

Consider the average treatment effect on the treated:

$$\Delta^{ATT} = \mathbb{E}(Y_1 - Y_0|T = 1) = \mathbb{E}(Y - Y_0|T = 1)$$

$$\Delta^{ATT} = \mathbb{E}(Y - \mathbb{E}(Y|X, T = 0)|T = 1)$$

$$\Delta^{ATT} = \mathbb{E}_{x|T=1}(\mathbb{E}(Y_1|T = 1, X = x) - \mathbb{E}(Y_0|T = 0, X = x) \tag{4}$$

The final estimator Δ^{ATT}, is then obtained as the deviations average of the situation of individuals treated and counterfactual built. The problem is then to estimate for each WAEMU country which characteristics are x_i, the quantity $E(Y_0 \,|\, X = x_i, T = 0) = g(x_i)$. To do that, we can simply match each country of the union with countries that have the same characteristics X_i (matching on variables) or to do the matching basing on propensity scores $\Pi(X) = P(T = 1|X)$ of the two groups of countries (matching on the propensity score) then estimate $g(x_i)$.

In the following, we focus on the matching approach on the propensity score which we present the various intermediate steps.

2.4.1. Propensity score

When estimating the propensity score, there are two choices to make: the estimation model to be used and the variables to be included in the model. In principle, any discrete model can be used. However, compared with probabilistic linear models, there is a preference for logit or probit models. These models should include all the observed variables that influence the

selection in the treatment and the result. It is proposed to use the logit regression model to estimate the propensity scores.

2.4.2. Common support

Once the score estimated for all countries in the sample, we determine the common support of the propensity score to ensure that for each WAEMU country, we can find at least one non-member country having the same propensity score. To build the common support of the propensity score, two approaches can be adopted. The choice of the appropriate approach depends on the distribution of propensity scores of the two groups. The first approach is essentially based on the comparison of minima and maxima of the propensity score in the two groups of countries. The basic criterion of this approach is to delete all the observations whose propensity score is lower (and more important) than the minimum (the maximum) in the control group. However, there are some problems related to the comparison of minima and maxima (for example, if there are observations within the limits that are excluded even if they are very close to the limits).

Another problem arises if there are areas in the range of the common support where there is only limited superposition between the two groups (for example in an interval, only treated observations can be found). Additional problems arise if the tails of the distribution are very thin (eg a large distance between the smallest maximum and the second smaller maximum). The second approach, suggested by Smith and Todd (2005), is a way to skirt these problems. This approach is based on the estimation of the distribution density in the two groups ("trimming" procedure). It consists in defining the region of the common support by P values which have a positive density for the distributions $T = 0$ and $T = 1$. This is the approach which has been used in this study.

3. Data

All the data used in this study were obtained from the database of the World Bank WDI (World Development Indicators), 2012. Two[3] results variables were considered in the evaluation of the WAEMU establishment impact to assess the robustness of the results: GDP per capita at constant 2000 prices of countries, expressed in U.S. Dollars and per capita GDP in purchasing power parity in constant 2005 prices in U.S. Dollars. These aggregates measured effectively the changes in the development level of countries and thus allow assessing the level of well-being. The values at constant prices were chosen to liberate the analysis of the price influences. The indicator in terms of purchasing power allows comparisons between countries by eliminating the impact of exchange rates. These variables were transformed in log to stabilize the variance. Observable characteristics also were transformed into logarithm[4].

The database contains 171 countries[5], including the countries of the WAEMU. According to Baier & Bergstrand (2007) the assessment is made in this study using data from 2009. Indeed, these authors showed that the creation effects of an integration area on macroeconomic variables

[3] The second variable results will control the robustness of the estimation results

[4] The variable number of deaths of children under five has zero values for some countries. So, before the log transformation, this variable was transformed by adding 1 to the initial values. This transformation allows for interpretations of the estimated coefficients in terms of elasticity on the one hand and on the other hand it aims to linearize any non-linear relationship between the a priori explanatory variables and the dependent variable

[5] The full list of countries in the database is presented in Appendix 1.

in member countries would be perceptible from the fifteenth year of its creation and the WAEMU was created in 1994. These are cross-sectional data.

4. Results

This section focuses on modeling the propensity score and presents the results of the evaluation of the WAEMU establishment impact on the development level in member countries.

4.1. Modeling of the propensity scores

The logistic regression was used to model the propensity scores. The choice of variables to be included in the model is made with tests of independence between the treatment variable "belonging to the WAEMU and the observable characteristics of all WAEMU countries except Guinea Bissau[6]. Table 1 presents the results of these tests.

Table 1Results of the independence tests

Observable characteristics	Independence test statistics	Critical Probabilities
Gross enrollment rate in primary education (%)	1.14	0.286
Proportion of population with access to safe drinking water (%)	10.81	0.001
Proportion of population with access to health services (%)	10.44	0.001
Number of under-five child deaths	0.90	0.343
Gross rate of infant mortality per 1,000 live births	11.78	0.001
Life expectancy at birth (years)	11.39	0.001

At the threshold of 5%, the gross enrollment rate in primary education and the Number of under-five child deaths are independent of the membership of countries in the sample in WAEMU. These are the two variables that we have included in the modeling propensity scores.

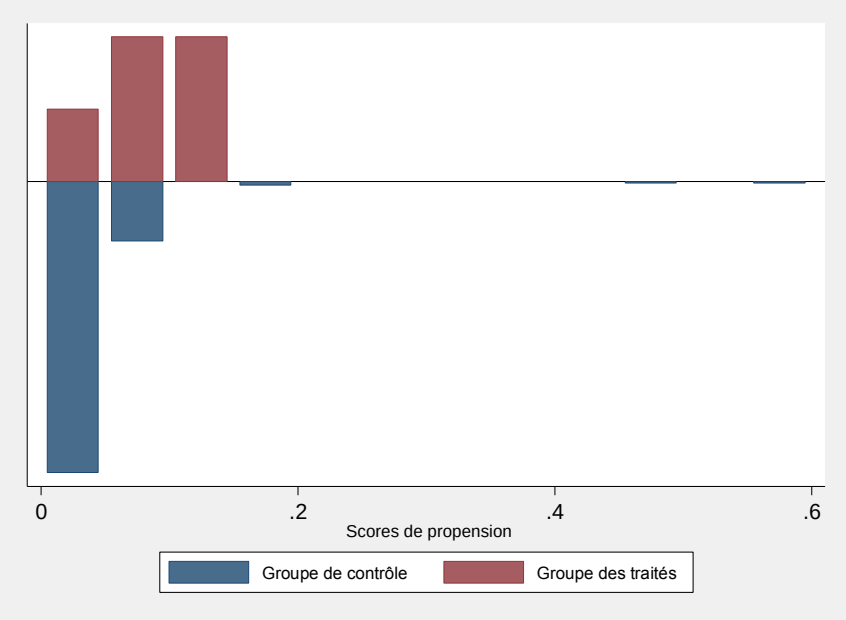
Before estimating the propensity scores, we treat outliers according to these two explanatory variables because it can be countries[7] whose values for the explanatory variables would influence significantly the coefficients of the logit model (or statistical validity) that estimates the scores propensity. Figures 1 and 2 in Appendix 4 show that there exists this type of observations in the database. The final estimate of propensity scores by logit regression does not take into account the observations that fulfill both criteria for outliers.

To ensure that for each country member of the WAEMU we can find at least one country in the database that has at least the same characteristics, we construct the region of common support for the propensity score. To achieve this, we compare the maxima and minima of the distribution of propensity scores for the two groups. We remove countries treated group whose scores are either lower or greater compared, respectively, to the minimum and to the maximum scores of countries in the control group. The region of common support we get is the interval

[6] As the analysis takes into account the countries that joined since the creation of the WAEMU in 1994, this is why this country has not been taken in the sample. Guinea Bissau, in fact, joined the WAEMU in 1997.
[7] Such observations may be outliers, either *leverages* or influentials. Such observations have been detected.

[0.05; 0.13]. Figure 1 shows the distribution of propensity scores in the region of common support for the treated group (the WAEMU countries) and the control group.

Figure 1: Distribution of propensity scores in the region of common support



Having determined the propensity scores, we divide the sample into equally spaced blocks of the propensity score. The optimal number of block is 1[8]. Five WAEMU countries have been matched with 27 non-members. Table 2 shows the characteristics of the optimal block.

Table 1 : Optimal number of equally spaced blocks and distribution of paired countries

Block number	WAEMU member		Total
	No	Yes	
1	27	5	32
Total	27	5	32

The five WAEMU countries are: Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali and Senegal. Benin, Togo and Niger are outliers as shown in the graphs in Appendix 4. The five countries included in the assessment are representative of all WAEMU countries. Indeed, in 2009, 2010, 2011 and 2012, respectively 78.10%, 78.05%, 77.63% and 76.97% of WAEMU GDP came from the economic activity in these countries (WAEMU[9], 2012). The sensitivity analysis of the results will allow testing the robustness of the estimates. The list of 27 countries non-members of the WAEMU is presented in Appendix 6.

Within this block, under the assumption of equal variances, we test the equality of WAEMU countries (treated group) and non -member countries (the control group) average

[8] The full results of the algorithm for determining the optimal number of blocks are presented in Appendix 5 after having a priori specified 5 blocks before the determination process.
[9] WAEMU Commission, Database of Multilateral Surveillance (BDSM), 2012.

propensity scores. We do that to test the treated and control groups obtained are not different according to observable characteristics used to estimate propensity scores. The results of this test (Appendix 7) show that the propensity scores average did not differ between the treated group and the control group[10].

The following step consists in testing the propensity score balance within the block. Then, we test within each block that the average of each characteristic does not differ between the WAEMU countries and the countries constituting the control group: it is the balance property. If the averages of one or several characteristics in a given block are different, the balance property is not satisfied in this block. Therefore, this one must be divided into even finer blocks then the test is repeated. If it is not verified again, we have to review the specification of the model by introducing interaction terms or of higher order for example. In this analysis, at a significance level of 0.001 (see results in Appendix 8), the equilibrium property holds for both observable characteristics used in estimating the propensity scores.

Therefore, considering these two groups of countries, we can estimate the impact of the creation of the WAEMU on the development level of member countries by matching methods. This is the subject of the next section.

4.2. Results of the evaluation of the impact

To determine the average effect of the WAEMU creation on the development level of member countries, we use the matching method to construct for each WAEMU member country of the Block 1, the counterfactual. The probability of observing two countries with exactly the same values of the propensity score is, in principle, zero since the distribution of propensity scores distribution is continuous. So only one estimator each exact matching on the propensity score is insufficient to assess the average effect of the WAEMU establishment on the member countries development level. That is why we propose to use different matching estimators.

Those one differ in the way of selecting the country in the control group to match with the countries of treated group and the weights assigned to selected countries of the control group when estimating the counterfactual result of treated group. However, the estimators of the average effect of the treatment on the treated obtained are all consistent under the assumptions of conditional independence and common support (Tommaso, 2006).

The results of the WAEMU creation average effect on the member countries development level estimation by different matching methods are presented in Table 3.

Table 3: Estimation Results

Result variables	GDP per capita in constant 2000 prices		GDP per capita in purchasing power parity in constant 2005 prices	
Matching Methods	The average effect of the creation of the WAEMU	Bootstrap standard error	the average effect of the WAEMU creation	Bootstrap standard error
Radius (r=0,1) Estimator	-1.99 (-4.27)	0.466	-1.69 (-4.76)	0.35
Kernel matching Estimator	-1.97 (-5.17)	0.381	-1.67 (-4.64)	0.36
Nearest neighbor Estimator	-1.611 (-2.05)	0.784	-1.24 (-1.95)	0.64

( ) student's statistic t.

[10] The threshold of the test was set at 0.001. The result has less than one chance in a thousand to be obtained by chance.

The Table 3 shows that regardless of the estimation method used, the creation of the WAEMU has not improved the living conditions in member countries since the estimator of the average effect is negative and significant. With radius and kernel matching methods, all the five WAEMU countries were matched with all 27 countries in the control group. The estimator of the average effect indicates a decrease respectively 1.99% and 1.97% in average for the GDP per capita in constant 2000 prices. Concerning the nearest neighbor method, the five countries of the WAEMU were matched with eight countries in the control group. The estimated average effect shows that the creation of the UEMOA also induced a decrease of 1.61% in average for the GDP per capita in constant 2000[11] prices. The sensitivity analysis of these results will allow checking the robustness of the obtained results.

4.3. Sensitivity Analysis

This sensitivity analysis permits to check the robustness of the obtained results against the failure of the conditional independence assumption to observable characteristics. Indeed, one of the central assumptions of the sensitivity analysis is that the assumption of conditional independence to observable is no longer valid. Furthermore, it is supposed that this assumption holds if we give, in addition to observable characteristics, unobserved characteristic. If U is the unobserved variable, this means that as U is not observed, the results of the checks cannot be credibly used to estimate the counterfactual result of treated. U is called confusion factor. For the sensitivity analysis, we introduce a confusion factor and we estimate the average effect by different matching methods. U is a random variable that follows a uniform distribution on the interval [0; 1]. This variable is taken into account in estimating the average effect of the WAEMU establishment on the member countries by using again all the methodology as presented in the previous sections raising the assumptions of conditional independence to the observed characteristics.

The optimal number of blocks is 4 .The common support is [0.09 ; 0.75]. Differences Tests of estimated scores averages in each block show that the average score is different in every block. Here, five WAEMU countries were matched to six non-members countries of the database. In addition, the balance tests are validated. The table shows the results of the average effect estimation.

Table 4: Results of the sensitivity analysis

Result variable	GDP per capita PIB in constant 2000 prices			
Matching Methods	the average effect without U	Bootstrap standard error	the average effect with U	Bootstrap standard error
Radius (r=0,1) Estimator	-1.99 (-4.27)	0.466	-0.33 (-0.47)	0.71
Kernel matching Estimator	-1.97 (-5.17)	0.381	-0.26 (-0.34)	0.76
Nearest neighbor Estimator	-1.611 (-2.05)	0.784	-0.11 (-0.15)	0.73

( ) student's statistic t.

[11] The estimation made with the per capita GDP in purchasing power parity in constant 2005 prices to control the robustness of this result, leads to the same conclusions.

These results show how the average effect estimated in the previous section is robust to a specific source of failure of the conditional independence assumption to observed characteristics of each country. Indeed, in the presence of confusion factors, the coefficient value is negative, though smaller in absolute value than that obtained without taking into account this factor. Thus, we obtain a negative average effect with a positive bias that overestimates the value of the parameter. Consequently, we can conclude that the average effect of the WAEMU establishment on the development level in member countries is negative.

5. Discussion and recommendations

This negative result could be explained by several factors impeding the improvement of the standard of living in member countries. These are among others, the collateral effects of the political and security instabilities in the West African region, corruption and bad governance, the multiplicity of sub-regional organizations and disparities in levels of development between member states.

The collateral effects of political and security instabilities in the countries of West Africa, member and non-member of WAEMU. The West Africa alone totalizes 35 *coup d'Etat* between 1960 and 2006. For example, the West African sub-region has experienced a political instability due to the civil war in Liberia and Sierra Leone. With these political and security instabilities which have disastrous consequences for the state's economy, it is difficult to envisage a dynamic regional groupings because they inhibit the effects of macroeconomic policies implemented for the improvement of living conditions.

Corruption and bad governance in many countries of the region are handicaps for achieving an integrated economic space with significant impacts on the populations' standard of living. In addition, the former colonial powers, in this case France, keep diplomatic force relations to maintain its influence in the WAEMU zone. These economic and political obstacles can delay the economic integration process in the region.

The multiplicity of sub-regional organizations could also explain this negative result. Indeed, the Regional Economic Communities (RECs) are expected to create free trade areas, customs unions and finally the horizontal coordination and harmonization to, at the end, establish an African common market. Africa has 14 RECs and around 200 intergovernmental organizations, this multiplicity is a source of many malfunctions. Because, most of the countries adhere to two or several regional blocks and the mechanisms of belonging to a regional group are not binding as is the case in the European Union or an observation period for the applicant to judge the vitality of its economy. States are therefore not subject to a pre-accession period. For example, all member countries of the WAEMU are also members of ECOWAS and other sub-regional organizations. These multiple memberships' consequences are a lack of efficiency of these organizations and a volatility of contributions that already seem low. States must contribute in several blocks and that can lead to delays in the implementation of development programs. This situation could also justify the low impact of pro-poor policies initiated in the 2000s in line with the MDGs and the failure of economic policy harmonization at the WAEMU.

The difference in development levels among member countries can sometimes lead to a certain reluctance of the most developed states to sacrifice their interests, in particular in favor of regional economic goals. To a lesser extent, they want to control the regional organization because of their economic power. These remarks are illustrated by the "control" of WAEMU by Cote d'Ivoire as Kenya dominates the East African Community (EAC) and Cameroon on the Customs Union of Central Africa. To conciliate the interests that are sometimes conflicting of

countries that are different by their size, their natural resources and their economic results seem difficult. These developmental differences may explain in a sense the low intra-community exchange rate (Longo and Sekkat, 2004) source of improving well-being. Besides, the lack of good economic infrastructure (rail or road) does not contribute to exchanges between members states while neighboring countries should be the first economic partner. Over the years, despite the creation of many organizations in different regions, they have generally done little to increase the mobility of people, trade or exchanges between African countries or even the level of development in member countries.

Ultimately, the UEMOA despite integration efforts consented by WAEMU instances to make the integration a vector of development in member countries, 15 years after its creation, the effects are not yet apparent.

6. Conclusion

This analysis evaluated the impact of the WAEMU establishment on the development level in the member countries using a micro econometric method of ex-post evaluation, the matching on the propensity score method. It appears that besides a convergence process that is not really admitted because of the conflicting results obtained by the authors (Jones, 2002; Wetta & Yerbanga, 2012; Chassem, 2012), the creation of the WAEMU is far from having enabled the beginning of a significant development process in member countries after more than a decade of integration.

However, with the possibility of contributing significantly to it, the study recommends that we have to focus, among other factors, on strengthening and coordinating sub-regional initiatives. The proliferation of regional organizations is a factor limiting the effectiveness of policies in matter of improving living conditions. That then requires immediate rationalization to stop the "proliferation". A realistic number of organizations would permit to save money that could be allocated to the Structural Funds in charge of compensating the inequalities between States (improvement of basic economic and social infrastructure). WAEMU must also strengthen its monitoring and development policies evaluation in order to better adapt to the environment of the country.

The WAEMU economic Commission must conduct the member states in the inclusion of Community law in the national plans and programs for greater impact on the member countries development level.

In addition, it should be noted that any preliminary to success of a regional grouping is peace and stability. Armed conflicts in West Africa with consequences such as mass displacement of populations, destruction of economic infrastructure, loss of life in both member countries and neighboring countries hamper economic integration process and limit the impact of development programs. It will be for the WAEMU to strengthen its crisis prevention plan by getting involved in the solutions research negotiated with the support of the African Union.

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Appendix

Appendix 1: List of countries in the database

Pays			
Afghanistan	Congo, Dem. Rep.	Iceland	Montenegro
Albania	Congo, Rep.	India	Morocco
Algeria	Costa Rica	Indonesia	Mozambique
Andorra	Cote d'Ivoire	Iran, Islamic Rep.	Myanmar
Angola	Croatia	Iraq	Namibia
Argentina	Cuba	Ireland	Nepal
Armenia	Cyprus	Israel	Netherlands
Aruba	Czech Republic	Italy	New Zealand
Australia	Denmark	Jamaica	Nicaragua
Austria	Djibouti	Japan	Niger
Azerbaijan	Dominican Republic	Jordan	Nigeria
Bahamas, The	Ecuador	Kazakhstan	Norway
Bangladesh	Egypt, Arab Rep.	Kenya	Oman
Barbados	El Salvador	Korea, Dem. Rep.	Pakistan
Belarus	Equatorial Guinea	Korea, Rep.	Panama
Belgium	Eritrea	Kuwait	Papua New Guinea
Belize	Estonia	Kyrgyz Republic	Paraguay
Benin	Ethiopia	Lao PDR	Peru
Bhutan	Fiji	Latvia	Philippines
Bolivia	Finland	Lebanon	Portugal
Bosnia and Herzegovina	France	Lesotho	Qatar
Botswana	Gabon	Liberia	Russian Federation
Brazil	Gambia, The	Lithuania	Rwanda
Bulgaria	Georgia	Luxembourg	Samoa
Burkina Faso	Germany	Macedonia, FYR	Sao Tome and Principe
Burundi	Ghana	Madagascar	Senegal
Cambodia	Greece	Malawi	Serbia
Cameroon	Grenada	Malaysia	Sierra Leone
Canada	Guam	Maldives	Singapore
Cape Verde	Guatemala	Mali	Slovak Republic
Central African Republic	Guinea	Malta	Slovenia
Chad	Guinea-Bissau	Mauritania	Somalia
Chile	Guyana	Mauritius	South Africa
China	Haiti	Mexico	Spain
Colombia	Honduras	Moldova	Sri Lanka
Comoros	Hungary	Mongolia	St. Lucia
Sudan	Tanzania	Turkey	Uzbekistan
Suriname	Thailand	Uganda	Vanuatu
Swaziland	Timor-Leste	Ukraine	Venezuela, RB
Sweden	Togo	United Arab Emirates	Vietnam
Switzerland	Tonga	United Kingdom	Zambia
Syrian Arab Republic	Trinidad and Tobago	United States	Zimbabwe
Tajikistan	Tunisia	Uruguay	

Appendix 2: Results table of estimates of the average GDP per capita at constant 2000 prices (U.S. $) of WAEMU countries between 1993 and 2011

Years	Mean	Standard Error (Bootstrap)	[95% Conf. Interval]
1993	286.82	51.54	[185.80; 387.84]
1994	286.90	55.67	[177.78; 396.02]
1995	295.08	61.08	[175.36; 414.80]
1996	305.24	57.16	[193.20; 417.28]
1997	315.55	64.15	[189.81; 441.28]
1998	312.95	56.61	[202.01; 423.90]
1999	317.34	66.38	[187.23;447.44]
2000	312.70	53.83	[207.20; 418.20]
2001	315.40	58.45	[200.84; 429.96]
2002	309.99	52.89	[206.33; 413.67]
2003	313.57	46.96	[221.52;405.63]
2004	315.08	52.57	[212.05;418.11]
2005	319.16	50.19	[220.78; 417.54]
2006	321.57	51.97	[219.71; 423.42]
2007	324.35	52.70	[221.07; 427.64]
2008	329.10	55.25	[220.81; 437.39]
2009	330.36	57.58	[217.50;443.22]
2010	335.91	56.05	[226.06;445.77]
2011	332.61	37.93	[258.27; 406.95]

Appendix 3: Allocation table of observed characteristics according to the membership of the countries to WAEMU.

	Member of the WAEMU		Total
Observable characteristics	No	Yes	
Gross enrollment rate in primary education (%)			
inferior to the median	92	6	98
superior to the median	71	2	73
Total	163	8	171
Proportion of population with access to safe drinking water (%)			
inferior to the median	81	8	89
superior to the median	82	0	82
Total	163	8	171
Proportion of population with access to health services (%)			
inferior to the median	83	8	91
superior to the median	80	0	80
Total	163	8	171
Number of under-five child deaths			
inferior to the median	89	3	92
superior to the median	74	5	79
Total	163	8	171
Gross rate of infant mortality per 1,000 live births			
inferior to the median	87	0	87
superior to the median	76	8	84
Total	163	8	171
Life expectancy at birth (years)			
inferior to the median	78	8	86
superior to the median	85	0	85
Total	163	8	171

Appendix 4: Figures of outliers and influentials detection

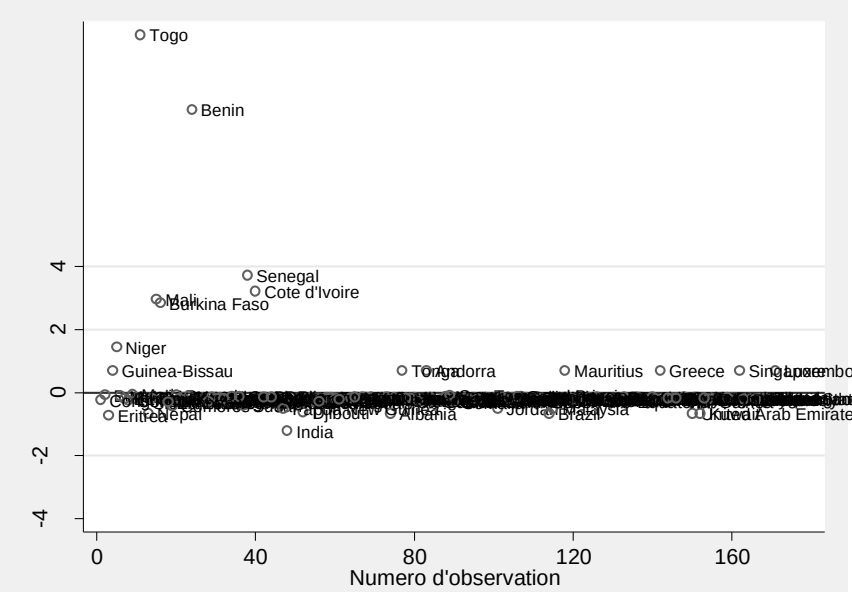

Figure 1. *Outliers'* detection

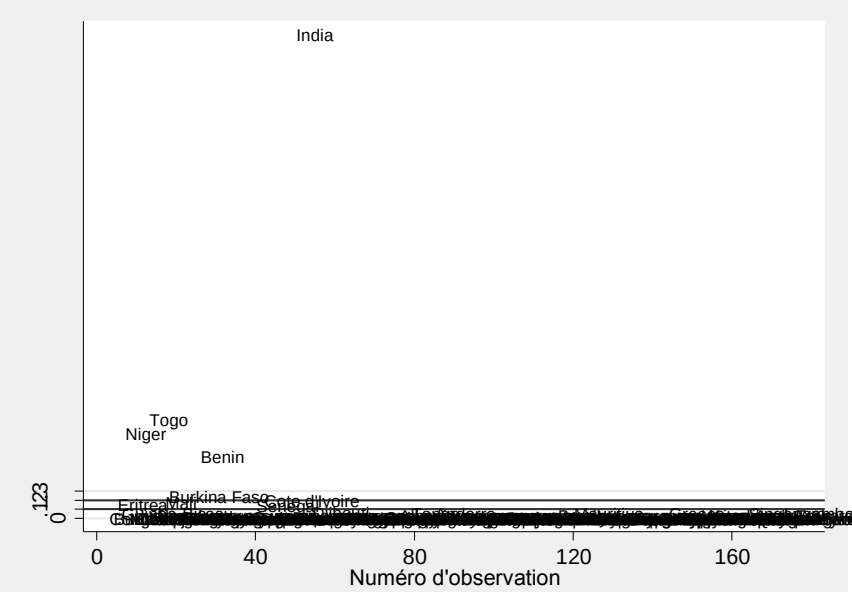

Figure 2: *Influential's* Detection

Appendix 5: Identification of the optimal number of blocks

```
**************************************************
Step 1: Identification of the optimal number of blocks
Use option detail if you want more detailed output
**************************************************
Distribution of treated (1) and controls (0) across blocks
 Blocks of |
the pscore |
       for |
 treatment |         UEMOA
    WAEMU  |         0          1 |     Total
-----------+----------------------+----------
         1 |        27          5 |        32
-----------+----------------------+----------
     Total |        27          5 |        32

Test that the mean propensity score is not different for treated and controls
Test in block 1
Observations in block 1
 obs: 32,  control: 27,  treated: 5
Test for block 1
Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      27    .0634666    .0011769    .0061153    .0610475    .0658858
       1 |       5     .086695    .0151641     .033908    .0445926    .1287974
---------+--------------------------------------------------------------------
combined |      32    .0670961    .0028126    .0159106    .0613597    .0728325
---------+--------------------------------------------------------------------
    diff |           -.0232284    .0066348               -.0367784   -.0096783
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  - 3.5010
Ho: diff = 0                                     degrees of freedom =       30
    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0007         Pr(|T| > |t|) = 0.0015          Pr(T > t) = 0.9993

The mean propensity score is not different for treated and controls in block 1

Test in block 2
Observations in block 2
 obs: 0,  control: 0,  treated: 0
Block 2 does not have observations
```

```
Move to next block

Test in block 3
Observations in block 3
 obs: 0,  control: 0,  treated: 0
Block 3 does not have observations
Move to next block

Test in block 4
Observations in block 4
 obs: 0,  control: 0,  treated: 0
Block 4 does not have observations
Move to next block

Test in block 5
Observations in block 5
 obs: 0,  control: 0,  treated: 0
Block 5 does not have observations
Move to next block

The final number of blocks is 1. This number of blocks ensures that the mean
propensity score is not different for treated and controls in each blocks
```

Appendix 6: List of countries matched with the five countries of the WAEMU

Albania	Guam	Luxembourg	Sierra Leone
Andorra	Guyana	Malaysia	Singapore
Bangladesh	Haiti	Mauritius	Somalia
Brazil	Iraq	Nepal	Tonga
Equatorial Guinea	Jordan	Nicaragua	United Arab Emirates
Gabon	Korea. Dem. Rep.	Nigeria	Zimbabwe
Greece	Kuwait	Papua New Guinea	

Appendix 7: Results of the mean comparison test between the group of the treated and the controls group in block 1.

```
Test for block 1: Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean     Std. Err.    Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      27    0,0634666    0,0011769    0,0061153    0,0610475    0,0658858
       1 |       5     0,086695    0,0151641     0,033908    0,0445926    0,1287974
---------+--------------------------------------------------------------------
combined |      32    0,0670961    0,0028126    0,0159106    0,0613597    0,0728325
---------+--------------------------------------------------------------------
    diff |           -0,0232284    0,0066348               -0,0367784   -0,0096783
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -3,5010
Ho: diff = 0                                     degrees of freedom =       30

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0,0007         Pr(|T| > |t|) = 0,0015          Pr(T > t) = 0,9993

The mean propensity score is not different for treated and controls in block 1
```

Appendix 8: Results of the test of balancing property

```
***********************************************************
Step 2: Test of balancing property of the propensity score Use option detail if you
want more detailed output
***********************************************************
Testing the balancing property for variable number infant under five death in block 1
Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      27    19149.15    6799.469    35331.08     5172.64    33125.66
       1 |       5       38401     22137.3    49500.51      -23062       99864
---------+--------------------------------------------------------------------
combined |      32    22157.25    6646.323    37597.28    8601.985    35712.51
---------+--------------------------------------------------------------------
    diff |           -19251.85    18272.37                -56569     18065.3
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.0536
Ho: diff = 0                                     degrees of freedom =       30
    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.1502         Pr(|T| > |t|) = 0.3005          Pr(T > t) = 0.8498
The variable infant mortality rate is balanced in block 1

Testing the balancing property for variable gross rate of primary socialization in
block 1
Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      27    83.16235    .1110781    .5771786    82.93402    83.39067
       1 |       5    80.59402     2.03504    4.550488    74.94384     86.2442
---------+--------------------------------------------------------------------
combined |      32    82.76105    .3468136    1.961874    82.05372    83.46838
---------+--------------------------------------------------------------------
    diff |            2.568328    .8502224                .8319422    4.304714
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   3.0208
Ho: diff = 0                                     degrees of freedom =       30
    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9974         Pr(|T| > |t|) = 0.0051          Pr(T > t) = 0.0026
```

The variable gross rate of primary socialization is balanced in block 1