Impact of income shock on children's schooling and labor in a West African country

Mafaïzath A. Fatoke-Dato

Working Paper No. 102

June 2015

BERG Working Paper Series

Bamberg Economic Research Group
Bamberg University
Feldkirchenstraße 21
D-96052 Bamberg
Telefax: (0951) 863 5547
Telephone: (0951) 863 2687
felix.stuebben@uni-bamberg.de
http://www.uni-bamberg.de/vwl/forschung/berg/

ISBN 978-3-943153-19-4

Redaktion:
Dr. Felix Stübben*

* felix.stuebben@uni-bamberg.de

Impact of income shock on children's schooling and labor in a West African country

Mafaïzath A. Fatoké-Dato*

*Corresponding author: Kärntenstraße 7, 96052 Bamberg, Germany Tel: +499518632766 Email: mafaizath.fatoke@uni-bamberg.de.

Acknowledgement

I am extremely grateful to Professor Eveline Wittmann, Professor Guido Heineck, and Professor Mareva Sabatier for the useful comments. My gratitude goes to the German Academic Exchange Service (DAAD) for the PhD scholarship. All responsibilities are mine for the remaining errors.

Abstract

This study measures the impact of a flood in 2010 in Benin on children's schooling and labor. The data used are the National Demographic and Health Surveys (DHS) of 2006 and 2012. The difference in differences estimates points out a significant decrease in income for farm households following the shock. The income shock affected enrollment of girls the most with a decrease in enrollment of 5.99% for girls in rural areas, of 4.45% for boys in rural areas, of 7.76% for girls in urban areas and of 6.17% for boys in urban areas. Meanwhile, the likelihood to be a domestic worker or a farmer has significantly increased. Despite the removal of school fees in 2006, the households still withdrew their children from school after this income shock. These results imply that income shocks could be a threat to the Universal Primary Education.

Keywords: Natural disasters, Education, Income shock, Child labor.

JEL classification: I24, O55, Q54

1. Introduction

In the last decade, numerous developing countries have launched policies to reach the goal of Education for All. These policies aimed to promote children's education and to decrease gender and income inequalities. Despite the remarkable enhancement of the schooling on many levels, the income disparities appear to be persistent. In Sub-Saharan African, a recent report on the Millennium Development Goals points out that enrollment in primary schools has more than doubled between 1990 and 2012, but only 23% of girls in poor households, do complete their primary education (United Nation, 2014). It raises the question of the prominence of household income in schooling decisions.

In this framework, many authors examined the relationship between parental income and children's schooling. In critical situations, underprivileged households might withdraw their child from school and send them to work. There is however only a minority of studies on African countries. Cogneau and Jedwab (2008) uses the cut in cocoa price in 1990 in Côte d'Ivoire to compare schooling decisions in cocoa family and others agriculture families. The authors indicated a significant impact of parental income on enrollment, labor and health. In Burkina Faso, the drop in income of food crop farmers in the mid nineties also induced a decreased in children's enrollment (Grimm, 2011). Beegle et al. (2006) discovered in Tanzania that transitory income shocks increase child labor and decrease enrollment. However, the household assets might help mitigate the shocks. Kazianga (2012) noticed also that the uncertainty in household's income leads to the decrease in enrollment and completed years of schooling. Other works investigated the potential role of the educational policies in helping household to mitigate negative income shocks. De Janvry et al. (2006) examines the role of the cash transfers as safety nets for children when households are submitted to income shocks. The authors discovered that households increased child labor, but did not remove their children from schools. Indeed, the prospect of receiving cash out of the child's enrollment refrained them from withdrawing their children from school. Björkman-Nyqvist (2013) also showed that the rainfalls' deviations from their long-term mean have a significant negative impact on enrollment in Uganda. After the elimination of school fees, girls are removed from school to cope with an income shock while boys are mostly not affected.

Consequently, this paper investigates the impact of a negative income shock on schooling in one West African country. The relevance of the present research lies in the analysis of the relationship between price and income effects. These effects are observed through the reactions of households to income or price changes. An elimination of school fees could cause an improvement in children's education, which is the price effect. A negative income shock could generate a relapse in children's education, which is the income effect. In the particular case of a low-income country, it could be of interest to determine the dominant effect. Does the income effect prevail over the price effect? In such a case, an income shock, during the implementation of the school fees' removal could result in a decrease in children's education. Does the price effect overrule the income effect? In that case, an income shock, during the implementation of the elimination of school fees, could result in a negligible or no influence on children's education. In any case, it could indicate which policy, based on the schooling price or the household income, to prioritize in order to enhance education.

An interesting case study is Benin. It is a small West African country with agriculture as a predominant economic activity. Approximately 47% of the active population works in agriculture (INSAE, 2012 (2)). Two types of crops are cultivated: cereals crops (maize, millet, beans, etc.) and industrial crops (cotton, groundnuts, palm nuts…). In October 2006 Benin launched, a policy of elimination of school fees for primary school aged children. The gross enrollment rate went from 94.7% in 2005 to 104.27% in 2008 (INSAE, 2012). The Demographic and Health Survey (DHS) of Benin of 2006 indicates that 88.3% of the population among the poorest and 27.8% among the richest had no formal education. For 2012, according to the DHS, 56.9% of the poorest and 7.0% of the richest had no formal education (INSAE, 2007, 2013). These statistics show that enrollment might have improved, but the income dissimilarities still exist. In 2010, an inundation occurred in Benin that caused a costly aftermath throughout the country. An official report by the Global Facility for Disaster Reduction and Recovery (GFDRR) in 2011 estimates the economic losses to about 160 millions US dollars. Approximately 680,000 people were affected at different levels and 46 persons were killed. Given the prominence of the shock, the government declared a state of emergency in October 2010 (GFDRR, 2011).

Therefore, the empirical strategies of this paper consider the negative rainfall deviation in 2010 to estimate the causal impact of income on schooling. The data used are the National Demographic and Health Surveys of 2006 and 2012. Agricultural activities have likely a higher vulnerability to weather shocks than other economic activities. Hence, the difference-in-differences compare children's schooling and labor in farm and non-farm households before and after the shock. The outcomes analyzed are enrollment, domestic work, farm work and the combination of enrollment and work. The inundation of 2010 induces a significant change in income between both groups of households. Due to this modification in income, diverse instrumental variable estimations can be performed to analyze the causal impact of household income on schooling. GDFRR (2011) also categorizes the country in affected and most affected municipalities. It is thus worth to examine the impacts of the weather shock on the most vulnerable. The robustness checks control the impact of the flood on farm households in affected and most affected municipalities. In addition, a placebo experiment was performed on non-farm and not affected households. The different sensitivity analyses confirmed the results of the evaluation.

One of the particularities of this work is that it considers the variable "enrollment and work", which is not often studied. The household can choose to send their child to school and increase their time spent in the family business as well. This alternative might not be the best but it prevents them from withdrawing the child from school. However, this option is only possible when school and work times are not competing. Another interest of this study is the gender-based approach used to present the results. It enables a further analysis of the choice between girls and boys for a child labor as risk coping strategy. One other interest is that it provides an insight on the consequences of income shocks and ways to manage them for policymakers. Finally, this work adds to the currently sparse literature on income shocks in Africa.

The structure of the paper is the following: Section 2 presents rainfall shocks in Benin; in section 3 the link between household income and the weather shock is analyzed. Section 4 shows the impact of the shock on schooling and labor. In section 5 the causal relationship between the household income and the child's schooling is explored. Section 6 displays the robustness checks, and section 7 presents the main conclusions.

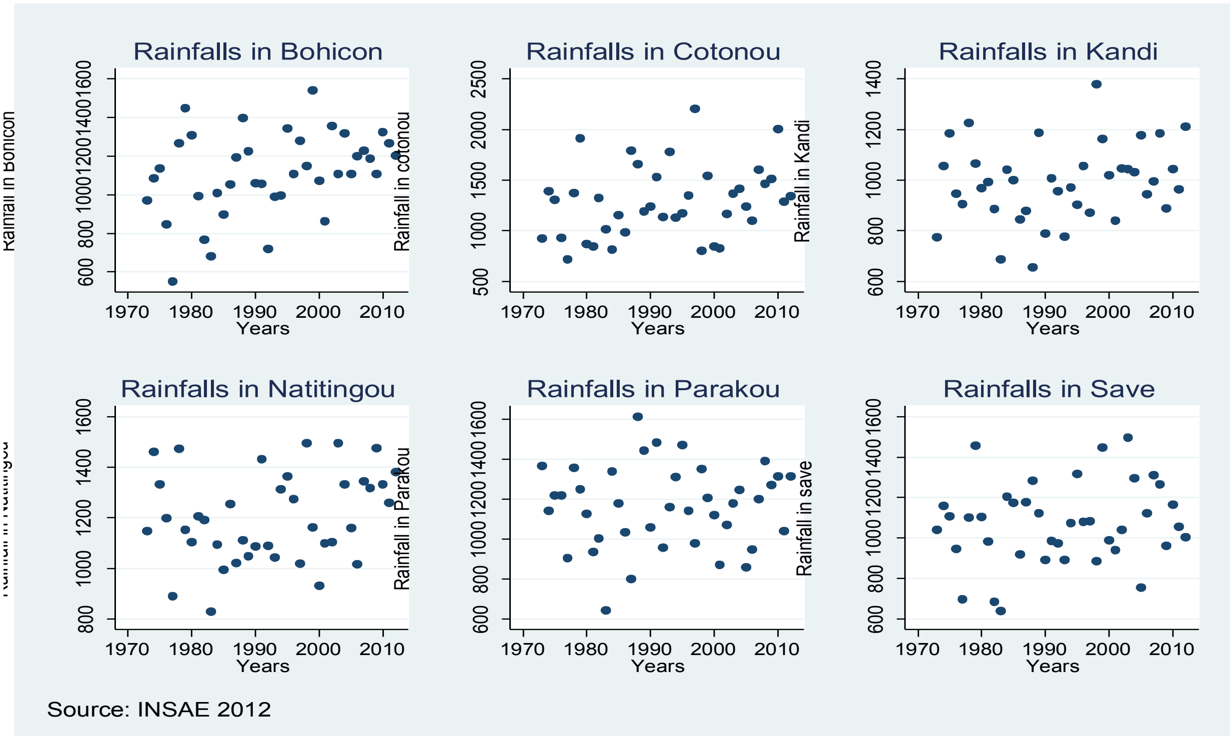
2. Rainfall shocks in Benin

Benin has a tropical wet and dry climate with variations in weather from the north to the south. There is a dry and a rainy season, the duration of which fluctuates depending on the different regions of the country. In the coastal region, four seasons can be identified: two dry seasons and two rainy seasons, one after the other. Given the tropical nature of its climate, the country is subjected to a number of floods and droughts over the years. Particularly, GDFRR (2011) considered the flood of 2010 as one of the most devastating in the past years in West Africa. This section analyzes the positive and negative rainfalls in Benin during the last 30 years and explains the causes of the flood of 2010.

The national meteorological department, of the "*Agence pour la Sécurité de la Navigation Aérienne en Afrique et à Madagascar (ASECNA)",* collects the rainfall data over six weather stations. The weather stations are: Bohicon, Cotonou, Kandi, Natitingou, Parakou and Save. These data are gathered in annual reports called " *Tableaux de bord social*" by the National Institute for Statistics and Economic Analysis (INSAE). The database used in this section comprises the quantity of rainfall in millimeters per year and weather station from 1973 to 2012. The graph 9 below presents a scatter plot of the rainfall data per station. The aim of the paper is to explain the impact of income's shocks on child labor and schooling. Therefore, it is necessary that the income shock be a random and unexpected shock. If the shock were expected, households would be able to anticipate and take decisions in order to cope with it. In the agricultural areas, for instance, by making more provisions that they would be able to use when difficult times occur. In that case, they might be no significant changes in their behavior. When the shock is unexpected, the usual insurance taken by the household prior to the shock might not be sufficient. The behaviors of the household under this constraint are the object of interest here.

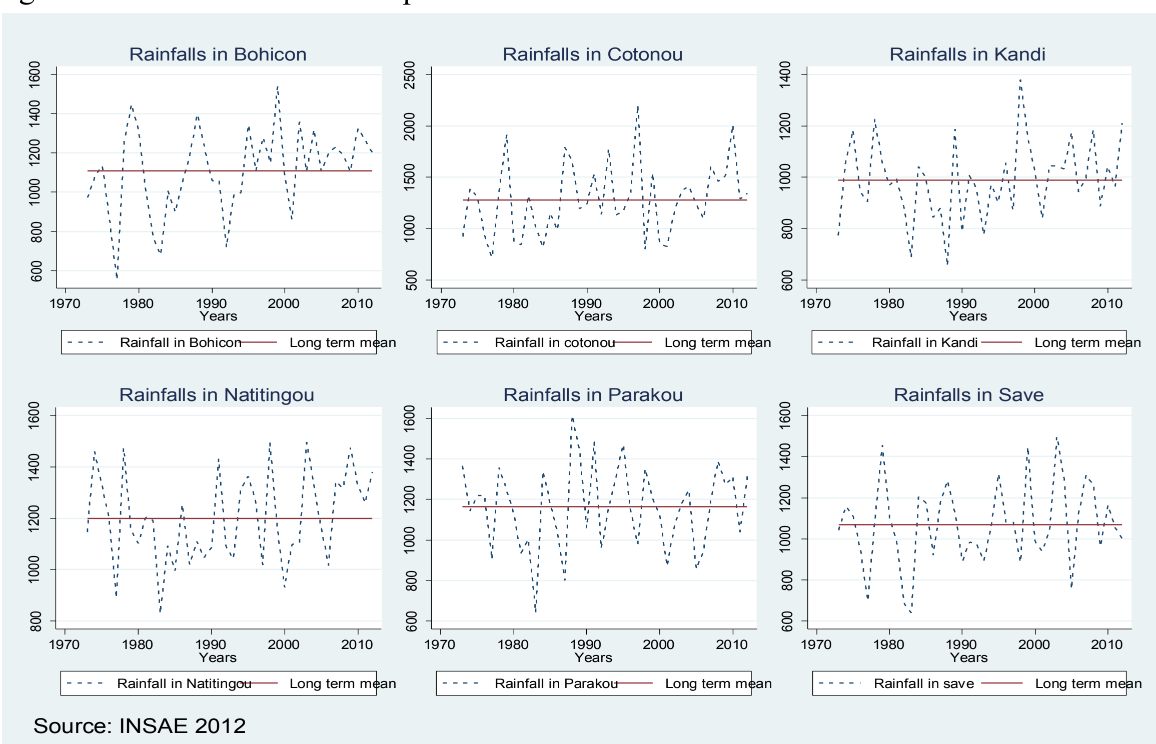
Overall, there seems to be no particular time pattern in the series that could indicate a correlation in the time series. The autocorrelogram of each series confirms there is no autocorrelation in the series. It denotes that there is not enough evidence to accept the hypothesis that the series are correlated over time. The rainfall data appear to be random. The Portemanteau test for white noise also rejected the hypothesis that the rainfall series are white noises. These remarks are important and necessary and mean that a positive or negative rainfall deviation in any region of the country is completely random and unpredictable. As a result, the different tests indicate that the rainfall shocks in Benin are random and thus unanticipated. In addition, graph 1 presents line charts of series and their long-term mean.

Figure 1: Scatterplots of rainfall data per station from 1973 to 2012



Source: Author based on INSAE, 2012

Figure 2: Line charts of rainfall per station from 1973 to 2012



Source: Author based on INSAE, 2012

After the computation of the long-term mean of each series, the differences of the series from their mean were calculated to obtain the deviation from the long-term mean. Usually the weather shocks are not observed at the same time in the different regions of the country. A year of drought or flood noticed in one weather station might not be the same in another weather station. This could be explained by the variations in climate of the regions. However, in the years 1975, 1978, 1979, 2004 and 2010, there were positive rainfall deviations in every region. One remark is the difference in intensity of the shock within the same year from a station to another. For instance, the long term means of the weather stations Bohicon, Cotonou and Natitingou are among the highest with 1110, 1282 and 1200 millimeters respectively per year over the period 1973-2012. In 2004, the deviations from the long-term mean for these weather stations are 18.78%, 10.25% and 11.04% respectively. Thus, the weather station with the highest rainfall deviation changes from year to year. In 2004, the highest positive rainfall deviation is approximately 20% of the long-term mean in the station Savè. In 2010, the highest positive rainfall deviation is 44% in the station Cotonou. Some caution is necessary since there is no information on standards retained by ASECNA to define a year of flooding.

The important rainfalls of 2010 in combination with other environmental and urban management issues made the government of Benin called for international assistance on October 1st, 2010 (GFDRR, 2011). One of the specificities of the flood of 2010 is that instead of two rainy seasons separated by a dry season, the two rainy seasons occurred successively over eight months. It contributed to the overflowing of some rivers like Ouémé, Niger and Mono from their banks. Moreover, the rapid growth of the population in cities like Cotonou was not accompanied with a development of the system of drainage of used waters. In some agglomerations of Cotonou, people have built their houses in swamp, for example, that are not adequate for construction because of the particularity of the soil. These areas are among the first to be overflowed in the rainy season. Besides, the damages of the flood of 2010 were quite important: 680,000 people were affected and 46 killed; 55,000 homes, 455 schools and 92 health centers were destroyed; crops and seeds lost. All these elements explain the interest of the study for the flood of 2010.

1. Household income and the flood of 2010

In the present section, the relationship between the flood of 2010 and household income is analyzed. Beforehand, it is necessary to present the data and the strategies to identify the weather shock.

3.1 Data

The Demographic and Health Survey (DHS) of 2006 and 2012 are used. The National Institute for Statistics in collaboration with Macro international Inc. produce them The databases covered at least 17,000 households in each year and are representative at three levels: district, municipality and cluster levels. Benin has 12 districts and 77 municipalities, according to the law 97-028 of January 15th, 1999. The DHS contain socio-demographic and economic information on a sample of households drawn randomly from the clusters defined in the surveys. In order to have additional information on the household characteristics, two were composed with the different datasets of the surveys: a database of children between six and 14 years old and a database of household heads only. The children's database has then been merged with the household head database. The final sample covers approximately 45,491 children aged six to 14. The DHS surveys of 2006 and 2012 are the most complete and reliable databases available for Benin before and after the weather shock in 2010.

3.2 Identification strategy

The influence of the shock may change depending on the household area of residence. The precedent section 2 indicates that the amplitude of the weather shock fluctuates from a region to another. Therefore, the inundation may affect every household in different ways. Hence, a variation in the shock that could be used for the identification strategy is the dissimilarity in the location of the households. GFDRR (2011) pinpoints 55 municipalities as affected over the 77 municipalities of the country. In addition, a map, drawn by the Regional office for West and Central Africa of the Office for the Coordination of Humanitarian Affairs (OCHA), categorizes three types of municipalities: the most affected, the less affected and the non-affected municipalities. From this different classification, the study retained two experiments. The first experiment compares children from six to 14 years old living in the affected municipalities to children of the same age living in the non-affected municipalities. The second experiment compares the outcomes of children from six to 14 years old in the most affected municipalities to the children in the other municipalities. The advantage of these experiments is that they consider a pre-established categorization of municipalities according to the damages caused by the flood of 2010. The disadvantage is that the sources of income are not considered. For instance, certain municipalities (e.g. Urban municipalities) may have predominantly people working in the tertiary sector of the economy. This sector also called the sector of services does not depend much on the weather. The workers get paid regardless of the weather conditions. It might be difficult to observe a change in the household income.

Another plausible variation can be identified in the sources of income of the household. In fact, the agricultural sector is the most vulnerable to weather shocks. A drought or a flood may cause a loss of crops and reduction of the harvests. It can lead to a decrease in the household income. As such, the third experiment would consider the differences between farm and non-farm households before and after the flood of 2010. The databases contain a variable on whether the household owns an agricultural land. The variable is collected in hectares of agricultural land. In other words, a household that owns a hectare of agricultural land could have farming as one of its sources of income. This variable serves as a criterion to define farm and non-farm households. The strong point of this strategy is that the sources of income are considered. Yet, there is not enough information in the DHS surveys to examine other sources of income.

Another potential threat to these strategies is migration. There is a possibility that people move from an area to another, because of the flood. Section 2 indicates that houses have been destroyed. In that case, the changes in income to capture might not actually be for the concerned households, but for their hosts. The impact could suffer from selection bias. It is thus necessary to control for migration. In the sample studied, for about 91% of the children the current place of residence is their place of birth. The sample can be limited to households that have not moved since the birth of their child. Hence, the municipality of birth of the children has been considered to create the treatment variable instead of the current place of residence. Hence, the treatment variable will be, for example, that the child was born in an affected municipality instead of the child living in an affected municipality. It helps controls for any migration effect.

Another potential weakness to the strategies is the comparability of the sample before and after the flood. One important assumption of the impact evaluation methods is the comparability of the groups. The idea is that the outcomes of the treated and controls would follow parallel trend without the treatment, which is the income shock, here. As a solution, the propensity score matching method allows to control for any observed differences between the control and treatment groups before the shock. Hence, the propensity score matching method has been used to create propensity scores for children in the database of 2006 and merge them with the children in the database of 2012. The variable used to compute the scores is the treatment variable for experiment 1: the child place of birth is one of the affected municipalities.

Once the different issues taken care of, the difference-in-differences estimations would show the impact of the flood of 2010 on the different groups. The following table gives a glance at the samples:

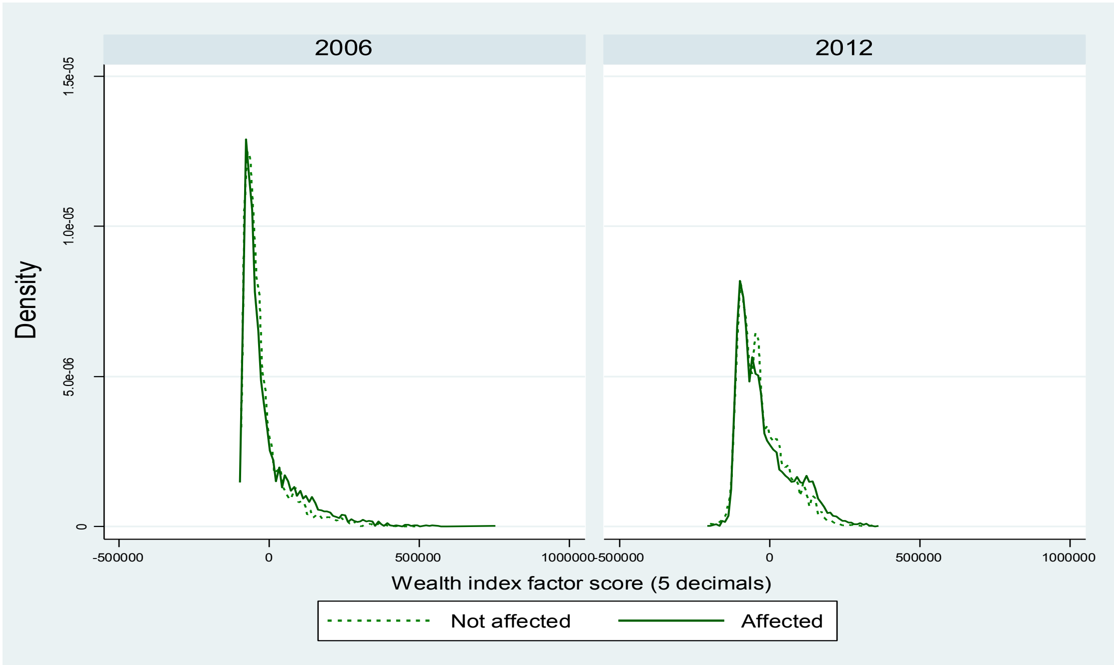
Table 1: Statistics of different treatment groups after matching

Experiment 1: Children born in an affected municipality	Year 2006	Year 2012	Total	Frequency (%)
Yes	14,793	14,805	29,598	65.06
No	7,808	8,085	15,893	34.94
Experiment 2: Children born in a most affected municipality	Year 2006	Year 2012	Total	Frequency (%)
Yes	8,497	8,699	17,196	37.80
No	14,104	14,191	28,295	62.20
Experiment 3: Children born in a household that owns agricultural land	Year 2006	Year 2012	Total	Frequency (%)
Yes	15,096	14,816	29,912	65.81
No	7,463	8,074	15,537	34.18

Source: Author’s computation based on DHS 2006, 2012

Table 1 denotes that the sample of experiment 3 is inferior to the samples of the two first experiments. The DHS surveys contain only one proxy of income, which is the wealth index. It is a standardized index computed based on the household’s assets (Filmer and Pritchett, 1998). The wealth index reduces the number of non-responses or missing values on income in the surveys. It is approximately between -250,000 and 800,000.

Figure 3: Development of households' wealth index according to the experiment 1 (Affected and non-affected households) per year and group



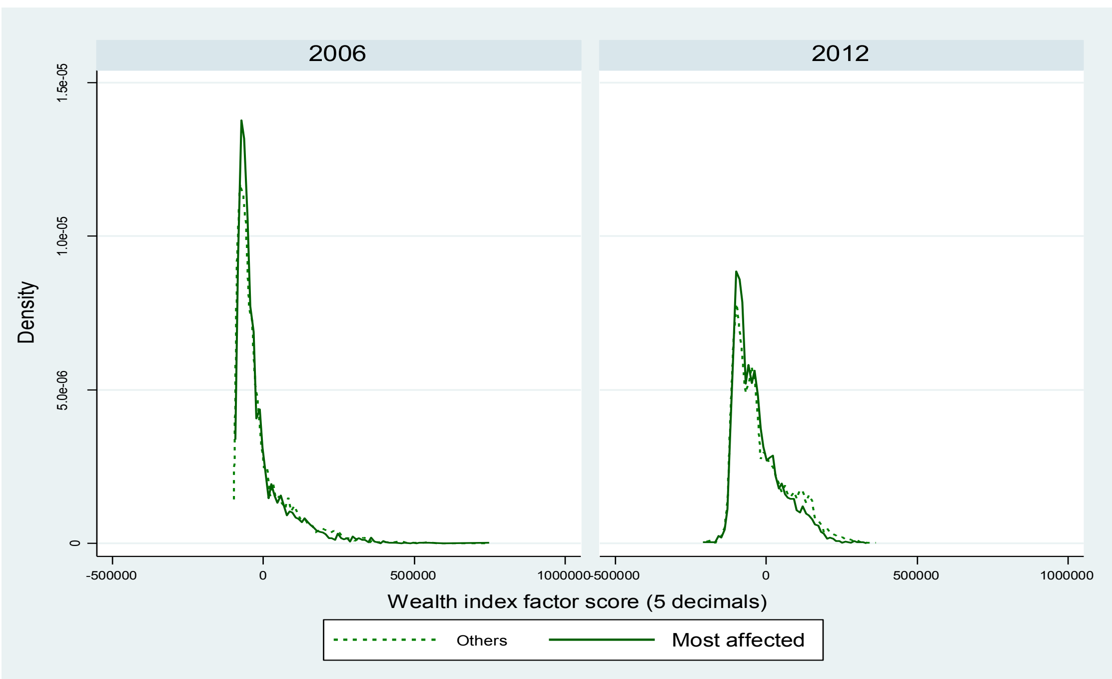
Source: Author based on DHS 2006, 2012

It is a proxy for long-term wealth or permanent income. Mostly, households with a positive index are either in the middle or in the richer quintiles of wealth. The following graphs present charts of the household wealth index according to the each experiment. Graph 3 presents experiment 1 which is the comparison between affected and non-affected households. Graph 4 shows experiment 2, which is the comparison between most affected households and non-affected households. Graph 5 displays the experiment 3, which is the comparison between farm households and non-farm households.

First of all, graph 3 indicates that the treatment and control groups, in 2006 before the flooding, have a similar distribution of wealth. Due to the propensity score matching, the groups are more comparable. The treatment group is the children born into households in affected municipalities and the control group the children born into households in non-affected municipalities. The left tail suggests that the majority of the population is in the poor quintiles. Only a few households are among the richest.

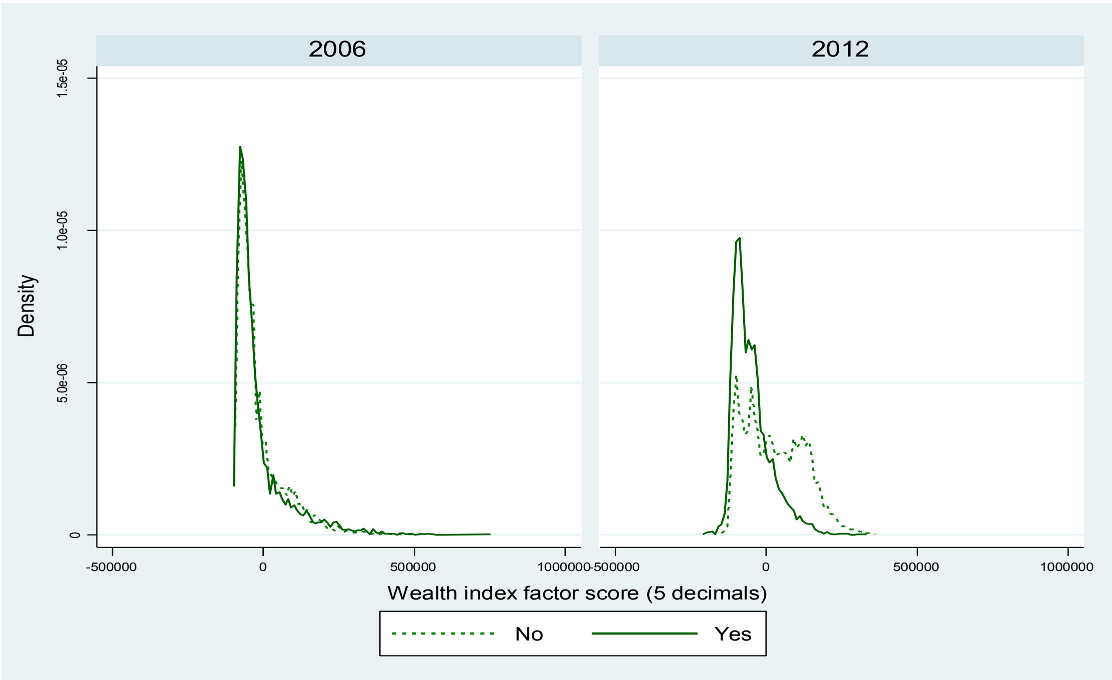
Secondly, in 2012, the distribution of wealth index seems more equitable than in 2006. The curve is still left-tailed but there are more households in the rich quintiles. This does not mean that income has increased in the population. It may rather signify that people are poorer but the distribution is more even. The wealth index is in CFA francs (Communauté Financière d'Afrique) the national currency. One US Dollar equals 621.55 CFA francs on April 13, 2015. In fact, the maximum of the wealth index in 2006 is 756,601 CFA francs (1271.27 US Dollars) against 370,786 CFA francs (596.55 US Dollars) in 2012. There is also a slight difference between the distribution of wealth index of treatment and control groups. The main difference of graph 11 to graph 12 is that households in the most affected municipalities seem to have less income than those in the other municipalities in 2012. Graph 3 and 4 also indicate that experiments on the affected and most affected municipalities might not be adequate because the difference in income of both groups is not really important.

Figure 4: Development of households' wealth index according to the experiment 2 (Most affected and non-affected households) per year and group



Source: Author based on DHS 2006, 2012

Figure 5: Development of wealth index of households, according to experiment 3 (Farm and non-farm households) per year and group



Source: Author based on DHS 2006, 2012

In experiment 3, the treated are children living in farm households, while the controls are children living in non-farm households. Graph 5 shows that the difference in income between both groups is more pronounced in 2012. The treatment group appears to have less income than the control group after the flooding. Still, the different remarks on the link between household income and flooding should be further analyzed in the estimations.

2. Impact of the flooding of 2010 on child schooling and labor

4.1 The model

In the model of human capital investment, income is likely to be endogenous. Income might be strongly linked with parental education. Parents with higher education have usually higher incomes than parents with lower levels of education. It is thus difficult to differentiate the effect of parent's abilities from their income. The solution to separate income and abilities' effects is to find a variable that affects income, but has no correlation with the error term of the equation on child's schooling. This instrument could be the flooding of 2010. Section 4 presents the impact of the income shock on the different groups and informs on the right instrument for the instrumental variable later on.

To analyze the impact of the flooding on child labor and schooling, many variables have been retained: enrollment, domestic work, farm or family work, and the combination of enrollment and work. All those variables are binary variables. For instance the variable on enrollment takes 1 when the child is enrolled in a primary school and 0 otherwise. A short-term reaction to the shock could be withdrawing the children from school. It could help the households cope with the shock by reducing their expenses. The DHS 2012 has been collected two years after the flood of 2010. That is not enough to capture a long-term impact of the shock. It explains the reason for the retention of enrollment as indicator for education instead of years of schooling for example.

Two types of labor are studied. The first type of labor, domestic work, refers to any activity performed by the child in the household as taking care of other household members, cooking or cleaning. The second type of labor concerns activities performed by the child to help its parent in a farm or a family business (e.g. Retail). It is also possible that a child combined enrollment and domestic work or farm work. In the sample, 65.43% of children were enrolled. Among the children enrolled, 44.74% combined enrollment and domestic work, while 24.71% combined enrollment and farm work. Among the children not enrolled, 37.70% were domestic workers and 42.19% were farm workers. Other types of work are not considered because the DHS surveys inform mainly on these two types of labor. Besides, farm work and domestic work might not be paid jobs, but could be an immediate response of the households to increase their income. Farm households could demand that the children work on the farm to add to the revenue of the households. The need for workers on farms is likely to be more important after a weather shock. Other households might want that their children stay at home to help rebuild the houses destroyed or take care of the ills. Consequently, the standard model to determine the impacts of the shock is:

$$Outcome_i = a_1 X_i + a_2 year\_2012_i + a_3 treatment_i + a_4 treatment_i * year\_2012 + u1_i \quad \textit{(Equation 1)}$$

X is a set of child and household characteristics; *Outcome* represents enrollment, domestic work, farm work and the combination of both, as well as the proxy for income, the wealth index; *year_2012* is a dummy variable that takes 1 when the year is 2012 and 0 otherwise; *treatment* is a binary variable that equals 1 when the child belongs to one of the treatment groups and 0 otherwise; the coefficients *a* are constant parameters; *u* is the error term. The child and household characteristics are: child's age, household head's age, household head's gender, household head's education, the relationship with the head, the number of children under five years old in the household, the number of household members and district dummies. The wealth index is divided by 1000 for simplicity in the analysis. The linear estimations with the ordinary least squares (OLS) are run separately per child's gender and area of residence (rural and urban). Most of the outcomes are not linear, but the OLS estimates will serve as a base to compare further estimations. The number of households that owns an agricultural land might be more important in rural areas than in urban areas. Children in rural areas could then be working more than those in urban areas. The impact might thus vary among those areas. Moreover, cultural considerations of parents about girls' enrollment could be different in both areas. That is the reason why separate estimations have been performed according to the gender and area of residence.

To retain a treatment variable as an instrument for household income, it is necessary that this variable be significant for income and has a significant influence on enrollment mainly through the income's effect. The previous models have been estimated for each experiment. Experiments 1 and 2 are dropped because the treatment variables have no significant effect on income. Being a child born in one of the affected or the most affected municipalities has no significant influence on the household's income. It means that the mere classification in municipalities after the flood of 2010 does not yield enough variations in income and cannot be used as instruments. On the contrary, the treatment variable of experiment 3 has a significant impact on income after the flood of 2010. Only this last variable has been presented as an instrument for income in the succeeding sections.

4.2 Impact of the flood of 2010 on household income

To obtain the impact of the flood of 2010 on farm households, equation 1 with the treatment variable of experiment 3 has been estimated. Treatment 3 consists of comparing outcomes of children living in farm and non-farm households before and after the inundation. Mainly, the estimations reveal a significant decrease in income for farm households in 2012. Table 26 shows the linear regressions of the outcomes for children in rural areas with experiment 3.

In the column on wealth of table 2, the statistics imply that income increases with the level of education. Indeed, there is a negative association between having a household head with no formal education or a primary education and the index of wealth in 2006. There is also a difference in remuneration between rural and urban areas. While in rural areas, a household whose heads have no formal education earns 60,000 CFA francs (96.53 US dollars) less than the highly educated head, in urban areas, a household whose head had no formal education earns 140,000 CFA francs (225.24 US dollars) The dissimilarities notice between urban and rural areas could be explained by better job opportunities in urban areas than in rural. Qualified workers could be better remunerated in urban than in rural areas.

In 2006, farm households have 10,000 CFA francs (16.09 US Dollars) more than non-farm households in rural areas and about 14, 000 CFA (22.54 US Dollars) francs more in urban areas. In 2012, income of the farm households has decreased by 26,000 CFA francs (41.83 US Dollars) in rural areas and 90,000 CFA francs (144.80 US Dollars) in urban areas. This likely means that farm households in urban have been more affected by the weather shock than households in rural areas.

Table 2: Linear regression of outcomes and income for children in rural areas for the period 2006-2012 with the experiment 3

	Girls in rural areas				Boys in rural areas			
VARIABLES	Enrollment	Domestic work	Farm or family work	Wealth	Enrollment	Domestic work	Farm or family work	Wealth
Househ. head no formal educ.	-0.283***	-0.154***	0.191***	-64.53***	-0.268***	-0.126**	0.135**	-58.98***
	(0.0238)	(0.0584)	(0.0522)	(5.819)	(0.0207)	(0.0494)	(0.0538)	(5.259)
Househ. head no formal educ. in 2012	0.0536*	0.0534	-0.217***	5.431	0.0621**	0.137*	0.00114	2.499
	(0.0292)	(0.0745)	(0.0729)	(6.477)	(0.0277)	(0.0815)	(0.0650)	(6.093)
Househ. head prim. educ.	-0.125***	-0.0643	0.0889	-44.88***	-0.0956***	-0.0397	0.0657	-40.63***
	(0.0260)	(0.0648)	(0.0585)	(5.735)	(0.0215)	(0.0567)	(0.0620)	(5.253)
Househ. head prim. educ. in 2012	0.0581*	0.0756	-0.0490	10.20	0.0537*	0.0763	0.0592	11.07*
	(0.0320)	(0.0840)	(0.0828)	(6.783)	(0.0282)	(0.0898)	(0.0745)	(6.513)
Numb. Children under 5 years old	-0.0150***	0.000215	0.00294	1.976*	0.0385**	-0.00832	0.0138**	2.462**
	(0.00550)	(0.00840)	(0.00826)	(1.037)	(0.0176)	(0.00543)	(0.00689)	(1.121)
Numb. Children under 5 years old in 2012	-0.00166	-0.00693	-0.00456	-1.801	-0.00140	0.00223	-0.00724	-2.304*
	(0.00800)	(0.0117)	(0.0112)	(1.237)	(0.0242)	(0.00974)	(0.0107)	(1.249)
Dummy for son or daughter	0.0582***	-0.0375	0.0757***	-11.42***	-0.0172***	8.88e-06	0.00524	-6.146**
	(0.0181)	(0.0250)	(0.0259)	(2.201)	(0.00510)	(0.0206)	(0.0268)	(2.702)
Dummy for son or daughter in 2012	-0.0182	-0.00941	-0.0701**	6.311**	0.000626	0.0115	0.00544	4.712
	(0.0243)	(0.0357)	(0.0345)	(2.984)	(0.00681)	(0.0309)	(0.0359)	(3.109)
2012 dummy	0.0912	0.187*	-0.0948	0.397	-0.0278	0.149	-0.609***	11.81
	(0.0558)	(0.106)	(0.0915)	(8.389)	(0.0528)	(0.109)	(0.100)	(8.609)
Farm household	0.0364**	-0.00522	0.0348	10.01***	-0.0263	-0.0170	0.0728**	9.723***
	(0.0168)	(0.0298)	(0.0307)	(1.924)	(0.0166)	(0.0217)	(0.0303)	(1.736)
Farm household in 2012	-0.0599***	0.105***	0.0904**	-25.51***	-0.0445*	0.0868**	0.106***	-26.68***
	(0.0228)	(0.0403)	(0.0389)	(3.424)	(0.0236)	(0.0370)	(0.0380)	(3.221)
Constant	0.623***	0.424***	0.292***	4.931	0.747***	0.124*	0.639***	-14.58**
	(0.0416)	(0.0770)	(0.0710)	(7.815)	(0.0396)	(0.0667)	(0.0775)	(6.897)
Observations	14,206	5,226	5,226	14,221	15,506	4,460	4,460	15,532
R-squared	0.138	0.138	0.138	0.178	0.136	0.147	0.335	0.160

Standard errors in parentheses adjusted robust for clustering across households in the same primary sampling unit (PSU). The equations include dummies for the child's age and district dummies that are not presented. *** Significant at 1%, ** Significant at 5%, *Significant at 10%.

Source: Author's computation based on DHS 2006, 2012

Table 2 continues: Linear regression of outcomes and income for children in rural areas for the period 2006-2012 with the experiment 3

	Girls in rural areas			Boys in rural areas		
VARIABLES	Enrollment and domestic work	Enrollment and farm work	Wealth	Enrollment and domestic work	Enrollment and farm work	Wealth
Househ. head no formal educ.	-0.0784**	0.148***	-64.53***	-0.121***	0.187***	-58.98***
	(0.0326)	(0.0346)	(5.819)	(0.0277)	(0.0334)	(5.259)
Househ. head no formal educ. in 2012	0.0101	-0.120***	5.431	0.0934**	-0.149***	2.499
	(0.0444)	(0.0370)	(6.477)	(0.0415)	(0.0380)	(6.093)
Househ. head prim. educ.	0.0195	0.0418	-44.88***	-0.0804***	0.132***	-40.63***
	(0.0360)	(0.0346)	(5.735)	(0.0294)	(0.0352)	(5.253)
Househ. head prim. educ. in 2012	-0.00777	-0.00815	10.20	0.144***	-0.0875**	11.07*
	(0.0494)	(0.0388)	(6.783)	(0.0437)	(0.0406)	(6.513)
Numb. Children under 5 years old	-0.00394	0.0134	1.976*	-0.0108*	0.0191**	2.462**
	(0.00824)	(0.00846)	(1.037)	(0.00585)	(0.00761)	(1.121)
Numb. Children under 5 years old in 2012	-0.00409	-0.0125	-1.801	0.00447	-0.0131	-2.304*
	(0.0117)	(0.00927)	(1.237)	(0.00929)	(0.00918)	(1.249)
Dummy for son or daughter	-0.0820***	0.0904***	-11.42***	-0.0296	0.0461*	-6.146**
	(0.0248)	(0.0225)	(2.201)	(0.0212)	(0.0263)	(2.702)
Dummy for son or daughter in 2012	0.0724**	-0.0791**	6.311**	0.0449	0.00336	4.712
	(0.0352)	(0.0306)	(2.984)	(0.0293)	(0.0332)	(3.109)
2012 dummy	0.114	-0.104	0.397	0.0998	-0.317***	11.81
	(0.0857)	(0.0764)	(8.389)	(0.0740)	(0.0739)	(8.609)
Farm household	0.0516**	0.0351	10.01***	-0.0352*	0.125***	9.723***
	(0.0245)	(0.0238)	(1.924)	(0.0189)	(0.0243)	(1.736)
Farm household in 2012	-0.0109	0.0496	-25.51***	0.0904***	-0.00651	-26.68***
	(0.0330)	(0.0302)	(3.424)	(0.0277)	(0.0297)	(3.221)
Constant	0.511***	0.138**	4.931	0.402***	0.337***	-14.58**
	(0.0670)	(0.0640)	(7.815)	(0.0503)	(0.0643)	(6.897)
Observations	8,145	7,210	14,221	10,120	8,839	15,532
R-squared	0.075	0.120	0.178	0.130	0.259	0.160

Standard errors in parentheses adjusted robust for clustering across households in the same primary sampling unit (PSU). The equations include dummies for the child's age and district dummies that are not presented. *** Significant at 1%, ** Significant at 5%, *Significant at 10%.
Source: Author's computation based on DHS 2006, 2012

4.3 Impact of the flood of 2010 on enrollment

The column enrollment of table 2 indicates that enrollment has significantly decreased in 2012 for children in farm households.

In terms of age, there is a negative association between enrollment and age six. It means that the probability to be enrolled at six years old is negative in the sample. Besides, the probability of enrollment is already significant and positive at seven years old and up to 12 years old for children in urban areas. In opposition to rural areas, the probability of enrollment is significant and positive at eight years old for girls and nine years old for boys. The estimations suggest that there are more late enrollment in rural areas than in urban areas. Especially, boys living in rural areas are the last to be enrolled. It is possible that children's enrollment is delayed in rural areas for income or work related issues.

The probability of enrollment increases with the level of education of the household head. The column on enrollment in table 2 shows that the probability of enrollment is lower of around 28% when the household head has no formal education compared to a household head with a higher level of education. The probability to be enrolled decreases by 1.50% for girls when the household has one more child under five years old. This probability is superior to that of boys. It suggests that the responsibility of taking care of younger siblings rests more on girls than on boys. Concerning biological and fostered children, table 2 shows that the probability of enrollment of biological children is higher to that of the fostered children. A girl is 5.82% more likely to be enrolled if she is the biological daughter of the household head than if she is a foster daughter.

In 2012, the probability of enrollment in farm households has decreased by 5.99% for girls and 4.45% for boys in rural areas. Section 4.2 stipulates that the decrease in income is more important in urban than in rural areas. Consequently, the decrease in enrollment in urban areas is higher than in rural areas. In fact, the probability of enrollment in farm households has reduced by 7.76% for girls and 6.17% for boys in urban areas.

The results denote that girls have a higher probability to be held home compared to boys. This difference is more important in rural than in urban areas. Interpreting the results, it has to be taken into account that according to previous research, the gender-differentiated impact of the income varies depending on the countries. In Burkina Faso, Grimm (2011) and Kanzianga (2012) have found an impact of the income shock more important on boys' enrollment than girls. Björkman-Nyqvist (2013) disclosed in Uganda that when schooling was not free of charge, a negative income shock affected both girls and boys. However, when schooling was free of charge, an income shock influenced mostly girls. In Benin, school fees were removed in 2006. The results indicate that the flood of 2010 affected more girls' enrollment than boys. The results of the present research comply more with Björkman-Nyqvist (2013). Finally, the gender dissimilarities are persistent in Benin.

4.4 Impact of the flood of 2010 on child labor

Concerning child labor, the columns of farm and domestic works show a significant increase in the probability to work for children in farm households in 2012. It is necessary to remember that children considered in these estimations are not enrolled in primary schools. In these samples, approximately 80% of the household heads have no formal education and 0.77% of the household heads have a higher education. In other words, the probability to be a domestic worker or a farmer decreases with the household head education.

Additionally, the column of domestic work displays a positive association between domestic work and the age dummies from six to 10 for children in rural areas and six to nine for children in urban areas in 2006. Conversely, the column of farm work reveals a significant negative association between farm work and the age dummies from six to nine for every child. After nine years old, there is a positive relationship with farm work, but it is not significant. It means that children are likely to be domestic workers already at six years old onward, but they are more likely to be farm workers over nine years old. In farming, laborers need to ne strong and in good physical shape to be able to work. This might disqualify really young children.

While the probability to be a domestic worker is not significant for children in farm households, the probability to be a farmer is significant for children in farm households. The probability to be a farmer is only significant and positive for boys in farm households in rural areas, but in urban areas in 2006, it is for both boys and girls. After the inundation, the probability to work on a farm has increased by 9.04% for girls and 10.06% for boys in rural areas. However, the probability to be a domestic worker has increased by 10.5% for girls and 8.68% for boys in rural areas. The results imply first that a potential response to the flood of 2010 for households in rural areas was to increase child labor especially farm work and domestic work. Despite the shock, cultural considerations remain: Boys have a higher likelihood to work on a farm and girls at home in rural areas. In urban areas, the probability for boys to be domestic workers has increased by 24.3%. It is possible that the damages caused by the inundation on farms are so important in urban areas that households cannot increase farm work in the short term but other types of work.

4.5 Impact of the flood of 2010 on enrollment and labor

The columns of enrollment and domestic or farm works of table 3bis present a significant increase in these variables in 2012.

In 2006, the probability to combine enrollment and domestic work is significant and positive for girls while significant and negative for boys in farm households in rural areas. It implies that girls are more likely to be enrolled and work at home than boys. In urban areas, this variable is not significant. Nevertheless, the probability to combine enrollment and farm work is significant for every child in farm households except girls in rural areas. The results imply that cultural considerations about girls and boys occupation are predominant in rural areas.

In 2012, the probability to combine enrollment and domestic work has increased by 9.04% for boys in rural areas. In urban areas, the probability to combine enrollment and farm work has increased by 6.57% for girls.

In summary, income of the farm households has significantly decreased in 2012. Following the shock, the probability of enrollment of children in these households has significantly diminished as well. In rural areas, children are more likely to work as domestic laborers or farmers. The combination of enrollment and work has also increased. This shows that even for children enrolled, the likelihood to do a complementary work, to help the family, has increased. In urban areas, domestic work and combination of enrollment and domestic work has significantly increased.

In addition, an endogeneity test confirms that the variable “farm household in 2012” is an instrument for household income. In fact, the test does not reject the null hypothesis of exogeneity after instrumentation with this variable.

3. Causal impact of income on children's enrollment

5.1 The models

Once the adequate instrument has been determined, the relationship between the household's income and enrollment can be analyzed. The models are:

First model

$$\mathrm{Wealth_i} = \mathrm{b_1X_i} + \mathrm{b_2year\_2012_i} + \mathrm{b_3treatment}_{\mathrm{i}} + \mathrm{b_4treatment_i} * \mathrm{year\_2012} + \mathrm{u1_i} \quad \text{(Equation 2)}$$

Second model

$$\mathrm{Outcome_i} = \alpha_1\mathrm{X_i} + \alpha_2\mathrm{year\_2012_i} + \alpha_3\mathrm{treatment}_{\mathrm{i}} + \alpha_4\widehat{\mathrm{wealth}}_{\mathrm{i}} + \mathrm{u2_i} \quad \text{(Equation 3)}$$

bi and αi are constants; u1 and u2 are residuals. The main dissimilarity between the models above is the instrument "treatment*year2012". The treatment variable is "Farm household". The instrumental variable procedure consists of estimating the endogenous variable in a first model with an instrument and reintroduce the estimated variable in the main regression. The purpose of these estimations is to handle the endogeneity bias and reveal the actual effects of income. Additionally, the tables presented in this section are the results of two of regressions: an ordinary least squares (OLS) and an instrumental variable with probabilistic regression (IVPROBIT). The OLS regressions are a basis to compare and observe the improvement of the models. The IVPROBIT models might fit more in the binary form of most of the dependent variables. Still, an additional double least square (2SLS) regression will help control the robustness of the results but is not presented.

5.2 Household income and schooling

Expectedly, children's schooling depends on the household's income. The OLS and IVPROBIT estimations in table 5 show that enrollment increases significantly with the wealth index for girls in rural areas. This result is similar for children in urban areas. The influence of income is quite low but significant for every group. In the columns of OLS in table 27, the probability of enrollment increased by 0.17% for girls and 0.14% for boys with an increase of one point in the wealth index in rural areas. In urban areas, the probability of enrollment increased with household income of 0.05% for girls and 0.08% for boys. The result implies a less strong influence of income on child's schooling in urban areas. It also shows that income has more impact on the decision to schoolgirls than boys in rural areas. However, with the IVPROBIT estimations, the impact of income on children's enrollment is higher. Girls' enrollment has increased by 0.26%, while boys' enrollment increased by 0.22% with a one-point increase in the wealth index.

In conclusion, Benin has launched in 2006, a program of removal of school fees for every child in primary schools. Despite the removal of fees, the household's income still determines the probability to be enrolled in primary school. The impact is stronger for girls than boys in rural areas. This explains that parents chose to withdraw their children from school and increase child labor after the flood of 2010.

Table 3: Instrumental variable regressions of enrollment from 2006 to 2012

	Girls in rural areas				Boys in rural areas			
VARIABLES	OLS	OLS	IVPROBIT	IVPROBIT	OLS	OLS	IVPROBIT	IVPROBIT
Wealth index/1000	0.00174***	0.00166***	0.0110***	0.00783***	0.00163***	0.00147***	0.00679***	0.00701***
	(0.000121)	(0.000108)	(0.00192)	(0.00239)	(0.000107)	(0.000106)	(0.00254)	(0.00266)
Househ. head no formal educ.	-0.183***	-0.176***	-0.0925	-0.359**	-0.179***	-0.183***	-0.499***	-0.536***
	(0.0249)	(0.0235)	(0.175)	(0.183)	(0.0210)	(0.0196)	(0.164)	(0.174)
Househ. head no formal educ. in 2012	0.00486	0.0445	-0.114	0.0181	0.0360	0.0601**	0.00542	0.103
	(0.0299)	(0.0283)	(0.109)	(0.108)	(0.0266)	(0.0266)	(0.113)	(0.117)
Househ. head prim. educ.	-0.0482*	-0.0506**	0.0995	-0.0806	-0.0333	-0.0385*	-0.129	-0.138
	(0.0268)	(0.0257)	(0.130)	(0.140)	(0.0224)	(0.0200)	(0.125)	(0.129)
Househ. head prim. educ. in 2012	0.0209	0.0407	-0.0450	0.0629	0.0355	0.0398	0.0838	0.0926
	(0.0327)	(0.0312)	(0.117)	(0.119)	(0.0284)	(0.0271)	(0.123)	(0.125)
2012 dummy	0.125***	0.0834	0.502***	0.318*	0.0717***	-0.0474	0.312***	-0.106
	(0.0277)	(0.0559)	(0.107)	(0.174)	(0.0236)	(0.0508)	(0.109)	(0.174)
Farm household	-0.00844	0.0116	-0.00244	0.0320	-0.0470***	-0.0441***	-0.144***	-0.138***
	(0.0132)	(0.0121)	(0.0361)	(0.0351)	(0.0126)	(0.0124)	(0.0372)	(0.0383)
Farm household in 2012			IV	IV			IV	IV
Constant	0.730***	0.618***	0.534***	0.374***	0.844***	0.767***	1.077***	0.915***
	(0.0250)	(0.0423)	(0.107)	(0.130)	(0.0191)	(0.0376)	(0.0774)	(0.122)
Observations	14,220	14,206	14,220	14,206	15,520	15,506	15,520	15,506
R-squared	0.089	0.167			0.082	0.159		
Other covariates	No	Yes	No	Yes	No	Yes	No	Yes

Standard errors in parentheses adjusted robust for clustering across households in the same primary sampling unit (PSU). The equations include dummies for the child's age, the household head's gender, number of household members, number of children under five years old in the household, districts dummies. *** Significant at 1%, ** Significant at 5%, *Significant at 10%.

Source: Author's own computation based on DHS 2006, 2012

4. Robustness check

The purpose of this section is first to check whether the results are consistent when using other groups of households potentially affected by the flood of 2010. The main assumption is that the classification in GFDRR (2011) is accurate. In that case, though the mere categorization of affected areas might not yield enough variations in the household income, it is possible to account for additional variations between farm households. A plausible dissimilarity could exist between farm and non-farm households in the affected municipalities or in the most affected municipalities. The expectations are that the impact of the inundation on these subgroups should be similar to the impacts observed in the main evaluation. These variations would thus reveal the consistency of the results across groups. Second, a placebo experiment on non-farm and non-affected households would be run. This last experience should evidence any other treatment that could influence the groups other than the flood of 2010.

6.1 Impact of flooding on the affected farm households

Equation 1 has been estimated on a sample of households "*affected*" by the shock. The treatment is still " *farm household in 2012*". The difference with the main evaluation is that the samples have been reduced to households whose children were born in an affected municipality. Two points are important. First, the new samples take into consideration the classification between affected and non-affected municipalities. Second, this restriction of the samples helps control for migration as well. As a remainder of section 3, the place of birth is the current place of residence for 90% of children. To avoid a potential migration effect, the municipality of birth is used to create the variable "affected", instead of the current place of residence. The following table shows the characteristics of the affected farm households.

The columns of the wealth index in table 4 present a significant decrease by 28,000 CFA francs (45.09 US Dollars) in rural areas and 108,000 CFA francs (173.76 US Dollars) in urban areas for farm households in 2012. This decrease in income is more important for the affected farm households than for the farm households in general. Instead of the reduction by 26,000 CFA francs (41.83 US Dollars) for farm households in rural areas, the diminution is about 28,000 CFA francs (45.09 US Dollars) for affected farm households in the same area.

Table 4: Linear regression of outcomes and income for farm households living in the affected municipalities from 2006 to 2012

	Girls in rural				Boys in rural			
VARIABLES	Enrollment	Domestic work	Farm work	Wealth	Enrollment	Domestic work	Farm work	Wealth
2012 dummy	0.166**	0.247*	-0.167	-3.371	-0.0374	0.206	-0.541***	2.174
	(0.0655)	(0.135)	(0.113)	(10.70)	(0.0598)	(0.142)	(0.124)	(10.38)
Affect. farm househ.	0.0376*	0.00845	0.0306	10.31***	-0.00423	-0.0226	0.0606	11.24***
	(0.0196)	(0.0322)	(0.0310)	(2.282)	(0.0191)	(0.0267)	(0.0374)	(2.014)
Affect. farm househ. in 2012	-0.0763***	0.0987*	0.0972**	-28.17***	-0.0471*	0.0484	0.113**	-28.91***
	(0.0282)	(0.0505)	(0.0446)	(4.163)	(0.0279)	(0.0524)	(0.0506)	(4.260)
Constant	0.604***	0.430***	0.277***	7.200	0.791***	0.172**	0.591***	-12.43
	(0.0503)	(0.0936)	(0.0865)	(9.766)	(0.0442)	(0.0833)	(0.0901)	(8.522)
Observations	9,109	3,326	3,326	9,120	9,899	2,813	2,813	9,915
R-squared	0.157	0.142	0.160	0.188	0.188	0.142	0.348	0.172

Standard errors in parentheses adjusted robust for clustering across households in the same primary sampling unit (PSU). The equations include dummies for the child's age, the household head's age, the household head' gender. *** Significant at 1%, ** Significant at 5%, *Significant at 10%.
Source: Author's own computation based on DHS 2006, 2012

The probability of enrollment has also significantly decreased for every child. This likelihood has reduced by 7.63% for girls and 4.71% for boys in affected farm households in rural areas. The probability to be enrolled has diminished by 11.5% for girls and 6.20% for boys in urban areas. This suggests that girls' enrollment has been more influenced by the flood of 2010 than boys'.

Besides, the likelihood of working has increased significantly in affected farm households in 2012. The probability of being a domestic worker has increased by 9.87% for girls in rural areas and 21.9% for boys in urban areas. The probability to be a farmer has increased by 9.72% for girls in rural areas, by 8.78% for girls in urban areas and by 11.3% for boys in rural areas. The probability to combine enrollment and farm work has increased by 6.69% for girls in rural areas and by 9.39% for girls in urban areas.

The instrumental variable estimations in table 5 are based on equations 2 and 3 with the new samples. The results confirm that household income has a significant impact on children's enrollment. The IVPROBIT columns of table 5 indicate that enrollment increased by 0.29% for girls in rural areas, by 0.22% for boys in rural areas. The statistics are lower for children in urban areas. Still, household income influences more girls than boys in rural areas.

Table 5: Instrumental variable regressions of enrollment for farm households in the affected municipalities from 2006 to 2012

	Girls in rural areas				Boys in rural areas			
VARIABLES	OLS	OLS	IVPROBIT	IVPROBIT	OLS	OLS	IVPROBIT	IVPROBIT
Wealth index/1000	0.00172***	0.00158***	0.0109***	0.00902***	0.00160***	0.00130***	0.00901***	0.00754**
	(0.000150)	(0.000131)	(0.00214)	(0.00264)	(0.000138)	(0.000115)	(0.00278)	(0.00313)
2012 dummy	0.132***	0.158**	0.548***	0.569***	0.0634**	-0.0448	0.317**	-0.132
	(0.0325)	(0.0658)	(0.124)	(0.209)	(0.0260)	(0.0591)	(0.127)	(0.214)
Affect. farm househ.	-0.0151	0.00655	-0.0119	0.0202	-0.0575***	-0.0232*	-0.173***	-0.0799*
	(0.0167)	(0.0145)	(0.0454)	(0.0425)	(0.0158)	(0.0135)	(0.0465)	(0.0447)
Affect. farm househ. in 2012			IV	IV			IV	IV
Constant	0.728***	0.599***	0.507***	0.291*	0.865***	0.810***	1.125***	1.079***
	(0.0303)	(0.0518)	(0.125)	(0.165)	(0.0215)	(0.0429)	(0.102)	(0.147)
Observations	9,119	9,109	9,119	9,109	9,906	9,899	9,906	9,899
R-squared	0.091	0.182			0.086	0.206		
Other covariates	No	Yes	No	Yes	No	Yes	No	Yes

Standard errors in parentheses adjusted robust for clustering across households in the same primary sampling unit (PSU). The equations include dummies for the child's age, the household head's gender, the household's head level of education, number of household members, number of children under five years old in the household and districts dummies. *** Significant at 1%, ** Significant at 5%, *Significant at 10%.
Source: Author's own computation based on DHS 2006, 2012

In summary, the flood of 2010 has similar and even worse impacts on affected farm households than on farm households in the main evaluation. Income and enrollment have decreased, but child labor has increased. The results are thus consistent for affected farm households.

6.2 Impact of the flooding on the most affected farm households

Another variation may exist between the most affected farm households and most affected non-farm households. A second classification of farm households is considered in this experiment. The treatment group is the farm households whose children were born in the most affected municipalities. The sample for this subgroup is limited to the most affected municipalities. This limitation controls for migration effect as well. Equation 1 is run on the most affected municipalities. Table 6 presents the results of these estimations.

Mainly, the income has significantly decreased for the most affected farm households. The income has reduced by 27,000 CFA francs for rural areas and 102,000 CFA francs for urban areas. With the decrease of income, the probability of enrollment has diminished by 7.69% for girls and 6.80% for boys in rural areas. This probability is higher in urban areas. In the column of farm work, the probability to be a farm worker has significantly increased by 11% for girls in rural areas. Enrollment and farm work has also significantly increased by 9.10% for girls in rural areas and by 13.7% for girls in urban areas. There is no significant impact on domestic or farm work for boys. An explanation is that boys might work in paid jobs rather than unpaid jobs. Domestic and farm labors are likely to be unpaid jobs, because the children work in the households or in the family business. Given the importance of the income loss, some parents might send their children for paid jobs that will yield more money. In addition, the instrumental variable equations estimated with the sub-samples of the most affected households reveal similar results to the main evaluation.

In the IVPROBIT columns of table 7 the probability of enrollment increases by approximately 0.29% for children in rural areas with the increase of one point in wealth index. In conclusion, the impact of the flood of 2010 is alike on the affected and most affected farm households. The experiments in section 6.1 and 6.2 confirm that the results are consistent across different groups in the country.

Table 6: Linear regression of outcomes and income for farm households living in the most affected municipalities from 2006 to 2012

	Girls in rural				Boys in rural			
VARIABLES	Enrollment	Domestic work	Farm work	Wealth	Enrollment	Domestic work	Farm work	Wealth
2012 dummy	0.0982	0.319**	-0.142	-2.455	-0.0933	0.199	-0.469***	-4.567
	(0.0896)	(0.159)	(0.131)	(12.85)	(0.0626)	(0.151)	(0.137)	(13.19)
Most affect. farm househ.	0.0295	0.0245	0.00429	14.91***	-0.0258	-0.0670**	0.166***	12.07***
	(0.0257)	(0.0403)	(0.0414)	(2.840)	(0.0253)	(0.0300)	(0.0464)	(2.458)
Most affect. farm househ. in 2012	-0.0769**	0.0488	0.110*	-27.51***	-0.0680*	0.0996	0.00479	-21.25***
	(0.0387)	(0.0680)	(0.0624)	(5.007)	(0.0376)	(0.0662)	(0.0614)	(4.771)
Constant	0.574***	0.440***	0.339***	-4.451	0.808***	0.196**	0.579***	-14.82
	(0.0673)	(0.101)	(0.0964)	(10.61)	(0.0471)	(0.0889)	(0.111)	(10.12)
Observations	5,272	1,955	1,955	5,279	5,900	1,801	1,801	5,899
R-squared	0.140	0.166	0.191	0.194	0.179	0.134	0.345	0.172

Standard errors in parentheses adjusted robust for clustering across households in the same primary sampling unit (PSU). The equations include dummies for the child's age, the household head's age, the household head' gender. *** Significant at 1%, ** Significant at 5%, *Significant at 10%.
Source: Author's own computation based on DHS 2006, 2012

Table 7: Instrumental variable regressions of enrollment for farm households in the most affected municipalities from 2006 to 2012

	Girls in rural areas				Boys in rural areas			
VARIABLES	OLS	OLS	IVPROBIT	IVPROBIT	OLS	OLS	IVPROBIT	IVPROBIT
Wealth index/1000	0.00181***	0.00182***	0.00952***	0.00896**	0.00191***	0.00173***	0.0108**	0.0129***
	(0.000187)	(0.000168)	(0.00283)	(0.00362)	(0.000187)	(0.000144)	(0.00443)	(0.00434)
year2012	0.145***	0.0903	0.574***	0.400	0.0829**	-0.100	0.398**	-0.174
	(0.0424)	(0.0891)	(0.158)	(0.280)	(0.0381)	(0.0610)	(0.186)	(0.254)
Most affect. farm househ.	-0.0114	-0.00897	-0.0359	-0.0382	-0.0749***	-0.0594***	-0.239***	-0.200***
	(0.0218)	(0.0208)	(0.0588)	(0.0627)	(0.0199)	(0.0186)	(0.0590)	(0.0589)
Most affect. farm househ. in 2012			IV	IV			IV	IV
Constant	0.715***	0.586***	0.539***	0.273	0.856***	0.815***	1.072***	0.990***
	(0.0376)	(0.0677)	(0.134)	(0.206)	(0.0283)	(0.0441)	(0.141)	(0.192)
Observations	5,279	5,272	5,279	5,272	5,900	5,900	5,900	5,900
R-squared	0.094	0.171			0.095	0.209		
Other covariates	No	Yes	No	Yes	No	Yes	No	Yes

Standard errors in parentheses adjusted robust for clustering across households in the same primary sampling unit (PSU). The equations include dummies for the child's age, the household head's gender, the household's head level of education, number of household members, number of children under five years old in the household, districts dummies. *** Significant at 1%, ** Significant at 5%, *Significant at 10%.
Source: Author's own computation based on DHS 2006, 2012

6.3 Impact of flooding on non-affected and non-farm households

The third subgroup to observe is a placebo experiment. The samples for this estimation are non-farm households whose children are not born in any affected municipality. Once the sample is retained, the method used is the simple difference before and after the shock. The linear regressions of the wealth index in table 8 presents no significant modification in household income in 2012. The main remark is that the wealth index has not significantly changed either in rural nor in urban areas.

Table 8: Linear regression of income for non farm households living in non affected municipalities from 2006 to 2012

	Wealth index			
VARIABLES	Girls in rural areas	Girls in urban areas	Boys in rural areas	Boys in urban areas
Househ. head no formal educ.	-56.38***	-114.3***	-47.71***	-99.92***
	(15.84)	(14.34)	(12.69)	(14.24)
Househ. head no formal educ. in 2012	-14.55	6.300	-40.74**	-11.04
	(19.24)	(17.14)	(18.66)	(19.37)
Househ. head prim. educ.	-33.87**	-77.95***	-31.97**	-58.25***
	(15.66)	(15.72)	(12.69)	(14.05)
Househ. head prim. educ. in 2012	2.272	28.81	-19.78	13.97
	(19.42)	(18.74)	(18.89)	(18.31)
2012 dummy	21.78	23.95	32.29	0.659
	(20.68)	(19.09)	(19.67)	(27.61)
Constant	14.90	135.7***	-1.701	121.6***
	(13.41)	(17.87)	(15.42)	(18.72)
Observations	1,473	1,091	1,544	1,026
R-squared	0.250	0.372	0.289	0.358

Standard errors in parentheses adjusted robust for clustering across households in the same primary sampling unit (PSU). The equations include dummies for the child’s age, the household head’s age, the household head’ gender, district dummies, number of children under five years old in the households and the relationship with the head. *** Significant at 1%, ** Significant at 5%, *Significant at 10%.

Source: Author’s own computation based on DHS 2006, 2012

Table 9: Linear regression of income for non-farm households living in non affected municipalities from 2006 to 2012

	Girls in rural				Boys in rural			
VARIABLES	Enrollment	Domestic work	Farm work	Wealth	Enrollment	Domestic work	Farm work	Wealth
Househ. head no formal educ.	-0.223***	0.0970	0.150	-56.38***	-0.237***	-0.183	0.256	-47.71***
	(0.0645)	(0.142)	(0.111)	(15.84)	(0.0556)	(0.199)	(0.227)	(12.69)
Househ. head no formal educ. in 2012	-0.102	-0.300	-0.390	-14.55	0.0689	0.239	-0.174	-40.74**
	(0.0748)	(0.276)	(0.262)	(19.24)	(0.0835)	(0.226)	(0.228)	(18.66)
Househ. head prim. educ.	-0.139*	0.310**	-0.0363	-33.87**	-0.104*	-0.117	0.245	-31.97**
	(0.0708)	(0.147)	(0.116)	(15.66)	(0.0560)	(0.229)	(0.232)	(12.69)
Househ. head prim. educ. in 2012	-0.0565	-0.344	-0.137	2.272	0.104	0.225	-0.0940	-19.78
	(0.0838)	(0.289)	(0.261)	(19.42)	(0.0819)	(0.251)	(0.246)	(18.89)
2012 dummy	0.0543	0.255	0.0943	21.78	-0.0770	-0.0721	-0.390	32.29
	(0.157)	(0.280)	(0.270)	(20.68)	(0.102)	(0.229)	(0.265)	(19.67)
Constant	0.686***	0.308**	0.295***	14.90	0.996***	0.218	0.408	-1.701
	(0.107)	(0.150)	(0.108)	(13.41)	(0.0690)	(0.197)	(0.257)	(15.42)
Observations	1,470	514	514	1,473	1,541	394	394	1,544
R-squared	0.158	0.233	0.168	0.250	0.192	0.174	0.373	0.289

Standard errors in parentheses adjusted robust for clustering across households in the same primary sampling unit (PSU). The equations include dummies for the child's age, the household head's age, the household head' gender, district dummies, number of children under five years old in the households and the relationship with the head.*** Significant at 1%, ** Significant at 5%, *Significant at 10%.
Source: Author's own computation based on DHS 2006, 2012

In all the columns of table 9 as well, there is no significant change in any children's outcome in 2012. Enrollment and child labor have not significantly changed for non-affected and non-farm households after the flood of 2010. There is no evidence of any other shocks on the household income during the same period. Thus the impacts observed in the main evaluation on households are essentially the impacts of the inundation.

5. Conclusion

The present study investigated households' decisions on schooling and child labor under the constraint of an income shock. A removal of school fees has been implemented in Benin since 2006. The aim of this paper is to determine the coping strategies of the households under an income shock in this particular setting. The income shock considered is the flood of 2010 that caused numerous damages in Benin.

The results point to a reduction in income for farm households compared to non-farm households either in urban or in rural areas. With the decrease in income, the probability of enrollment has decreased more for girls than boys. A diminution of income of 26,000 CFA francs (41.83 US Dollars) in rural areas led to a decrease in enrollment of 5.99% for girls and 4.45% for boys in farm households. The likelihood to work as a farmer or a domestic laborer has increased. Indeed, the likelihood to be a domestic laborer has increased by 9.04% for girls and 10.06% for boys in rural areas and to be farmer has increased by 10.5% for girls and 8.68% for boys in the same areas. Despite the increase in child labor after the flood of 2010, regardless of gender, the cultural considerations seem to be persistent in rural areas. Thus, under the income shock, households choose to diversify their reactions. Although, there are no school fees to be paid for enrollment, children were held in their households and send to work in response to the decrease in income. The instrumental variable estimates indicate an elasticity income of 0.17% for girls and 0.14% for boys in rural areas with a one-point increase in the wealth index. The outcomes are roughly similar in urban areas. The results were further controlled with additional groups based on the categorization between affected and most affected municipalities. These robustness checks confirmed the previous results. The impacts of the flood of 2010 were even worse on these subgroups than on the groups considered for the main evaluation. An additional placebo experiment shows that the impacts observed were not the consequences of other shocks than the inundation. Indeed, there was no significant change in income for non-farm and non-affected households after the flood of 2010.

Seemingly, the results suggest that the income effect prevails over the price effect in Benin. In fact, although there were no school fees to pay, the households' reactions to the negative income shock were to hold their children home. These findings might disclose that a reduction or elimination of school fees cannot serve as a safety net under an income shock in Benin. Except the direct school cost that is school fees, there is the opportunity cost of the child spending time at school instead of working for his parents. In times of crisis, this opportunity cost rises and it becomes more difficult for parents to maintain their children in school.

National and international efforts to school children and reach the universal primary education could be at risk with income shocks. It could be difficult to acquire skills when the schooling is interrupted each time there is a weather shock. In addition to the removal of school fees, the main recommendation is to give subsidies to parents to maintain their children in school especially in case of crisis.

References

1. Beegle K., Dehejia R., Gatti R. (2006), Child labor and agricultural shocks, Journal of Development Economics 81 (2006) 80– 96.

2. Behrman J. and Knowles J. (1999), Household income and child schooling in Vietnam, World Bank Economic Review, Vol. 13, N°2, 211-56.

3. Björkman-Nyqvist M. 2013. Income shocks and gender gaps in education: Evidence from Uganda. Journal of Development Economics 105 (2013) 237–253.

4. Cogneau D. and Jedwab R. 2008. Commodity Price Shocks and Child Outcomes: The 1990 Cocoa Crisis in Cote D'Ivoire. Paris School of Economics, Working paper N°9.

5. Filmer, D. and L. Pritchett (1998) 'Estimating Wealth Effects without Expenditure Data or Tears: With an Application to Educational Enrollments in States of India', World Bank Policy Research Working Paper No. 1994.

6. Global Facility for Disaster Reduction and Recovery. 2011. Inondations au Bénin: Rapport d'évaluation des besoins post catastrophe.

7. Grimm M. 2011. Does household income matter for children's schooling? Evidence for rural Sub-Saharan Africa. Economics of Education Review 30 (2011) 740–754.

8. Institut National de Statistique et de l'Analyse Economique avec la collaboration du Programme National de Lutte contre le Sida (PNLS) Cotonou, Bénin et Macro International Inc. Calverton, Maryland, USA (INSAE et al., 2007) . Enquête démographique et de santé du Benin (EDSB III). November 2007.

9. Institut National de Statistique et de l'Analyse Economique Cotonou, Benin, Ministère du Développement, de l'Analyse Économique et de la Prospective, et ICF International, Calverton, Maryland, USA ORC Macro, Calverton, Maryland, USA (INSAE et al., 2012). Enquête démographique et de santé du Benin (EDSB IV). October 2013.

10. Institut National de Statistique et de l'Analyse Economique (INSAE). 2012. Tableaux de bord social du Bénin 2012: Profils socio-économique et indicateurs de développement.

11. Jacoby H., and Skoufias E., (1998), Testing theories of consumption behavior using information on aggregate shocks: income seasonality and rainfall in rural India, American Journal Agricultural Economics 80 (1): 1-14.

12. Kazianga H. 2012. Income Risk and Household Schooling Decisions in Burkina Faso. World Development Vol. 40, No. 8, pp. 1647–1662, 2012.

13. Maurin E. 2002. The impact of parental income on early schooling transitions: A re-examination using data over three generations. Journal of Public Economics 85 (2002) 301–332.

14. Pierre Dubois P., de Janvry A., Sadoulet E., Effects on School Enrollment and Performance of a Conditional Cash Transfer Program in Mexico, Journal of Labor Economics, Vol. 30, No. 3 (July 2012), pp. 555-589.

15. Shea J., (2000), Does parents' money matter?, Journal of Public Economics 77, 155–184.

16. United Nations Organization (UNO). 2014. Millennium Development Goals Report 2014.

BERG Working Paper Series

1 Mikko **Puhakka** and Jennifer P. **Wissink**, Multiple Equilibria and Coordination Failure in Cournot Competition, December 1993

2 Matthias **Wrede**, Steuerhinterziehung und endogenes Wachstum, December 1993

3 Mikko **Puhakka**, Borrowing Constraints and the Limits of Fiscal Policies, May 1994

4 Gerhard **Illing**, Indexierung der Staatsschuld und die Glaubwürdigkeit der Zentralbank in einer Währungsunion, June 1994

5 Bernd **Hayo**, Testing Wagner`s Law for Germany from 1960 to 1993, July 1994

6 Peter **Meister** and Heinz-Dieter **Wenzel**, Budgetfinanzierung in einem föderalen System, October 1994

7 Bernd **Hayo** and Matthias **Wrede**, Fiscal Policy in a Keynesian Model of a Closed Monetary Union, October 1994

8 Michael **Betten**, Heinz-Dieter **Wenzel**, and Matthias **Wrede**, Why Income Taxation Need Not Harm Growth, October 1994

9 Heinz-Dieter **Wenzel** (Editor), Problems and Perspectives of the Transformation Process in Eastern Europe, August 1995

10 Gerhard **Illing**, Arbeitslosigkeit aus Sicht der neuen Keynesianischen Makroökonomie, September 1995

11 Matthias **Wrede**, Vertical and horizontal tax competition: Will uncoordinated Leviathans end up on the wrong side of the Laffer curve? December 1995

12 Heinz-Dieter **Wenzel** and Bernd **Hayo**, Are the fiscal Flows of the European Union Budget explainable by Distributional Criteria? June 1996

13 Natascha **Kuhn**, Finanzausgleich in Estland: Analyse der bestehenden Struktur und Überlegungen für eine Reform, June 1996

14 Heinz-Dieter **Wenzel**, Wirtschaftliche Entwicklungsperspektiven Turkmenistans, July 1996

15 Matthias **Wrede,** Öffentliche Verschuldung in einem föderalen Staat; Stabilität, vertikale Zuweisungen und Verschuldungsgrenzen, August 1996

16 Matthias **Wrede**, Shared Tax Sources and Public Expenditures, December 1996

17 Heinz-Dieter **Wenzel** and Bernd **Hayo**, Budget and Financial Planning in Germany, February 1997

18 Heinz-Dieter **Wenzel**, Turkmenistan: Die ökonomische Situation und Perspektiven wirtschaftlicher Entwicklung, February 1997

19 Michael **Nusser**, Lohnstückkosten und internationale Wettbewerbsfähigkeit: Eine kritische Würdigung, April 1997

20 Matthias **Wrede**, The Competition and Federalism - The Underprovision of Local Public Goods, September 1997

21 Matthias **Wrede**, Spillovers, Tax Competition, and Tax Earmarking, September 1997

22 Manfred **Dauses**, Arsène **Verny**, Jiri **Zemánek,** Allgemeine Methodik der Rechtsangleichung an das EU-Recht am Beispiel der Tschechischen Republik, September 1997

23 Niklas **Oldiges**, Lohnt sich der Blick über den Atlantik? Neue Perspektiven für die aktuelle Reformdiskussion an deutschen Hochschulen, February 1998

24 Matthias **Wrede**, Global Environmental Problems and Actions Taken by Coalitions, May 1998

25 Alfred **Maußner**, Außengeld in berechenbaren Konjunkturmodellen – Modellstrukturen und numerische Eigenschaften, June 1998

26 Michael **Nusser**, The Implications of Innovations and Wage Structure Rigidity on Economic Growth and Unemployment: A Schumpetrian Approach to Endogenous Growth Theory, October 1998

27 Matthias **Wrede**, Pareto Efficiency of the Pay-as-you-go Pension System in a Three-Period-OLG Modell, December 1998

28 Michael **Nusser**, The Implications of Wage Structure Rigidity on Human Capital Accumulation, Economic Growth and Unemployment: A Schumpeterian Approach to Endogenous Growth Theory, March 1999

29 Volker **Treier**, Unemployment in Reforming Countries: Causes, Fiscal Impacts and the Success of Transformation, July 1999

30 Matthias **Wrede**, A Note on Reliefs for Traveling Expenses to Work, July 1999

31 Andreas **Billmeier**, The Early Years of Inflation Targeting – Review and Outlook –, August 1999

32 Jana **Kremer**, Arbeitslosigkeit und Steuerpolitik, August 1999

33 Matthias **Wrede**, Mobility and Reliefs for Traveling Expenses to Work, September 1999

34 Heinz-Dieter **Wenzel (**Herausgeber**)**, Aktuelle Fragen der Finanzwissenschaft, February 2000

35 Michael **Betten**, Household Size and Household Utility in Intertemporal Choice, April 2000

36 Volker **Treier**, Steuerwettbewerb in Mittel- und Osteuropa: Eine Einschätzung anhand der Messung effektiver Grenzsteuersätze, April 2001

37 Jörg **Lackenbauer** und Heinz-Dieter **Wenzel**, Zum Stand von Transformations- und EU-Beitrittsprozess in Mittel- und Osteuropa – eine komparative Analyse, May 2001

38 Bernd **Hayo** und Matthias **Wrede**, Fiscal Equalisation: Principles and an Application to the European Union, December 2001

39 Irena Dh. **Bogdani**, Public Expenditure Planning in Albania, August 2002

40 Tineke **Haensgen**, Das Kyoto Protokoll: Eine ökonomische Analyse unter besonderer Berücksichtigung der flexiblen Mechanismen, August 2002

41 Arben **Malaj** and Fatmir **Mema**, Strategic Privatisation, its Achievements and Challenges, Januar 2003

42 Borbála **Szüle** 2003, Inside financial conglomerates, Effects in the Hungarian pension fund market, January 2003

43 Heinz-Dieter **Wenzel** und Stefan **Hopp** (Herausgeber), Seminar Volume of the Second European Doctoral Seminar (EDS), February 2003

44 Nicolas Henrik **Schwarze**, Ein Modell für Finanzkrisen bei Moral Hazard und Überinvestition, April 2003

45 Holger **Kächelein**, Fiscal Competition on the Local Level – May commuting be a source of fiscal crises?, April 2003

46 Sibylle **Wagener**, Fiskalischer Föderalismus – Theoretische Grundlagen und Studie Ungarns, August 2003

47 Stefan **Hopp**, J.-B. Say’s 1803 *Treatise* and the Coordination of Economic Activity, July 2004

48 Julia **Bersch**, AK-Modell mit Staatsverschuldung und fixer Defizitquote, July 2004

49 Elke **Thiel**, European Integration of Albania: Economic Aspects, November 2004

50 Heinz-Dieter **Wenzel**, Jörg **Lackenbauer**, and Klaus J. **Brösamle,** Public Debt and the Future of the EU's Stability and Growth Pact, December 2004

51 Holger **Kächelein**, Capital Tax Competition and Partial Cooperation: Welfare Enhancing or not? December 2004

52 Kurt A. **Hafner**, Agglomeration, Migration and Tax Competition, January 2005

53 Felix **Stübben**, Jörg **Lackenbauer** und Heinz-Dieter **Wenzel**, Eine Dekade wirtschaftlicher Transformation in den Westbalkanstaaten: Ein Überblick, November 2005

54 Arben **Malaj,** Fatmir **Mema** and Sybi **Hida,** Albania, Financial Management in the Education System: Higher Education, December 2005

55 Osmat **Azzam**, Sotiraq **Dhamo** and Tonin **Kola,** Introducing National Health Accounts in Albania, December 2005

56 Michael **Teig,** Fiskalische Transparenz und ökonomische Entwicklung: Der Fall Bosnien-Hercegovina, März 2006

57 Heinz-Dieter **Wenzel** (Herausgeber), Der Kaspische Raum: Ausgewählte Themen zu Politik und Wirtschaft, Juli 2007

58 Tonin **Kola** and Elida **Liko**, An Empirical Assessment of Alternative Exchange Rate Regimes in Medium Term in Albania, Januar 2008

59 Felix **Stübben**, Europäische Energieversorgung: Status quo und Perspektiven, Juni 2008

60 Holger **Kächelein,** Drini **Imami** and Endrit **Lami**, A new view into Political Business Cycles: Household Expenditures in Albania, July 2008

61 Frank **Westerhoff**, A simple agent-based financial market model: direct interactions and comparisons of trading profits, January 2009

62 Roberto **Dieci** and Frank **Westerhoff**, A simple model of a speculative housing market, February 2009

63 Carsten **Eckel**, International Trade and Retailing, April 2009

64 Björn-Christopher **Witte**, Temporal information gaps and market efficiency: a dynamic behavioral analysis, April 2009

65 Patrícia **Miklós-Somogyi** and László **Balogh**, The relationship between public balance and inflation in Europe (1999-2007), June 2009

66 H.-Dieter **Wenzel** und Jürgen **Jilke**, Der Europäische Gerichtshof EuGH als Bremsklotz einer effizienten und koordinierten Unternehmensbesteuerung in Europa?, November 2009

67 György **Jenei**, A Post-accession Crisis? Political Developments and Public Sector Modernization in Hungary, December 2009

68 Marji **Lines** and Frank **Westerhoff**, Effects of inflation expectations on macroeconomic dynamics: extrapolative versus regressive expectations, December 2009

69 Stevan **Gaber**, Economic Implications from Deficit Finance, January 2010

70 Abdulmenaf **Bexheti,** Anti-Crisis Measures in the Republic of Macedonia and their Effects – Are they Sufficient?, March 2010

71 Holger **Kächelein**, Endrit **Lami** and Drini **Imami,** Elections Related Cycles in Publicly Supplied Goods in Albania, April 2010

72 Annamaria **Pfeffer**, Staatliche Zinssubvention und Auslandsverschuldung: Eine Mittelwert-Varianz-Analyse am Beispiel Ungarn, April 2010

73 Arjan **Tushaj**, Market concentration in the banking sector: Evidence from Albania, April 2010

74 Pál **Gervai**, László **Trautmann** and Attila **Wieszt**, The mission and culture of the corporation, October 2010

75 Simone **Alfarano** and Mishael **Milaković**, Identification of Interaction Effects in Survey Expectations: A Cautionary Note, October 2010

76 Johannes **Kalusche**, Die Auswirkungen der Steuer- und Sozialreformen der Jahre 1999-2005 auf die automatischen Stabilisatoren Deutschlands, October 2010

77 Drini **Imami,** Endrit **Lami** and Holger **Kächelein,** Political cycles in income from privatization – The case of Albania, January 2011

78 Reiner **Franke** and Frank **Westerhoff,** Structural Stochastic Volatility in Asset Pricing Dynamics: Estimation and Model Contest, April 2011

79 Roberto **Dieci** and Frank **Westerhoff**, On the inherent instability of international financial markets: natural nonlinear interactions between stock and foreign exchange markets, April 2011

80 Christian **Aßmann**, Assessing the Effect of Current Account and Currency Crises on Economic Growth, May 2011

81 Björn-Christopher **Witte**, Fund Managers – Why the Best Might be the Worst: On the Evolutionary Vigor of Risk-Seeking Behavior, July 2011

82 Björn-Christopher **Witte**, Removing systematic patterns in returns in a financial market model by artificially intelligent traders, October 2011

83 Reiner **Franke** and Frank **Westerhoff**, Why a Simple Herding Model May Generate the Stylized Facts of Daily Returns: Explanation and Estimation, December 2011

84 Frank **Westerhoff**, Interactions between the real economy and the stock market, December 2011

85 Christoph **Wunder** and Guido **Heineck**, Working time preferences, hours mismatch and well-being of couples: Are there spillovers?, October 2012

86 Manfred **Antoni** and Guido **Heineck**, Do literacy and numeracy pay off? On the relationship between basic skills and earnings, October 2012

87 János **Seregi**, Zsuzsanna **Lelovics** and László **Balogh**, The social welfare function of forests in the light of the theory of public goods, October 2012

88 Frank **Westerhoff** and Reiner **Franke**, Agent-based models for economic policy design: two illustrative examples, November 2012

89 Fabio **Tramontana**, Frank **Westerhoff** and Laura **Gardini**, The bull and bear market model of Huang and Day: Some extensions and new results, November 2012

90 Noemi **Schmitt** and Frank **Westerhoff,** Speculative behavior and the dynamics of interacting stock markets, November 2013

91 Jan **Tuinstra**, Michael **Wegener** and Frank **Westerhoff,** Positive welfare effects of trade barriers in a dynamic equilibrium model, November 2013

92 Philipp **Mundt**, Mishael **Milakovic** and Simone **Alfarano,** Gibrat's Law Redux: Think Profitability Instead of Growth, January 2014

93 Guido **Heineck**, Love Thy Neighbor – Religion and Prosocial Behavior, October 2014

94 Johanna Sophie **Quis**, Does higher learning intensity affect student well-being? Evidence from the National Educational Panel Study, January 2015

95 Stefanie P. **Herber**, The Role of Information in the Application for Merit-Based Scholarships: Evidence from a Randomized Field Experiment, January 2015

96 Noemi **Schmitt** and Frank **Westerhoff**, Managing rational routes to randomness, January 2015

97 Dietmar **Meyer** and Adela **Shera**, Remittances' Impact on the Labor Supply and on the Deficit of Current Account, February 2015

98 Abdylmenaf **Bexheti** and Besime **Mustafi**, Impact of Public Funding of Education on Economic Growth in Macedonia, February 2015

99 Roberto **Dieci** and Frank **Westerhoff**, Heterogeneous expectations, boom-bust housing cycles, and supply conditions: a nonlinear dynamics approach, April 2015

100 Stefanie P. **Herber**, Johanna Sophie **Quis**, and Guido **Heineck**, Does the Transition into Daylight Saving Time Affect Students' Performance?, May 2015

101 Mafaïzath A. **Fatoke-Dato**, Impact of an educational demand-and-supply policy on girls' education in West Africa: Heterogeneity in income, school environment and ethnicity, June 2015

102 Mafaïzath A. **Fatoke-Dato**, Impact of income shock on children's schooling and labor in a West African country, June 2015