Determinants of Child work in Cameroon: taking into account Non-linearity of the Income and the Space Dependence

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Abstract

Based on the third Cameroonian Survey near the Household of 2007 present research examines the assumption of non-linearity of the impact of the incomes per capita on the child work and the econometric estimate appropriateness taking of account the space dependence of the observations. The multilevel analysis with the income taken in "splines" reveals the non-linearity of the incomes per capital of the households located below the threshold of the first and second quintiles and checks the Basu's "axiom of luxury". When the incomes of the adults located below the threshold of the first quintile of the distribution increase by F CFA 10 000, the rate of variation of the incidence of the child work decreases by a multiplicative factor of 1,016 the relative risk being of 1,022. The space dependence is correctly taken into account by the macroeconometric model spatially autoregressive, which confirms also non-linearity. Thus the significant reduction of the child work depends on the increase in incomes in the adults in the poorest households. The target of actions according to the spatial distribution of the economic activities is significant and important.

Keywords : Multilevel Modelling; Spatial econometrics; Spline Regression Models.

1. Introduction

At the international level, the two main standards that reference in the field "child work" are Conventions No. 138 and No. 182 of the International Labor Organisation (ILO). The first concerns the minimum age -15 years - for admission to employment, and the second focuses on the worst forms of child labor. Cameroon has ratified above conventions and established two instruments: the Law No. 92/007 of 14 August 1992 on the Labour Code and the Order No. 17 of 27 May 1969 related to Child Labour of Ministry and Social Laws. Despite all these raised instruments, this scourge continues. In fact, the National Report on child work in Cameroon reveals that among 5,999,053 children 5-17 years (41 percent) 2,441,181 children are concerned.

The recent renewed interest in the theoretical and empirical literature inherent in child work in developing countries highlights among the diverse factors of supply and demand, Dialo (2001), the role of household income, including the impact of poverty. For this purpose the theoretical approach of Basu and Van (1998) is probably one of the most appropriate to the context of developing countries to understand the decision of children's participation in the labour market according to Lachaud, (2008). Because the model is based on two assumptions one hand, the "luxury axiom" indicates that the economic activity of children prevail only if the household has a lower standard of living to a critical threshold. Thus, leisure and education of children are luxury goods, and parents are altruistic. On the other hand, the "substitution axiom" states equivalence, a correction factor close, working adults and children.

Then, several empirical research seems to confirm the significant impact of poverty on the child work. Thus, Basu and Tzannatos (2003) quote many micro or macro-economic study, recently carried out in Asia, showing a close connection between the increase in the standard of living of the households and the reduction of the child work. In this respect, the approach of Edmonds (2005), founded on panel data in Vietnam, suggests a signficant reduction of the hard-working children when the economic status of the families improves. In the same way, in West Africa, several empirical investigations - Blunch and Verner (2000), Grootaert (1998), Diallo (2001), Lachaud (2008) -, highlight a positive relation between the poverty and the children work.

Both the nonlinearity of the relationship between household income and children's participation in the labor market and the impact of the spatial dependence of child work seem to be insufficiently discussed (Lachaud, 2008). Lastly, there two rare studies taking of account non-linearity between the child work and the household's incomes produce interesting teachings.t the macro-economic level, Fallon and Tzannatos (1998) observe that the incidence of the child work varies according to the GDP's per capita level. At the micro economic level, Lachaud (2008) highlights the nonlinearity of the effect of adult earnings per capita on child labor using a "spline" modelling, and check the "luxury axiom". Ray (1999);Maitra and Ray (2000), Rosati and Rossi (2001);Ray (2001);Ray and Lancaster (2003) considered differentiation of the area by introduciong of a binary variable. Grootaert (1998);Nielsen (1998) ;Blunch, Verner (2000);Diallo (2001);Shafiq (2007);Cockburn, Dostie, 2007) considered equation specific to each area.

Based on the third Cameroonian Household Survey of 2007, this research examines first the hypothesis of non-linearity of the impact of household's income on child work in Cameroon. Then it examines the appropriateness of econometric estimates taking into account the spatial dependence of observations. The methodology is presented Section 2, section 3.and sections 4 are devoted, respectively, to the teachings of the multilevel micro-econometric approach and the spatial macroeconometric approach. Finally, Section 5 concludes the research.

2. Methods of analyze
The hierarchical structure of data from the third Cameroonian survey of 2008 allow both micro-econometric multilevel and spatial macro-econometric modeling.

2.1. Micro-econometric multilevel approach
According to Goldstein (2003) and Gelman, Hill, (2007) the framework for multilevel analysis provides a first appropriate approach to reflect the hierarchical structure of the data. First, the modeling in terms of random constants and random coefficient takes into account on the one hand, the greater homogeneity of observations within a group and consider that the level of children's work incidence varies between strata - regions. The constant consists of two terms: the fixed part is common to all regions, while, the component is specific to each strata is the random part. The random effect represents unobserved local factors for children located in the same stratum (region), and participation rates of children in the labor market in the same stratum are correlated because they share the same random effect. In this study, we consider that the effect of environment j on the incidence of child work varies from one region to another, instead of remaining fixed as the last. According to previous studies, Diallo (2001); Lachaud, (2007); and available data, the factors that may explain child work in Cameroon have been grouped into three classes: the characteristics of the child, characteristics of the household head and family environment.

This research aims to capture the discontinuities by modeling household's consumption expenditure per capita according to the regression approach by "spline". From this perspective, the study proposes to model consumer spending per capita household so that the coefficients - or marginal effects - indicate change in the rate of change in the incidence of child labor, following a change in consumption expenditure corresponding to a segment of adult resources, the latter being generated in terms of quintiles of the distribution. This technique involves a continuity of the function, that is to say the join of the various segments of spending thresholds. The Wald statistic tests the null of simultaneous different coefficients of consumption expenditure per capita - linear or nonlinear restrictions attached to set of coefficients. Thus the functional form (1) $D_{ijh} = D_{ij} - Z_h$ means that if $D_{ij} > Z_h$, Z_h being different quintiles h threshold. For example, if $D_{ij} > Z_1$, $D_{ij1} = D_{ij} - Z_h$. Similarly, $D_{ij4} = D_{ij} - Z_4$. As a result the codification of consumption expenditure per capita is made of the extent that each coefficient inherent to a quintile $D_{(h+1)}$ of consumption per capita is the change in slope relative to the segment, and with $h \geq 1$ and D_1 the first quintile threshold D_{ij2}. Therefore, the slope of D_{ij1}, for example, is $(\alpha_0 + \alpha_1)$, and the slope of that is of consequence. Jointed Wald test to check if the slope of the function is constant. This approach involves the development of appropriate tests. First the partition coefficient of variance can be evaluated..

3.2. Macro-econometric spatial modelling

The spatial econometrics seeks to address the two major characteristics of spatial data that is spatial autocorrelation refers to the lack of independence between geographical observations and spatial heterogeneity that is related to the differentiation in the space of variables and behaviours. The present study focuses on the spatial dependence of observations and hence the autocorrelation. In the study, the spatial econometric approach captures the spatial autocorrelation using regression models with spatial autoregressive error and mixed. Regarding the model with spatial error (1), the spatial dependence is stipulated as a disturbance through an auto-regressive variable. Regarding the model spatially auto-regressive model(2), the spatial autocorrelation is taken into account by a lagged endogenous variable in equation

4. Teachings of the multilevel micro-econometric approach

There are significant differences in children work. The employment rate for children in the same region are correlated because they share the same random effect, that represent unobserved local factors. Then, we observe that the variance partition coefficient is 0.3994. About 40 percent of the total variance of the residuals is due to differences among regions. Finally, the coefficient for the environment is positive and varies by region with an estimated variance 0.546 (0.255). The covariance of random effects in the range of -0.832 indicates a negative relationship between the random effects in the region and environment/area. The strength of this correlation is noted through their correlation coefficient is about -0.91 near unity in absolute value.

Econometric estimates show the nonlinearity of the impact of household consumption expenditure per capita - and therefore income per capita - on the early development of children in the labor market. In this regard Lachaud (2008, p14) points out that the logistic estimation to calculate the relative risk - likelihood ratio - which is the exponential of the regression coefficient. It represents the multiplicative effect of a unit increase in the regressor on the initial ratio of opportunity (if the variable is continuous).

In this context information about the multilevel hierarchical model show that adults income coefficient is negative and statistically significant. Its relative risk is equal to 0.994, meaning that an increase in earnings of adults in the household of F CFA 10,000 induced, all things being equal elsewhere, a lower risk of child work by a multiplicative factor of 0.994. Similarly, the rule of division by four of the regression coefficient Lachaud (2008) indicates a reduction of 0.158 percent of the probability of child work resulting from adults earnings increase in a unit (F CFA 10, 000).

Taking into account the nonlinearity of income is appropriate that the square of the coefficient of adults income is not significant. Indeed modeling adults income in "splines" indicates that when adult earnings are below the threshold of the first quintile of the distribution increases to 10 000 CFA, the rate of change of labor incidence children increases by a multiplicative factor of 1.016. Another way to interpret the coefficient of 0.0155475 – statistically significant - is to indicate that for the first income quintile, the rate of change in the probability of child labor is 0.389 percent (according to rule fourfold), where income adults range from 10,000 F CFA. Moreover, there is a positive and meaningful change in the rate of variation of children's participation in the labor market in when adult earnings per capita exclude the equivalent threshold in the first quintile. This result agrees with that of Lachaud (2008) in the case of Madagascar.

5. Teachings of the spatial macro-econometrics approach

The spatial macro-econometric approach takes into account the spatial dependence of the observations, although the aggregation of these observations, Lachaud (2007) -- limits the understanding of the impact of individual factors - for example, the structure of parental education may influence the rate of employment of children at micro-economic level, without being seen in terms of average per spatial unit in this study. Moreover, in this our study, the number of observations is reduced to 22 spatial units according to the considerations made, regarding the topology of the spatial configuration of Cameroon inherent in the available data. The macro-econometric spatial estimations check the robustness of certain items previously highlighted. The coefficients of the regression models with spatial autoregressive error and testing for the 22 spatial units, the relationship between, on the one hand, the rate (per spatial unit) of employment of children 5-17 years and, on the second hand, a set of parameters generated by the third cameroonian survey.

First, we note that for the spatial autoregressive model that the coefficient ρ of the variable spatially dependent is significant. In addition, the Breusch-Pagan statistic shows that this model is free of heteroscedasticity at 5 percent, which implies a constant variance of residuals. In fact, in the model with spatially varying delayed, the Lagrange multiplier test-LM (delay) inherent in the standardized spatial weight matrix is significant - 3.482 (0.062) - unlike the likelihood ratio - LR (delay) 2.260 (0.133), which may lead to assume that the spatial dependence has been properly taken into account by the parameter. Moreover, the spatial error model does not show the presence of spatial autocorrelation since the coefficient of the random variable spatially dependent delay is not significant. Comparing the log likelihood criteria shows that the best model is the model with spatially varying delayed. Therefore comments are made in relation to the model (2) spatial autoregressive. Moreover, the statistic calculated Jarque-Bera is 1.192 less than the tabulated value (5.99) at two degree of freedom at 5%. We accept the null hypothesis of the test the assumption of normality of errors.

Second, the model (2), shown indicates a negative and significant (-0.034) coefficient of consumption expenditure per capita. Therefore, all things being equal, depending on the model (2), the increase in per capita consumption expenditure of

households reduced the proportion of economically active children and hence the propensity of children to participate in the labor market. In this regard, the evaluation of the mid-point elasticity produces a value of -1.553. In other words, the macro-econometric estimation with spatial autoregressive model suggests that, given the level of education of the household head, the proportion of female heads of household and social capital - average people over the age of 55 per household - (variables assumed unchanged), an increase of one percent of regional income per capita adults induces a reduction of about 1.55 percent ratio - per unit space - children 5-17 years economically occupied.

Third, the non-linearity of the impact of income per capita household on child labor is checked for spatial units, since according to the model (2) spatial autoregressive regression coefficient of per capita income squared is significant 10 percent.

Fourth, spatial incidence of child labor is related to the ratio of women heads of households. Indeed, the latter coefficient is positive and significant. In particular, the labor market participation of children is much higher than the ratio of women heads of households is high. Moreover, the elasticity calculated midpoint is 0.42 which means that, all things being equal, a one percent increase in the ratio of women heads of households leads to an increase in the ratio of economically active children 0.42 percent. This could be explained by the particularly difficult living conditions which they face.

The predicted employment rate - per spatial unit – of children 5-17 years depending on consumption expenditure per spatial unit per capita illustrates the inverse relationship between earnings / income of adults and children's participation in the labour market. The linear fit to the spatial autoregressive model has a negative slope of -0.0177. This means that all else being equal, the ratio of employment of children decrease 0.0177 when consumption expenditure per capita household increased by 1 percent.

6. Conclusion

The present research examine the hypothesis of non-linearity of the impact of household's incomes per capita on child work and consider the appropriateness of the econometric estimates taking into account the spatial dependence of the observations in Cameroon. To come to these concerns a multilevel micro-econometric modeling and a spatial macroeconometric modeling where required.

The differentiation of behavior and thus the nonlinearity is revealed by household's income per capita taken into "spline" in the early children work. Indeed, when adult earnings are below the threshold of the first quintile of the distribution increases to 10 000 CFA, the rate of change in the incidence of child labor decreases by a multiplicative factor of 1.016. However, there is a positive and meaningful change in the rate of change in work when household's resources excluding the threshold equivalent in the first quintile of income distribution, the relative risk being 1.022.

The spatial dependence of the observations is properly taken into account by an autoregressive spatial model. The income per capita coefficient is significant and negative; this confirms the "luxury axiom" of Basu and Van on aggregated data ie the increase in household's consumption expenditure per capita reduces the proportion of children economically active. The non-linearity of the impact of the income per capita of the households on the child work is checked at the level of the spatial units The space incidence of the child work is in relation with the ratio of female households, the elasticity calculated at the average point is 0,42 what means that, an increase in one percent of the ratio of the female households implies an increase of the child work ratio of 0,42 percent.

Therefore, the significant reduction of child work depends on the households income increase of the poorest households. Moreover, the effects can vary by region and community, targeting actions depending on the spatial distribution of economic activities and opportunities is important.

References

[1]   Basu, K., (1999). « Child Labor: Cause, Consequences, and Cure, with Remarks on International Labor Standards, Journal of Economic Literature, 37: 1083-1119.

[2]   Basu, K., Tzannatos, Z., (2003). « The Global Child Labor Problem: What Do We Know and What Can We Do?», World Bank Economic Review, 17: 147-173.

[3]   Basu, K., Van, P.H.,. (1998). « The Economics of Child Labor », American Economic Review, 88: 412-427.

[4]   Blunch, N-H., Verner, D., (2000). Revisiting the Link Between Poverty and Child Labor: The Ghanaian Experience, Washington, Policy Research Working Paper 2488, The World Bank.

[5]   Canagarajah, S., Coulombe, H., (1997), « Child labor and schooling in Ghana», Policy research working paper n/1844, World bank, Washington, D. C.

[6]   Conventions No. 138 and No. 182 of the International Labor Organisation on Child work

[7]   Diallo, Y., (2001). Les enfants et leur participation au marché du travail en Côte d'Ivoire, Bordeaux, thèse de doctorat ès sciences économiques, Centre d'économie du développement.

[8]   Fallon, P., Tzannatos, Z., (1998). Child Labor. Issues and Directions for the World Bank, Washington, Social Protection Human Development Network, The World Bank.

[9]   Gelman, A., Hill, J., (2007). Data Analysis Using Regression and Multilevel/Hierarchical Models, New York, Cambridge University Press.

[10] Goldstein, H.(2003), Multilevel Statistical Models, London, 3rd Edition, Arnold.

[11] Grootaert, Ch. (1998). Child Labor in Côte d'Ivoire: Incidence and Determinants, Washington, mimeo, The World Bank.

[12] Lachaud J.-P., (2008), «Le travail de enfants et le revenu des ménages à Madagascar : Dépendance spatiale et non linéarité », Groupe d'économie du développement-GED LARE-EFI –Université Montesquieu-Bordeaux IV, Document de travail DT/143/2008.

[13] Law No. 92/007 of 14 August 1992 on the Labour Code in Cameroon

[14] Maitra, P., Ray, R., (2000). « The Joint Estimation of Child Participation in Schooling and Employment: Comparative Evidence from Three Continents », Oxford Development Studies, 30: 252-276.

[15] Nielsen, H.S., (1998). Child Labor and School Attendance:The Joint Decisions, Aarhus, Working Paper 98-15, Centre for Labour Market and Social Research, Denmark.

[16] Ray, R., (1999). How Child Labour and Child Schooling Interact with Adult Labour, Washington, Policy Research Working Paper 2179, The World Bank.

[17] Ray, R., (2001). Child Labour and Child Schooling in South Asia: A Cross Country Study of their Determinants, Hobart, mimeo, September, University of Tasmania.