

# Contract Type and Teacher Absenteeism in Benin: The Role of Teacher's Supplemental Income

Barthelemy Mahugnon Senou

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# **Contract Type and Teacher Absenteeism in Benin: The Role of Teacher's Supplemental Income**

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## List of abbreviations and acronyms

BEPC	Brevet d'Etudes du Premier Cycle
CEAP	Certificat Elémentaire d'Aptitude Professionnelle
EFA	Education for All
IGA	Income Generating Activities
INSAE	National Institute of Statistics and Economic Analysis
PASEC	Programme d'Analyse des Systèmes Educatifs de la Confemen
PTA	Parent-Teacher Associations
UNDP	United Nations Development Programme
WAEMU	West African Economic Monetary Union

# Abstract

Absenteeism is a phenomenon that has been noted in professional circles with consequences on the income of the wage earner as well as the profits of the firm, consequences that led, according to statistics from 2005, to losses in public finance amounting to close to 70 billion francs for the Government of Benin. Despite such losses, very few studies in economics have focused on the subject in order to try and give an understanding of the real causes of absenteeism and its consequences. The objective of this study is to explore the relationship between the status of the teacher, supplemental income of the teacher, and the absenteeism of the teacher. Using data from PASEC-CONFEMEN 2005, that will be applied to a theoretical model that we are developing, and through the use of a Tobit empirical method, after having taken the endogeneity bias on the practice of supplemental income generating activities by the teacher into account, this study demonstrates that the practice of income generating activities by teachers positively influences their absenteeism, with contract teachers being more frequently absent than those who are on permanent and pensionable employment contracts. Through linking the level of prices in a locality with absenteeism behaviours, we make it clear that the reasons for absenteeism are mostly related to low purchasing power in the context of earning relatively meagre salaries. These results elicit a set of recommendations that essentially suggest that there should be an improvement in the salaries and working conditions of teachers.

**Key words:** Absenteeism; Teacher; Endogeneity; Education; Tobit.

# 1. Background and statement of the problem

A good number of firms and public service agencies are experiencing absenteeism among their workers who for various reasons are not present at their workplaces, leading to manifold costs to the structures that use them. These costs include notably the costs related to recourse to replacements, additional training, selection of replacement of the absent workers, and the administrative management of absenteeism. In developing, as well as developed countries, the phenomenon has been snowballing over several decades. Losses in working hours which arise from it have consequences that triggered, according to the statistics from 2005<sup>1</sup>, the loss of close to 70 billion francs of public funds for the Benin Government, and to a loss of 72 billion francs in 2016 according to UNDP (2016).

In the education sector, the phenomenon is particularly concerning; indeed, given the role that education plays in economic growth, and in view of the role of education in the education system, teacher absenteeism is a troubling problem, because its consequences on the quality of education are tremendous due to the reduction in learning periods and the incomplete syllabi that such actions entail. According to Tao (2013) in Kenya, Mozambique, Nigeria, Senegal, Togo, Uganda and Tanzania, teachers were, on average, absent from classroom more than 40% of the time. According to Mulkeen (2010), teachers do not always cover the official number of hours required for effective teaching. The evaluation by PASEC (2014) placed Benin in the fifth position in terms of primary school teacher absenteeism out of the ten countries evaluated, and in second position just after Burkina Faso among the West African Economic Monetary Union (WAEMU) countries. Even though Benin has the longest official class teaching periods (28 hours per week), the rate of non-completion of training programmes in primary school are higher (65%) among the evaluated countries (PASEC, 2014).

In light of the statistics that highlight the extent of absenteeism of workers in general, and that of teachers in particular, it becomes very important to focus on teacher absenteeism. The question is even more significant because teaching is an essential production factor in education and the fact that it cannot be substituted cannot be gainsaid, given the high costs that come with replacing a teacher. The question becomes even more significant when one considers the myriad categories of teachers that are today employed in developing countries. Indeed, in the 1990s, and in the 2000s, a large number of teachers were recruited to respond to the need



of expanded education, in line with the objectives of Education for All (EFA). However, most countries found themselves faced with a double problem: not only a shortage of teachers, with the continent having to create 2.3 million new posts by the year 2030 (UNESCOISU, 2014), but also that of limited finances. They therefore implemented policies for lowering the wage bill thus creating new categories of teachers “contract” “community” “volunteer”, etc., often managed in a decentralized manner, and while breaching international labour laws affecting the sector (Adotévi, 2008; UNESCO-BREDA, 2009). These new teachers are said in most cases to be “contractual”, since the duration of their contracts is limited in time and thus always has to be renewed. A permanent job as a teacher can only be attained when one obtains additional qualifications (UNESCO-BREDA, 2009). In terms of the amount of engagement by the government, their status is more or less precarious. For example, community teachers are under the employ of the community (parents) and are mostly paid a token salary. These new types of teachers have faced very different situations according to the country where they work, whether it is in relation to their contract, or to their career plans (Bourdon & Nkengné-Nkengné, 2007).

Despite the costs of absenteeism of labourers to the economy, very few economic studies have focused on the subject in order to understand the underlying reasons. At the theoretical level, the neoclassical static model of labour supply (Allen, 1981), and the efficiency wage model (Shapiro & Stiglitz, 1984) constitute the two methods most often used to examine absenteeism from work.

According to the neoclassical model of labour supply (Allen, 1984), absenteeism occurs when the employee has to work more than he/she would like to during a given period, and thus the reaction of the said employee being that of absenting himself/herself in order to adjust their optimal labour supply to that which is imposed on them by the contract. Dunn and Youngblood gave an empirical illustration of the same in 1986. According to the efficiency wage model developed by Shapiro and Stiglitz (1984), which highlights “shirking” behaviour, the employee avoids work as long as the salary is not enough to compensate the effort that they have to put in at work.

According to studies by PASEC (2014), almost 25% of primary school teachers in Benin undertake income generating activities besides their teaching jobs, and among these, almost half of them are involved in the absenteeism phenomenon. Both in terms of the facts that demonstrate the high degree of delinquency by teachers in the education system, the variety of types of teachers in the education system whose financial benefits vary according to the type of contract, and the practice of income generating activities by a large number of primary school teachers in Benin, one could attempt to find out the role played by the practice of income generating activities of the teacher on their absenteeism from work. This study thus focuses on an analysis of the relationship between out-of-work income of primary school teachers of Benin, their status (the type of contract under which they work) and the frequency of their absenteeism from work.

## 2. Objectives

The overall objective of this study is to examine the relationship between the type of contract of the teacher and the tendency towards absenteeism at their workplace. More specifically, the study will:

- Identify the effect of the status of the teacher on the engaging by the said teacher in income generating activities besides those that are related to their job as a teacher.
- Evaluate the role played by extra-contractual income of the teacher on the frequency of their delinquency in terms of effecting their duties.

Having established the objectives of this study, the section that follows synthesises literature on the question of absenteeism by workers.

### **3. Factors contributing to absenteeism: Literature review**

For several researchers, the notion of absenteeism is not homogeneous because different processes seem to explain different aspects of absenteeism (Bakker et al., 2003). A synthesis of literature on absenteeism of workers brings out three models of absenteeism:

- (i) Fear avoidance model, which presents absence as being a flight from negative aspects of labour; according to this model, absenteeism is usually interpreted as an escape, a compensation, or even a contestation, vis-a-vis difficult working conditions (Chadwick-Jones et al., 1982).
- (ii) The adaptation, adjustment and mismatch, according to which absenteeism from work is seen as a result of organizational socialization and the process of adaptation to the demands of work (Johns, 1997).
- (iii) The decision model, in which absenteeism is described as a rational decision or a process of choices determined by their goals (Kaiser, 1998).

Among these different models of analysis of absenteeism, the latter on decision is the closest to the labour-leisure choice framework suggested by Allen (1984), which makes the tendency towards absenteeism dependent upon the deviation on the gap between the contractual duration linking the worker to their employer on the one hand, and on the other hand the optimal duration of the individual, which maximizes his/her potential under budgetary constraint. The first empirical studies on this theoretical concept were undertaken during the 1980s (see, for example, Dunn & Youngblood, 1986; Brown & Sessions, 1996).

Worker absenteeism, viewed as a choice made by the worker, is also tackled in literature in terms of the reaction by the worker to the wage level which does not encourage them to put in their maximum potential. In this conception of absenteeism, as developed by Shapiro and Stiglitz (1984) in their salary efficiency model, the worker chooses the level of effort that they must supply in order to accomplish their tasks as a function of the incentives which they experience. One of the incentives is found in the level of wages proposed to the worker, a level which is positively correlated to the effort that they give. This effort could thus be translated to the tendency towards assiduity, understandably assuming that the worker who reports on duty will effectively complete the tasks assigned to him/her. If he maximizes his

utility by providing minimum effort, the worker thus engages in “shirking”. Studies on absenteeism that are based on this model have in common the consideration of absenteeism as arising from the level of effort given by the employee. In this context, and from the moment when the employer cannot know with certainty the level of effort, the problem can only be raised in terms of moral hazards. Studies carried out by researchers at this level are mostly focused on means of limiting the assumed effects. In the 1990s, Barmby et al. (1994) proceeded upon an enrichment of a theoretical framework arising from the model of Shapiro and Stiglitz by making the utility function of the worker dependent upon their income, leisure and their health status. More recently, Case and Deaton (2005) attempted to simultaneously take into account the labour and health dimensions in a theoretical model adopting the Grossman model (1972) on the development of the state of health.

Beyond these theoretical contributions, the economic analysis of worker absenteeism has also known methodological and empirical developments. From the methodological point of view, we note that improved econometric tools have been used by these researchers; one notes, for example, the recourse to the Weibull proportional hazards model to model the transition of a worker from assiduity to absenteeism (Barmby et al., 1994). Without necessarily undertaking a survey of studies from the year 2000, notably those by Afsa and Givord (2006), one gets the basic understanding that the econometric analysis of worker absenteeism finds itself confronted by a set of problems such as the difficulty in measuring worker absenteeism, and especially problems related to estimation bias, notably selection bias and the endogeneity of certain variables; in a more recent essay on the examination of worker absenteeism, Chaupain-Guillot and Guillot (2007, 2011) essentially tackle problems related to methodology, notably the question of measuring absenteeism and problems related to economics.

Among the problems related to economics is the question of exogeneity of some variables which influence absenteeism of the worker, if one agrees that financial variables such as salary and workers income are likely to influence the assiduity of the worker. It is from a methodological point of view, fundamental to interrogate the exogenous character of these variables which on the whole are seen in econometric analysis as being in themselves determined by a set of other factors. The question of endogeneity bias should therefore be fundamental when one is tackling an estimation of the model of worker absenteeism (Dunn & Youngblood, 1986; Brown & Sessions, 1996; Case & Deaton, 2005).

From the use of methodological tools to analyse absenteeism of the worker, there emerge a number of empirical results which mostly highlight the determinants of absenteeism of workers. Among the numerous studies on worker absenteeism, one could cite the literature review undertaken by d'Aiglepierre (2011) on absenteeism by teachers. According to this review, absenteeism by teachers is particularly high in developing countries and is often presented as a major problem in their education systems (WDR, 2004). The reasons given are mainly the health conditions, poverty, lack of support, poor recruitment practices, and lack of transparency in internal promotion

or also administrative problems notably on the payment of wages. Age and the level of education positively influence absenteeism while the salary and type of contract seem to have an insignificant impact (Kremer et al., 2005). Overall, private school teachers seem to be less absent than those who teach in public schools. Empirical evidence on the determinants of absenteeism is nevertheless still low (Bennell & Akyeampong, 2007), while the question of cumulative employment is yet to become the focus of serious empirical research. Regarding this literature review, d'Aiglepiere (2011) highlights the determinants of absenteeism of teachers in Madagascar, and according to his results, an increase in continuous training and education meetings is one of the measures that would reduce the absenteeism of teachers; a fundamental result which the researcher establishes is that, when the endogeneity bias is controlled, there does not seem to be a significant relationship between the satisfaction of teachers, cumulative employment and the level of absenteeism of teachers.

Given that the question of cumulative employment is directly related to research on additional income, the present study places a particular emphasis upon the role played by other income generating activities on the teacher's absenteeism. The section that follows gives the methodological approach used in the framework of this study.

## 4. Methodology

We will develop a theoretical model that examines the absenteeism of the worker; then we will present an empirical specification, before describing the data gathered for the estimation of an empirical model.

### Theoretical model for the analysis of absenteeism of the worker

We focus on a teacher who is in a contractual relationship with their employer. The contract terms of the teacher with their employer define the fixed wage  $R_0$  of the teacher. By absenting themselves from their workplace over a period of time  $a_i$  ( $a_i = \delta - a_t$ ,  $\delta$  being the duration of the contractual work and  $a_t$  the effective duration of labour), the teacher devotes their time during the period of absence  $a_i$  to working elsewhere in order to earn additional income  $R_a$ . If labour in the second workplace is remunerated at a rate of  $\omega$ , the remuneration of the teacher in the market over the period  $a_i$  is  $R_a = \omega a_i$ . The utility function of the teacher is therefore:

$$V(\cdot) = U(R_0 + \omega a_i) - c(a_i, S, L) \quad (1)$$

Further to the variables  $a_i$ ,  $\omega$ ,  $R_0$  previously defined,  $S$  and  $L$ , respectively, designate the index of main job security and the index of understanding of the regulations (the law).

$U(\cdot)$  is the labour utility function and depends on the income earned from the job.  $U(\cdot)$  obeys the usual conditions of a utility function:  $U(\cdot)$  is increasing ( $U'(\cdot) \geq 0$ ), and  $U(\cdot)$  is concave ( $U''(\cdot) \leq 0$ ).

$c$  is a function of the psychological cost faced by the teacher who absents themselves from their workplace, dependent on the assumption of the duration of absence on the job security index ( $S$ ) and the index of an understanding of the regulations ( $L$ ). We assume that:

$$\frac{\partial c}{\partial a_i} \geq 0, \frac{\partial c}{\partial a_m} \geq 0, \frac{\partial c}{\partial S} \leq 0, \frac{\partial c}{\partial L} \geq 0, \frac{\partial^2 c}{\partial a_i \partial S} < 0 \text{ et } \frac{\partial^2 c}{\partial a_i \partial L} > 0. \quad (2)$$

The calculation of the teacher's maximization programme allows for determining its absenteeism function (see Appendix 1 for the calculation).

$$a_i^* = a_i^*(\omega, R_0, S, L) \quad (3)$$

The period of absence of the teacher which he/she entirely dedicates to working elsewhere in order to earn additional income is therefore a function of the salary rate  $\omega$  which is proposed to him/her elsewhere, the fixed wage  $R_c$ , which is paid to him/her by the employer, job security ( $S$ ), and an understanding of the regulations ( $L$ ) in the labour market.

Effects of various variables on absenteeism

Proposal 1: Effect of a variation of the salary rate  $\omega$  in other markets on teacher absenteeism

$$\frac{da_i}{d\omega} = -\frac{U'(d)}{\varphi'_{a_i}} [1 - a_i \omega R_A] \quad (4)$$

Given the absenteeism of the teacher is within its tolerance limits to the risk of absenteeism ( $\tau = \frac{1}{\omega R_A}$ ), an increase in the salary rate proposed in the market increases teacher absenteeism in order to go and work in the other market.

Proposal 2: Effect of job security ( $S$ ) on teacher absenteeism

$$\frac{da_i}{ds} = -\frac{\partial^2 c}{\partial a_i \partial S} / -\varphi'_{a_i} \geq 0 \quad (5)$$

(because assuming,  $\frac{\partial^2 c}{\partial a_i \partial S} \leq 0$  et  $\varphi'_{a_i} \leq 0$ )

An improvement of employment security leads to an increase in absenteeism by the teacher who goes to work in another market. More specifically, the permanent teachers would tend more towards absenteeism than those hired on contract.

Proposal 3: Impact of the understanding of the regulations ( $L$ ) on teacher's absenteeism

$$\frac{da_i}{dL} = -\frac{\partial^2 c}{\partial a_i \partial L} / -\varphi'_{a_i} < 0 \quad (6)$$

(because assuming,  $\frac{\partial^2 c}{\partial a_i \partial L} > 0$  et  $\varphi'_{a_i} \leq 0$ )

A better understanding of the regulations (the laws).

Proposal 4: Effect of the salary level ( $R_0$ ) on absenteeism by the teacher

$$\frac{da_1}{dR_0} = \omega \frac{U''(d)}{-\varphi'_{a_1}} \leq 0 \tag{7}$$

(because assuming  $U$  is inverted and  $\varphi'_{a_1} \leq 0$ )

The improvement of the salary of a teacher contribute in reducing their delinquency caused by their need to go and work elsewhere.

## Empirical specification

Literature on the analysis of absenteeism gives rise to the use of several econometric methodologies. The choices are justified as well according to the nature of the explained variable, which is absenteeism according to the econometric problems that could arise from the data used. In the specific case whereby we explain the absenteeism of teachers by placing a particular emphasis on the impact of income they earn from activities that are outside their professional domain, let us assume that:

$a_i$ : absenteeism by the teacher, measured by the percentage of days missed; the teacher missed classes out of the number of official working days during a given period;

$X$ : A vector of  $k$  variables among them the type of contract of the teacher, an indicator of job security (indicated by  $S$ ), the monthly salary of the teacher (indicated by  $R_0$ ), income from activities other than teaching (indicated by  $\omega$ ), which gives

$$X = (X_1, X_2, \dots, X_{k-3}, S, R_0, \omega) \tag{8}$$

The model of absenteeism of the teacher could thus be written as:

$$a_1 = f(X, \varepsilon_1) \tag{9}$$

Or in the linear form:

$$a_1 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_{k-1} X_{k-3} + \beta_{k-2} S + \beta_{k-1} R_0 + \beta_k \omega + \varepsilon_1 \tag{10}$$

Two problems that frequently occur during the estimation of econometric models are potentially present here. These are the problem of collinearity between explanatory variables and the problem of the endogeneity of some explanatory variables. Among the variables of interest to our study, the case of income earned from another source is particularly preoccupying.

Contrary to the PASEC survey that was undertaken during the academic year 2004-2005, which provided information on the level of this income, PASEC 2014 did not give the income earned from other sources. By default, it provided information on the undertaking of these activities. If income earned from other sources is potentially endogenous, the practice of activities that generate this income is also endogenous



because it depends, in the case of the concerned party, on transferred income, more or less, on the choice of working hours of the teacher. One could also justify the endogeneity of the income generating activity through the fact that the need to make ends meet by supplementing income from the main work activity, which is considered to be too low to meet the needs of the teacher, could lead the teacher to have a portfolio of extra activities, which generate income, that could considerably increase the purchasing power of the teacher; applying exogeneity in the practice of the income generating activity in these conditions would considerably reduce the estimated parameters in the absenteeism model with the practice of the income generating activity as an explanatory variable.

Another variable that is considered as endogenous in economics literature is that of the wages of the worker, and these wages are generally one of the explanatory factors of labour supply and therefore absenteeism, as is explained by Allen (1981, 1984); however, in the present study, the salary scale of teachers is well known and the variability in these salaries cannot be attributed to any play in the gap between supply leading to the determination of an equilibrium wage. In these conditions, applying a wage endogeneity does not seem very pertinent.

In all these cases, the wages of the teacher, as well as the practice of an income generating activity, form variables of standards of living that are generally suspected to have endogeneity in economic literature; in this specific case, it seems more justified to prioritize an eventual endogeneity bias at the level of income from activities outside the main job, rather than wage levels.

That said, it is important to explain the practice of these activities through a set of variables, thus the necessity of finding a vector of instrumental variables  $Z = (Z_1, Z_2, \dots, Z_q)$  in order to estimate the model of the practice of income generating activities according to Equation 9:

$$G = g(X, Z, \varepsilon_2) \quad (11)$$

Which is written in linear form as:

$$G = \delta_0 + \delta_1 X_1 + \delta_2 X_2 + \dots + \beta \delta_p X_p + \theta_1 Z_1 + \theta_2 Z_2 + \dots + \theta_q Z_q + \varepsilon_2 \quad (12)$$

The idea here is to find a vector of variables  $Z$  which could be correlated with the potentially endogenous variable (here the practice of extra activities ( $G$ )) but not correlated with either the error terms, or with the vector of explanatory variables.

In the case of the practice of extra activities, which in this case is potentially endogenous for several reasons (measurement bias, bias on the omission of variables, or bias of simultaneity), an instrument that verifies the conditions of correlation with the practice of extra activities which is independent vis-a-vis the error terms and  $X$  explanatory variables, could be the level of prices. This hypothesis is based on studies undertaken by Clark et al. (2004) who in their estimation of collective labour supply emphasize the role of the standards of living on the out-of-work incomes of

households. Indeed, the practice of income generating activities for a worker has, as its main objective, the improvement of the income of the worker, income which should be dedicated to the consumption needs of the worker; since the consumption of the worker is found to be correlated to the level of prices (Antonin et al., 2017).

The level of prices is potentially non-correlated with the error terms that broadly regroup the variables that are not taken into consideration in explaining the absenteeism of the teacher (competency, health status of the teacher, etc.); these different variables being linked in an intrinsic manner to the teacher as an individual, one could argue that there is mutual exclusivity between them and the level of prices, which are macroeconomic variables and therefore dependent on the economic status of a country.

Finally, we could argue that the level of prices in the locality where one teaches is correlated to their absenteeism. Indeed, assuming that the wages of the teacher have not changed in the short term, a high level of prices would have the consequence of lowering their purchasing power. The search for an improvement of their purchasing power could thus lead the teacher, all other things remaining equal, to carry out income generating activities so as to earn additional income which would allow them to improve their standards of living.

In relation to these elements, the price levels could presumably be used as an instrument. The tests of the validity of the instruments (notably the test of predicted values) allow for an empirical determination of the quality of the instrument.

An estimation of model (12) enables us to obtain the predicted values  $\varepsilon_{2\_pre}$  of  $\varepsilon_2$  which, once stated in Equation 10, gives:

$$a_t = \varphi_0 + \varphi_1 X_1 + \beta \varphi_2 X_2 + \dots + \varphi_{k-3} X_{k-3} + \varphi_{k-2} S + \varphi_{k-1} R_{0i} + \varphi_k G + \rho \varepsilon_{pre} + \pi \quad (13)$$

This estimation procedure is known as estimation by the method of instrumental variables.

## Description of variables of the model

The dependent variable is absenteeism of the teacher during a reference period. The reference period in this case is a period of one month or the 30 days preceding the survey.<sup>2</sup>

The explanatory variables of interest and within the data that is generally available are the monthly wages of teachers ( $R_{0i}$ ), the practice of income generating activities ( $G$ ), and job security ( $S$ ) represented by the type of contract under which the teacher has been employed. To these variables of interest, we add a set of control variables which are related to the socio-demographic characteristics of the teacher, their level of education, the number of years they have practiced teaching, their professional training, the type of school where the teacher works, the perks received by the teacher,

the existence of a Parent-Teacher Association (PTA) in the school, the variables of job satisfaction, and the union to which the teacher belongs. One could thus describe the variables of the model as follows:

- *The monthly salary of the teacher*

The monthly salary of the teacher is the stable component of the income of the teacher; according to the theory of permanent income (Friedman, 1957), the fact that its stability in the period on one's active working life, the monthly salary is a reflection of the permanent income that governs the consumption function of the individual. Thus, if the salary of the teacher is low, their consumption will have a tendency to decrease; in order to increase and stabilize their consumption level, the teacher could perhaps be forced to come up with extra activities that are likely to bring in income; in order to do so, they would have the tendency to absent themselves and dedicate their period of absence to the practice of those activities. We therefore argue that the salary of the teacher has a negative effect on their absenteeism, just like is stated in proposition 4.

- *The practice of income generating activities by the teacher*

The practice of income generating activities by the teacher is aimed at procuring extra income for the teacher. These activities are business, agricultural labour, home tuition, among others. The impact of extra income has been highlighted theoretically as well as empirically by Allen (1981, 1984) and the results show a positive effect on this income on the period of absence at work. We expect, in the case of this study, to have a positive effect in terms of the practice of income generating activities on the frequency of absenteeism by the teacher.

- *Job security*

Job security is captured through the type of contract under which the teacher has been employed. It could be a permanent or temporary contract.

- The status of permanent refers to those teachers recruited by their employer to be permanent public servants, benefitting from all the privileges accorded to public servants.
- The status of temporary contract (public or private) is that under which some teachers have been recruited by the government on short-term contracts which are renewable under some conditions, or been hired by Parent-Teacher Associations (PTA) in collaboration with schools in order to alleviate the shortage of teachers in government schools that cannot provide an adequate number of teachers. Thus presented, the type of contract seems to be a proxy to job security besides wages, and to the extent that a more secure job by nature makes the worker more assiduous, we expect that the temporary contract status is more likely to lead to work absenteeism.

The control variables are:

- *The characteristics of the teacher*

These are age, sex and marital status.

- **Age:** When the teacher is of an older age, they have more ambitions to realize and could, due to that fact, be tempted to create more financial sources for themselves in order to meet their needs; one of the means by which they can achieve this objective, when their wages are not enough, is to be absent at certain periods in order to focus on other income generating activities, notably business, home tuition, and all other activities that are likely to generate them income. We thus expect that age would have a positive effect on the frequency of absenteeism by the teacher.
- **Sex:** It is proven that women generally have a higher tendency to be absent from work especially for reasons related to their marital life, notably the health care of their younger children. On the basis of Allen (1981, 1984), Leigh (1985, 1991), Drago and Wooden (1992), and Paringer (1983), we expect that these women will be absent more often than their male counterparts.
- **Marital status:** The effect of the marital status on absenteeism as is discussed in research articles remains ambiguous; indeed, the single teacher could have more future ambitions and thus present higher cases of absenteeism in a context whereby the wages are low, so as to create extra income streams. Equally, the married teacher on his/her part experiences serious financial difficulties in the context of low salaries and consequently would not likely to adopt a wait and see behaviour, but would more likely come up with a defence mechanism vis-a-vis the precarious situation that he/she is facing, and consequently would be absent more often, so as to create extra income streams. The expected effect of this variable of absenteeism therefore is in both directions.

- *Level of education*

The teacher could be of an education level that is lower than BEPC, be at the level of BEPC, or have a level of education that is higher than BEPC. Teachers who have a level of education that is higher than BEPC (O' level and higher) generally have the ambition to continue with their studies in order to teach at a level higher than primary school; primary school teaching therefore becomes for them an interim job, that would enable them to obtain higher level education in order to obtain other opportunities. Contrary to them, those who do not have the BEPC level of education would generally not have such ambitions; we therefore expect that the latter would tend to absent themselves from class less frequently than the former.

- *The degree of experience of the teacher*

The degree of experience of the teacher translates to the duration during which the teacher has been employed in the profession. This professional experience allows them to get used to the professional environment and sometimes to develop relationships within the educational establishment. Thus, we argue that the absenteeism of the teacher will increase with their professional experience.

- *Professional training of the teacher*

Through professional training, the teacher acquires pedagogy practices that are of the nature to make him/her more effective in the practice of their profession. According to d'Aiglepiere (2011), an increase in professional training leads to a reduction in the rate of absenteeism of teachers. Building on the works of this researcher, we assume that professional training of a teacher will have a positive effect on absenteeism.

- *The type of school*

The school where the teacher works could be a public school where the teachers are employed by the government, or a private school (secular or mission) whereby the teachers are thus employed by private investors or religious organizations. In terms of the difference in programme rigour in management between public schools and private ones, we argue that the teachers in public school would tend to be more absent than those in private schools.

- *The geographic location of the school*

The school could be situated either in an urban area or rural area. The effect of the geographic location of the school is a priori indeterminate. Indeed, according to literature, the situation of a school in an urban area could positively or negatively influence the absenteeism behaviour of the teacher. All depends on the context in which the education system of the country is to be found.

- *The existence of a Parent-Teacher Association in the school*

Parent-Teacher Associations are organizations that are heavily involved in the management of schools, not only through the controls that they exercise on financial management of these establishments, but also on the control they exercise in the behaviour of students and teachers in these establishments. In certain areas, they also contribute to the payment of the teachers that they directly recruit in order to alleviate teacher shortages. We could therefore expect a positive effect on the absenteeism of teachers from schools due to such associations.

- *The variable of job satisfaction*

Job satisfaction according to Locke (1976) is an emotional state that is agreeable or positive that results from an evaluation undertaken by a person on their work or their experiences at work. Even though the definition by Bennion and Locke (2010) is the most frequently used, a review of the literature on the concept of job satisfaction has been done by Randon (2010), a review according to which the measurement of job satisfaction is more and more undertaken in terms of the satisfaction index.

The effect of job satisfaction on absenteeism has been widely discussed in literature, notably by Freeman (1978), Borjas (1979), and Afssa and Givord (2006); in general, a worker who is less satisfied with his work conditions would tend more towards absenteeism from work than a worker who is more satisfied by his work; thus in measuring the satisfaction of a teacher at work by his/her perception index on the conditions of work, one expects that a higher index of satisfaction on job conditions reduces absenteeism by the teacher.

- *Trade union membership by the teacher*

The role of trade unions has also been debated in literature since the earlier studies by Allen (1984), and those by Chaudhury and Ng (1992), and the empirical facts show a higher propensity of unionized workers towards absenteeism, lack of job satisfaction being highest amongst unionized workers (Borjas, 1979; Allen, 1984; Freeman, 1978). We assume in our study that the fact that the teacher is affiliated to a union will increase the frequency of absenteeism.

Besides these different variables, we will use in our estimations the level of prices in the locality of the teacher; indeed, in regard to the discussion on methodology, this price level is potentially an instrument in the correction of endogeneity in the practise of side activities by the teacher with the aim of earning additional income in order to improve their standards of living.

Table 1 presents a summary of the description of variables.

**Table 1: Description of variables**

Categories of variables	Variables	Modalities
Absenteeism by the teacher		
	tx_absence	Percentage (from [0,1])
Salary of the teacher		
	salaire_inf=90000	1 if the salary is lower or equal to 90000, 0 if not
	salary_90_119	1 if salary is within [90000, 120000], 0 if not
	salary_120_149	1 if salary is within [120000, 1500000], 0 if not
	salary_150_199	1 if salary is within [150000, 200000], 0 if not
	salary_250_299	1 if salary is within [250000, 20000], 0 if not
	salary_300_349	1 if salary is within [300000, 350000], 0 if not
	salary_350_399	1 if salary is within [350000, 400000], 0 if not
The practice of income generating activities		
	IGA	1 if the teacher practices an IGA, 0 if not
<b>Type_IGA</b>	AGRICULT	1 if the teacher engages in agricultural labour, 0 if not
	COMMERCE	1 if the teacher engages in trade, 0 if not
	REPETIT	1 if the teacher does home tuition, 0 if not
<b>Job security</b>		
	mt_contractuel	1 if the teacher works on contract, 0 if not
	mt_permanent	1 if the teacher has a permanent job, 0 if not
Socio-demographic characteristics of the teacher		
	mt_age	In years
	mt_homme	1 if the teacher is male , 0 if not
Level of education of the teacher (reference)		
	mt_max_2nde	1 if the highest was classe de seconde, 0 if not
	mt_max_tle	1 if the highest was terminale , 0 if not

	mt_max_1ere	1 if the highest was 1ère, 0 if not
	mt_max_bac_2	1 if the maximum is Bac plus 2 , 0 if not
	mt_max_bac_3	1 if the maximum is Bac plus 3 , 0 if not
	mt_max_bac_4p	1 if Bac plus 4 or higher , 0 if not
Professional training of the teacher		
	mt_aucune_pedag	1 if there is no professional training, 0 if not
	mt_ceap	1 if the teacher has CEAP, 0 if not
	mt_cap	1 if the teacher has CAP, 0 if not
Professional experience of the teacher		
	mt_experience	In years
Type of school		
	ecole_publ	1 if the school is public, 0 if not
	ecole_priv_confess	1 if the school is a private mission school, 0 if not
	Ecole_priv_laïque	1 if the school is a secular private school, 0 if not
The geographic location of the school		
	ecole_ville	1 if the school is in the urban area, 0 if not
	ecole_rural	1 if the school is in the rural area, 0 if not
The existence of a Parent-Teacher Association in the school		
	PTA	1 if the school has a PTA, 0 if not
<b>Satisfaction of the teacher</b>		
	mt_indice_ct	In [0,1]

Source: Author (2019).

## Data

The data used is derived from the database of the PASEC survey carried out in Benin in 2014-2015. This database contains information on teachers, students, and school classes in public as well as private schools. The data concerning teachers will be used in the framework of our estimations. These data will be supplemented by information on the level of prices, which will be obtained from the National Institute of Statistics and Economic Analysis (INSAE) and from information collected from actors in the education system and civil servants working in the ministry of finance.

# 5. Presentation of results, analysis and discussions

## Descriptive statistics

According to the data in Appendix 2, on average, a primary school teacher is absent for almost two days per month. The reasons for their absence are diverse: we can distinguish between, among other things, absences in order to engage in income generating activities which are at a high level of priority, absence for administrative formalities under the framework of career management, and absences due to illness. A majority of teachers, close to 52%, have 1ère as their highest level of education. About 70% of teachers have a CEAP as their professional diploma. The sample comprises 60.75% permanent teachers, the average number of years of professional experience being 18.15 years of service. Almost 21.51% of these teachers carry out activities outside their teaching hours. These activities are, among others, agricultural activities, artisanal activities, trade, and tuition classes. It is also important to note that 84% of the schools where these teachers work are public schools and 34% are located in urban areas.

## Analysis and discussion of the estimation results

In the context of this study, one could suspect problems of collinearity between explanatory variables and absenteeism of the teacher; it is the case, for example, for the possibility of collinearity between the salary of teachers and their level of education. Indeed, according to Mincer (1974), the salary of individuals is strongly correlated with the number of years of education of individuals. This collinearity is highlighted by Mincer through what the author calls Mincer's gain function that justifies why we are interested in the collinearity between the salaries of teachers and their education level, if the nature of data allows for it. However, due to the fact that a good number of explanatory variables are qualitative, it is difficult to highlight this using basic data. The existence of quantitative information on the basic variables would thus make it possible to make formally evident the collinearity between these variables.

Besides the problem of collinearity between variables, another fundamental problem is that of the endogeneity of various explanatory variables. That said, in



conformity with the planned methodology, a test of endogeneity was carried out for the practice of income generating activities by the teacher in addition to their work as a teacher. Once the endogeneity test was undertaken, we estimated the teacher absenteeism model. This sub-section gives the results of the endogeneity test and those of the estimation of the absenteeism model.

### ***Endogeneity test for the practice of income generating activities by the teacher***

The endogeneity test is important for two main reasons: first, the non-correction of endogeneity when there is an estimation bias of coefficients in the model. Secondly, correcting endogeneity when there is none, leads to high standard deviations, and consequently to less precision (Ribar, 1994).

There is a multitude of endogeneity tests of a variable in the estimation of a model. For purposes of this study, we use the endogeneity test of Nakamura and Nakamura (1981). It is a test of one of the two steps which, in the context of this study, allows us to determine the endogenous nature of the variable on the practice of income generating activities by the teacher. In the first step, the variable on the practice of income generating activities (*mt\_agr*) is regressed on the price index (IPRIX) in the locality where the teacher works and the exogenous variables of the absenteeism model. Consequently, the residues of this first step are recovered and included in the absenteeism model. The significance of the residue in the absenteeism model allows us to conclude the endogeneity of the variable of the practice of income generating activities on the income of the teacher (*mt\_agr*).

According to the results of the estimation presented in the appendix, the coefficient of the residue of the first step is significantly non-zero (with a *t* of student of -7.68) in the model of the second step, thus confirming the endogenous character of the variable of the practice of income generating activities (*mt\_agr*). Further, one could conclude that, due to the result of the first step, the price index has a positive effect on the practice of income generating activities by the teacher, and overall, in regard to the very low salary, that high salaries have a negative effect on the variable of the practice of income generating activities (*mt\_agr*).

On the basis of these results, one could confidently estimate the model of teacher absenteeism by considering the variable of income generating activities (*mt\_agr*) as endogenous. The result of the estimation of the model of absenteeism by the teacher in this hypothesis of the endogeneity of the variable of the practice of income generating activities (*mt\_agr*) is presented and discussed in the sub-section that follows.

### ***Results of the estimation of the model of teacher absenteeism***

Teacher absenteeism is measured here in terms of frequency. Indeed, the explained variable is that of the proportion that represents the number of days of absence by the teacher in the total number of working days in the four weeks prior to the survey. On this basis, the explained variable is found to be measured through these proportions

and is therefore between 0% and 100%.

Furthermore, there are a large number of individuals for whom absenteeism is zero, these individuals not having been absence at all during the period under study. The fact that the absenteeism of the individual is zero is not in this case an indication of the fact that information is unavailable, but more the consequence of a rational choice by the individual; it is therefore not a censure case, but more of an example of a probable solution. Such a constraint on the explained variable leads us to the use of a Tobit model with the probable solution in order to estimate the absenteeism model.

The result of the estimation of the teacher absenteeism model as derived from a theoretical analysis model is presented in Table 2.

**Table 2: Results of the estimation of the Tobit absenteeism model**

Categories of variables	Variables	Coefficients	t of Student
Practice of IGA			
	mt_agr	.1341525 **	8.34
Type of activity (Reference: REPETIT)			
	AGRICULT	.0578733**	5.71
	COMMERCE	.0622566**	3/30
Socio-demographic characteristics of the teacher			
	mt_age	-0.014672	-1.44
	mt_man	0.0313638**	2.73
Level of education of the teacher (reference: mt_max_2nde)			
	mt_max_tle	0.1492075**	5.36
	mt_max_1ere	.021845**	2.03
	mt_max_bac_2	-.0486023**	-3.05
	mt_max_bac_3	.0578933**	3.90
	mt_max_bac_4p	.0406315**	2.09
Professional training of the teacher (reference: mt_aucune_pedag)			
	mt_ceap	.0622969**	3.94
Status of the teacher (reference: mt_permanent)			

	mt_contractuel	.086265**	4.51
Professional experience of the teacher			
	mt_experience	.0041803**	3.27
Salary of the teacher (reference: salary_inf=90000)			
	salary_90_119	-.1521505**	-3.36
	salary_120_149	-.0564328**	-3.12
	salary_150_199	.0181644	1.18
	salary_250_299	-.0027437	-0.12
	salary_300_349	-.0099236	-0.53
	salary_350_399	-.0201324	-1.24
Type of school (reference: ecole_priv)			
	ecole_publ	.1426362**	5.39
Geographic location of the school (reference: ecole_rural)			
	ecole_ville	.0079105	0.89
Satisfaction of the teacher			
	mt_indice_ct	-.0033295**	-6.30
Existence of PTA			
	PTA	-.1521508	-2.33
Residue of the IGA model			
	mt_agr_res	-.00964**	-7.68
	_cons	-.0891378	-1.57
Number of respondents		2543	
LR chi2(21)		433.45	
Prob> chi2		0.0000	

\* Significant to a threshold of 10% .      \*\* Significant to a threshold of 5%.

Source: Author from results of estimations.

## **Impact of the status of the teacher on the practice of income generating activities**

In light of the first results obtained, the practice of income generating activities by teachers significantly depends on the status of the teacher as is indicated in the prices within the locality where the teacher works and resides. Indeed, according to the results of the first step of the endogeneity test in the practice of IGA, the contractual status of the teacher has a positive and significant impact on the practice of income generating activities by the teacher, together with the positive effect of the price index on the likelihood of practicing income generating activities. One therefore understands that the weakness of purchasing power of the contract teacher whose salary perks are already quite limited when compared to those on permanent employment, could lead these teachers to carrying out income generating activities in order to earn additional income that is likely to improve their purchasing power.

## **Determinants of the frequency of absenteeism by a teacher**

Absenteeism by a teacher is assumed to depend, according to the theoretical model developed as a methodology, on variables such as other forms of income that the teacher could earn in other markets where they could go to work while absenting themselves, on the job security of the teacher, on the understanding that they have of the regulations, and on the salary that they earn for working as a teacher.

### *- Effect of income earned from other markets on the absenteeism of the teacher*

Given that the income that the teacher could earn in other markets through their absenteeism was not available in the database, and assuming that this income is only earned by teachers who engage in income generating activities, the practice of income generating activities was retained as a proxy of extra income from non-teaching activities. On this basis, the estimations show that the practice of income generating activities by the teacher have a significant and positive impact on absenteeism by the teacher, which is in conformity with proposition 1 (see Equation 3), according to which inasmuch as the absenteeism of the worker is within the tolerance limit of the risk of absenteeism ( $\tau = \frac{1}{\omega RA}$ ), an increase in the salary rate proposed in another market increases the absenteeism by the worker at their contracted job in order for them to go and work in the other market. This result is also similar to that obtained by Allen (1981) who forecasts a positive effect by other forms of income generated by the worker during their absenteeism, which is considered as a normal good.

We could also note, according to these results, the practise of business activities and agricultural activities by the teacher, which favour the absenteeism of the latter. These are activities which in general take place during the time when the teacher should be present in class; thus the involvement by the teacher in these types of activities means that there is a reduction in the time that the teacher has dedicated to their regular job. The availability of information on absenteeism of the teacher over

the entire year would allow us to know whether the practice of agricultural activities, especially during the planting season, would have a higher impact on the absenteeism of the teacher. Unfortunately, the available data only covers a period of one month.

- *Effect of job security of the teacher on teacher absenteeism*

Job security is approached in the database through the type of contract of the teacher. Indeed, contract employment is less secure than a permanent job, to the extent that, not only does contract employment have salary conditions that are far from ideal as compared to permanent employment, but also the renewal of contracts is not automatic. On this basis, the results of the estimation show that contract teachers are more frequently absent compared to teachers on permanent employment, thus refuting proposition 2 (counterpart Equation 4) according to which an improvement in job security leads to an increase in the absenteeism of the worker in order for that worker to go and work in another market (which specifically means that workers without permanent employment will have a higher tendency towards absenteeism than those who are hired on short-term renewable contracts. Such a result, however, needs more in-depth examination.

- *Effect of the salary level on absenteeism by the teacher*

According to the results of our estimations, compared to teachers with lower salaries, teachers who have higher salaries are absent less frequently, results which agree, not only with the theoretical assumptions according to proposition 4 (counterpart Equation 6) according to which an improvement in the salary of the worker contributes to a reduction of the frequency of their absenteeism in order to go and work in another market, but also theoretical formulations given by Allen (1981). It follows that a policy on the reduction of absenteeism by teachers could lead to a reevaluation of the function of the teacher through an improvement of the salary scales of the teachers.

- *Other determinants of absenteeism by teachers*

Further to the main determinants identified on the basis of the theoretical model, teacher absenteeism is, according to the results, dependent on other variables such as the gender of the teacher, the type of school and the level of job satisfaction of the teacher in regard to their work conditions.

In terms of the gender of the teacher, the estimations show that men are more prone to absenteeism than women. It can be said that in the African context in general and that of Benin in particular, households are generally headed by men, which then demands more financial resources from them; we understand that in a context of low salaries, they would absent themselves more when there is a lack of control measures by the employer, in order to go out in search of extra income.

Teachers in public schools are more prone to absenteeism than those in private schools. This is not a surprising result, in that the phenomenon of absenteeism has always been more significant in the public sector whereby the workers are generally

known for their absenteeism, contrary to the private sector where there are known to be rigorous controls from the employers who, for the objectives of profitability and effectiveness, would have the general tendency to put in place rigorous mechanisms in order to monitor the assiduity of the worker.

The existence of a PTA in the school is a determinant of the absenteeism by the teacher. And indeed, through the fact of the involvement of the PTA in various aspect of school management, one could understand that the desire of parents to have their children succeed could lead the parents of students to be more observant of the behaviour of teachers. This result confirms those arrived at by PASEC (2014) according to which in rural areas, the parents of students, sometimes give donations in kind (farm produce, for example) to teachers in order to facilitate them to spend more time teaching their children. According to the same results by PASEC, PTAs generally contribute financially to the remuneration of contract teachers hired locally, in order to alleviate the shortage of teachers in places where the numbers are wanting. In such conditions, they exercise rigorous monitoring of the behaviour of the teachers, which then leads to a reduction in the likelihood of teachers being absent from work.

Finally, increased job satisfaction by the teacher negatively affects absenteeism by the teacher, which is a logical result that gives impetus to the need to put in place better working conditions, as is generally demanded by corporations in their guidelines. However, if one refers to studies by Hamermesh (1977), job satisfaction is dependent on a set of variables that are linked to working conditions as well as socioeconomic variables. The availability of more information in the database would have allowed us to take this endogeneity into account.

## **Estimation of the social costs of absenteeism**

The cost of absenteeism to the society is a major preoccupation in the analysis of teacher absenteeism. The evaluation of this cost is of immense complexity, and the studies that have undertaken this in economics literature generally did so on the basis of basic assumptions (Lessard & Barrère, 2002; Maroy, 2006; Tardif & Lessard, 1999; Tournier, 2011). These hypotheses in general distinguish the costs in terms of loss in teacher's working hours that are dedicated to training of learners, wastage of financial resources by the employer because of salary payment for incomplete work by the teacher, a lowering of productivity in terms of the products from the education system in the labour market. The specifications in the calculation of these costs depend on the nature and the availability of the data used.

In this study, due to the lack of statistical data obtained from analyses, interviews carried out by actors in the education system, notably school heads, Parent-Teacher Associations (PTA), and public servants from the ministry of finance allowed us to highlight the cost of absenteeism of teachers in terms of losses in teaching of learners, and in terms of wastage of financial resources by the employer through payment of salaries for work that was not completed by the teacher.

## ***Cost of absenteeism on the training of learners***

According to interviews carried out on school heads and Parent-Teachers Association, teacher absenteeism tremendously reduces the learning time that students would benefit from in the course of a year. If, as data shows, a teacher absents themselves by an average of 10% of regulation time, according to education managers, notably school heads, this translates, not only to a programme incompleteness rate of 10%, but also to a poor understanding of the completed part of the programme, because the teachers are mostly forced to accelerate the pace of their teaching towards the end of the year in order to catch up with the time lost during their absence. Furthermore, the impact of absenteeism on the training of learners does not stop with the class taught by the teacher, but also spills over to the subsequent years, which then leads to high failure rates by entire classes in their final examinations.

### Information Box 1:

... Secondly, there are teachers who skip classes for various reasons. “I had problems in mathematics and French” says Jean-Carol, a student in Terminale D who reveals that the maths teacher did not come to class regularly and toward the end of the year he increased the frequency of make-up classes which however did not explain things in-depth.” Just like him, Flora H in 1ère A, is a victim of the absenteeism of her French language teacher. “I have gaps in French because last year our French teacher did not attend class regularly”, said the young girl, according to whom, “teachers should attend classes regularly”. They have to finish their programmes so as to allow us to be up to speed before moving on to a higher level class.

Source: Bénin Education, enseignants, brebis galeuses de l'école, reportage du Ministère de l'enseignement secondaire et de la formation professionnelle.

## ***Cost of absenteeism on the national budget***

The cost of absenteeism is not borne solely by the learners; the budget of the government, which uses teachers, is also affected by this phenomenon. Indeed, in the context of the public service through which public school teachers are employed, salaries are decided through regulations and therefore are not a function of the number of days of work effectively performed by the teachers. In this context, even the skipped days would be paid to teachers although they did not do their work effectively. Assuming that 10% of classes were missed, according to the data examined, one could note that, on average, 10% of salary is unduly paid to teachers. Compared to the total number of teachers in the primary school education system, this corresponds, according to the estimations by officers from the ministry of finance, to an average figure of 11,405,164,800 per year. If one takes into consideration the fact that these resources could be used otherwise in order to improve the education system for

teachers or to ensure the availability of infrastructure and equipment for schools, one realizes the substantial cost of absenteeism of teachers to the government's budget. The operationalization of measures aimed at effectively fighting against this scourge is therefore a necessity in order to mitigate this source of inefficiency in public expenditure that affects the education system of countries with heavy and persistent budget constraints that limit actions in favour of social services.



## 6. Conclusions and policy recommendations

In formulating this study, on the basis of the tremendous costs incurred through absenteeism, not only to economies in general, but especially on the performance of the education system, our objective was to highlight the role played by the practice of income generating activities of the teacher on their absenteeism frequency. An analysis of the absenteeism of the teacher reveals to us that, in regard to teaching in primary schools of Benin, contract teachers are more prone to absenteeism than their permanently employed colleagues; an important observation noted from our results is that the status of the teacher changes through the channel of the practice of income generating activities by the teacher, a practice which is furthermore influenced by the price levels, to impact on their absenteeism. Therefore, in order to compensate for the relatively low levels of their salaries, contract teachers generally engage in income generating activities on which they spend their working hours, leading to their delinquent behaviour. Furthermore, we can note from this study, the necessity, not only of improving the salary conditions of teachers, but also of putting in place better working conditions for them in order to reduce absenteeism among them.

The present study, however, has a certain number of limits; indeed, the question of endogeneity of the explanatory variables, even if it was handled using various variables, still needs further analysis through the inclusion of more variables, notably that of the job satisfaction of the teacher. Indeed, if one refers to studies by Hamermesh (1977), job satisfaction is dependent on a set of variables that are linked to working conditions as well as socioeconomic variables. The availability of more information in the database would have allowed us to take this endogeneity into account.

Regardless of these limits, through additional analysis, we could, on the basis of the first set of results obtained, carry out simulations in order to evaluate the impact of policies of revaluating of the teaching function could have on the absenteeism of teachers, and therefore on the effectiveness of their educational expenses, notably expenses related to the payment of salaries.

The results obtained inspire a number of recommendations. To this effect, we recommend:

- An improvement in the salaries of teachers in order to strengthen their purchasing power in a context of improving their standards of living, all the while improving the aspect of improving the monitoring of their absenteeism from school. Indeed,

the results obtained demonstrate that the level of salaries has a negative impact on the frequency of absenteeism by teachers, and the teachers who engage in income generating activities besides their work as teachers are more prone to absenteeism. If the practice of these activities is aimed at allowing the teacher to improve their real income, efforts engaged in by public authorities in terms of improving the salaries of teachers could be explored in order to reduce the practice of income generating activities by teachers in order to allow them to dedicate more time to engaging in their work as teachers in order to ensure better internal efficiency within the education system. This recommendation is in agreement with the efforts engaged in by the government in order to improve employment within the education system by reducing the hiring of teachers on temporary contracts. Besides, a look at the results of the PASEC 2014 performance test shows a considerable drop in student performance in Benin over the period 2005-2014 and that one of the reasons for this decline is the way that Benin handled the contract employment of teachers in its education sector. It should, however, be noted that budgetary constraints that are experienced in the country, just like in all the other countries in the sub-region, could limit the possibility of an improvement of salaries, but it is imperative that the government makes a choice between maintaining the education system and the respect of local standards in terms of the raising of the wage bill.

- An improved monitoring of the practices in the public education sector; indeed, teachers in the public sector appear to be, according to the results, more prone to absenteeism than their colleagues in the private sector. Improved administration in the sector of public teaching could be an alternative in order to reduce teacher absenteeism in the public sector. In the private sector, teachers are more closely monitored and thus cannot easily absent themselves for reasons that are not valid, whereas in the public sector, the monitoring of the assiduity of the teacher is not a current practice, as is the case within the larger public service sector. Teaching in public schools therefore needs the operationalization of a series of reforms that will target the disciplining of actors in various levels of management in the education system for ensuring more rigour in terms of monitoring in the sector.
- In addition to the salary conditions of the teachers, it is important to put in place a raft of measures aimed at improving job satisfaction of teachers in the practice of their functions. With this in mind, an improvement in working conditions notably efforts in terms of the reduction of the number of students in each class, the availability of work tools, the construction of quality infrastructure, the improvement of accessibility of schools, and a better collaboration between professional trainers and teachers in terms of classroom situations, between heads of schools and their teaching staff, are some of the measures to prioritize in order to keep teachers in their classrooms during working hours and to make students benefit from the contribution of these teachers.

These recommendations are, in regard to the nature of the results obtained, important in terms of reducing the frequency of absenteeism by teachers. However, it is important to specify that the attainment of the objective of the reduction of absenteeism of teachers following the implementation of these policies is dependent upon the monitoring that the various actors that are in charge of the sector would implement. Indeed, a policy, however well thought out, only produce success to the extent of the monitoring measures followed in its implementation.

## Notes

- 1 Statistics from the Ministry of Administrative and Institutional Reform, 2005.
- 2 This is the PASEC (2014) survey.

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# Appendixes

## Appendix 1: Theoretical model for the analysis of absenteeism by the worker

The analytical model of determinants of absenteeism by the worker is a derivative of the reactions of his/her absenteeism behaviour towards modifications in the factors that influence this behaviour. In this context, let us consider worker T who is in a contractual relationship with an employer E. The terms of the contract between worker T and his/her employer E define the remuneration  $R$  of the worker. We assume that two situations are possible:

- i. Remuneration  $R$  is fixed, independent of the duration of the work effected by the worker. So  $R = R_0$ ;
- i. The worker receives a wage  $R$ , a function of the effective duration of the work done  $a$ , the period of absenteeism  $a_1$  in the course of the period that was not remunerated. In this case, we have  $R = wa_1w$ , being the salary rate according to the contract terms.

By being absent during a period of time  $a$  ( $a = \delta - a_1$ ,  $\delta$  being the time period of the contractual labour and  $a_1$  the effective work duration) the worker has two alternatives for their usage of time;

- i. Use their period of absence  $a$  to work elsewhere in order to earn supplementary income  $R_a$ . If labour in the second workplace is remunerated at a rate of  $\omega$ , the remuneration of the teacher in the market over the period  $a = a_1$  is  $R_a = \omega a_1$ .
- i. Dedicate their period of absence to leisure (we indicate  $a_m = a$  the leisure time)

The crossing of the two possible models of remuneration with work at their main workplace and the two possible uses of their period of absence allows us to distinguish four situations with each as a function  $V(\cdot)$  that the worker will maximize in order to determine his/her period of absence.



**Table A1: Utility functions of the worker according to the model of remuneration and the usage of their period of absence**

		Usage of period of absence	
		Working elsewhere	Dedicated to leisure
Payment mode	Fixed wage	$V(\cdot) = U(R_0 + \omega a_1) - c(a_1, S, L)$ (A1)	$V(\cdot) = U(R_0) + v(a_m) - c(a_m, S, L)$ (A2)
	Remuneration in terms of the effective period worked	$V(\cdot) = U[w(1 - a_1) + \omega a_1] - c(a_1, S, L)$ (A3)	$V(\cdot) = U[w(1 - a_m)] + v(a_m) - c(a_m, S, L)$ (A4)

Source: Author (2019).

Further to the variables  $a_i, a_m, W, \omega, R_c$ , previously defined,  $S$  and  $L$ , respectively, designate the index of main job security and the index of understanding of the regulations (the law).

$U(\cdot)$  is the labour utility function and depends on the income earned from the job.  $U(\cdot)$  obeys the usual conditions of a utility function

$$* U(\cdot) \text{ is increasing } (U'(\cdot) \geq 0) \text{ (A5)}$$

$$* U(\cdot) \text{ est an inverted U } (U''(\cdot) \leq 0) \text{ (A6)}$$

Equally,  $v(\cdot)$  is the utility function of leisure and fulfils the growth conditions:

$$(v'(\cdot) \geq 0) \text{ (A7)}$$

and that of the U inversion:

$$(v''(\cdot) \leq 0). \text{ (A8)}$$

$c$  is a function of the psychological cost faced by the teacher who absents themselves from their workplace, dependent on the assumption of the duration of absence on the job security index ( $S$ ) and the index of an understanding of the regulations ( $L$ ). We assume that:

$$* \frac{\partial c}{\partial a_1} \geq 0 \text{ et } \frac{\partial c}{\partial a_m} \geq 0 \text{ (A9)}$$

Indeed, absenteeism provokes psychological disturbance for the worker who is absent.

$$* \frac{\partial c}{\partial S} \leq 0 \text{ (A10)}$$

The relations A6 states that improved job security reduces the psychological cost of absenteeism.

$$* \frac{\partial c}{\partial L} \geq 0 \quad (A11)$$

(A7) only states that the more the awareness of the regulations, the higher the psychological cost of absenteeism to the worker.

$$* \frac{\partial^2 c}{\partial a_i \partial S} < 0 \text{ et } \frac{\partial^2 c}{\partial a_m \partial S} < 0 \quad (A12)$$

This relationship states that the marginal cost of absenteeism diminishes with the level of job security, that the duration of absence should be consecrated to working elsewhere or to leisure.

$$* \frac{\partial^2 c}{\partial a_i \partial L} > 0 \text{ et } \frac{\partial^2 c}{\partial a_m \partial L} > 0 \quad (A13)$$

(A9) states that the marginal cost of absenteeism diminishes with the index of understanding of the regulations, that the period of absence should be consecrated to working elsewhere or to leisure.

We can then resolve the problem of maximization of the worker in each of these cases:

**Case 1: The worker has a fixed salary  $R_0$ , and dedicates his/her period of absence to working elsewhere**

$$V(\cdot) = U(R_0 + \omega a_i) - c(a_i, S, L) \quad (Equation A1 \text{ of Table A1})$$

$$\text{By stating } d = R_0 + \omega a_i \quad (A14)$$

We can write Equation A1 of the utility function of the worker in a simplified form:

$$V(\cdot) = U(d) - c(a_i, S, L) \quad (A15)$$

(A14) is the equation of the total income of the worker.

$$V \left( \begin{cases} \frac{\partial V}{\partial a_i} = \omega U'(d) - \frac{\partial c}{\partial a_i} = \varphi(\omega, a_i, R_0, S, L) = 0 \end{cases} \right) \quad (A16) \text{ lity } V(\cdot)$$

$$\left( \begin{cases} \frac{\partial^2 V}{\partial a_i^2} = \frac{\partial \varphi(\cdot)}{\partial a_i} = \varphi'_{a_i} < 0 \end{cases} \right) \quad (A17)$$

The Equation A16 allows us to express the optimal duration of absence  $a_i^*$ :

$$a_i^* = a_i^*(\omega, R_0, S, L) \quad (A18)$$

The period of absence of the teacher which he/she entirely dedicates to working elsewhere in order to earn additional income is therefore a function of the salary rate

$\omega$  which is proposed to him/her elsewhere, the fixed wage  $R_c$ , which is paid to him/her by the employer, job security ( $S$ ), and an understanding of the regulations ( $L$ ) in the labour market.

Effects of various variables on absenteeism

→ Effect of the proposed salary rate proposed in another market ( $\omega$ ) on absenteeism

$$\varphi'_{a_1} da_1 + \varphi'_\omega d\omega = 0 \Rightarrow \frac{da_1}{d\omega} = -\frac{\varphi'_\omega}{\varphi'_{a_1}} \tag{A19}$$

$$\text{So } \frac{da_1}{d\omega} = \frac{U'(d) + a_1 \omega U''(d)}{-\varphi'_{a_1}} = -\frac{U'(d)}{\varphi'_{a_1}} \left[ 1 + \frac{a_1 \omega U''(d)}{U'(d)} \right] \tag{A20}$$

On the basis of the hypotheses of growth and the inverted U nature of  $U(\cdot)$  (see equations A5 and A6),  $R_A = -\frac{U''(d)}{U'(d)}$  represents Arrow-Pratt's coefficient of risk aversion (Arrow, 1965; Pratt, 1964) and verifies  $R_A \geq 0$ . We therefore have

$$\frac{da_1}{d\omega} = -\frac{U'(d)}{\varphi'_{a_1}} [1 - a_1 \omega R_A] \tag{A21}$$

Given that  $U'(d) \geq 0$  (see A5), and  $\varphi'_{a_1} \leq 0$  (See A17), the sign of  $\frac{da_1}{d\omega}$  is that of  $1 - a_1 \omega R_A$ .

Given  $\tau = \frac{1}{\omega R_A}$  the relative tolerance which measures the percentage of contracted time that the worker is allowed to be absent regardless of the resultant penalties (as an analogy of the risk tolerance as described in investment theories).

As long as  $a_1 < \tau$ ,  $\frac{da_1}{d\omega} \geq 0$  and the best salary rates proposed elsewhere have a positive effect of the absenteeism by the worker.

**Conclusion:** As long as the absenteeism of the teacher is within the tolerance limits of the risk of absenteeism, an increase in the salary rate proposed by another market increases teacher absenteeism in order to go and work in the other market.

→ Effect of job security ( $S$ ) on teacher absenteeism

$$\varphi'_{a_1} da_1 + \varphi'_S dS = 0 \Rightarrow \frac{da_1}{dS} = -\frac{\varphi'_S}{\varphi'_{a_1}} \tag{A22}$$

Either  $\frac{da_1}{dS} = -\frac{\partial^2 c}{\partial a_1 \partial S} / -\varphi'_{a_1} \geq 0$  because by assumption  $\varphi'_{a_1} \leq 0$  (see A12), and

$$\frac{\partial^2 c}{\partial a_1 \partial S} \leq 0 \tag{see A17}$$

**Conclusion:** An improvement in job security leads to an increase in absenteeism by the teacher in order to go and work in another market. More specifically, the workers employed on a permanent basis would be more prone to absenteeism than those on a renewable short-term contract.

→ Impact of the understanding of the regulations ( $L$ ) on teachers absenteeism

$$\varphi'_{a_l} \cdot da_l + \varphi'_L \cdot dL = 0 \Rightarrow \frac{da_l}{dL} = -\frac{\varphi'_L}{\varphi'_{a_l}} \tag{A23}$$

Either  $\frac{da_l}{dL} = -\frac{\partial^2 c}{\partial a_l \partial L} / -\varphi'_{a_l} < \mathbb{C}$  because by assumption  $\frac{\partial^2 c}{\partial a_l \partial L} > \mathbb{C}$  (see A13), and  $\varphi'_{a_l} \leq 0$  (see A17)

**Conclusion:** A better understanding of the regulations (the laws) by the worker is dissuasive towards their absenteeism; indeed, being absent in order to go and work elsewhere is thus seen by the worker as a wrongdoing which would be more heavily punished were the regulations more strict.

→ Effect of fixed salary  $R_0$  of the worker on absenteeism by the worker

$$\varphi'_{a_l} \cdot da_l + \varphi'_{R_0} \cdot dR_0 = 0 \Rightarrow \frac{da_l}{dR_0} = -\frac{\varphi'_{R_0}}{\varphi'_{a_l}} \tag{A24}$$

Because  $\frac{da_l}{dR_0} = \omega \frac{U''(d)}{-\varphi'_{a_l}} \leq \mathbb{C}$  assuming is  $U$  inverted and  $\varphi'_{a_l} \leq 0$

**Conclusion:** The improvement of the salary of a teacher contributes in reducing their delinquency caused by their need to go and work elsewhere.

**Case 2: The worker has a fixed salary  $R_0$ , and dedicates his/her period of absence to leisure**

$$\begin{cases} \frac{\partial V}{\partial a_m} = v'(a_m) - \frac{\partial c}{\partial a_m} = \varphi(a_m, S, L) = 0 & \text{(A25)} \\ \frac{\partial^2 V}{\partial a_m^2} = \frac{\partial \varphi(\cdot)}{\partial a_m} = \varphi'_{a_m} < 0 & \text{(A26)} \end{cases} \quad v(a_m) - c(a_m, S, L)$$

From  $\varphi(a_m, S, L) = \mathbb{C}$ , one derives the equation of absenteeism for leisure by the worker:

$$a_m^* = a_m^*(S, L) \tag{A27}$$

Absenteeism for leisure therefore exclusively depends on job security and the understanding of the regulations.

→ Effect of job security (S) on worker absenteeism

We obtain  $\frac{da_m}{ds} = -\frac{\varphi'_S}{\varphi'_{a_m}} = -\frac{\partial^2 c}{\partial a_m \partial S} / -\varphi'_{a_m} > \mathbb{C}$  (A28)

(A28) is justified because by assumption  $\frac{\partial^2 c}{\partial a_m \partial S} \leq C$  (see A12), and  $\varphi'_{a_m} < C$  (see A26)

**Conclusion:** An improvement in job security would increase absenteeism just like in case 1, the workers employed on permanent contract are more prone to absenteeism than those employed on short-term contracts.

→ Effect of the understanding of regulations (L) on absenteeism by the worker

$$\frac{da_m}{dL} = -\frac{\varphi'_L}{\varphi'_{a_m}} = -\frac{\partial^2 c}{\partial a_m \partial L} / -\varphi'_{a_m} < C \tag{A29}$$

**Conclusion:** Just like in case 1, a better understanding of the regulations (the laws) by the worker is dissuasive towards their absenteeism; indeed, being absent in order to go to leisure is thus seen by the worker as a wrongdoing which would be more heavily punished were the regulations more strict.

**Case 3: The worker is paid according to the effective duration of working hours and dedicates their time to working elsewhere**

$$V(\cdot) = U[w(1 - a_i) + \omega a_i] - c(a_i, S, L) \quad V(\cdot) = U[w(1 - a_i) + \omega a_i] - c(a_i, S, L)$$

(Equation A3 of Table A1)

Either  $V(\cdot) = U(d) - c(a_i, S, L)$   $V(\cdot) = U(d) - c(a_i, S, L)$  by giving

$$\left\{ \frac{\partial V}{\partial a_i} = (-w + \omega)U'(d) - \frac{\partial c}{\partial a_i} = \varphi(w, \omega, a_i, S, L) = 0 \right. \tag{A30}$$

$$\left. \left\{ \frac{\partial^2 V}{\partial a_i^2} = \frac{\partial \varphi(\cdot)}{\partial a_i} = \varphi'_{a_i} < 0 \right. \right. \tag{A31} \text{worker}$$

It is important to note here that, condition  $\omega > w$  is necessary in order for  $a_i$  to exist. Indeed, the worker would absent themselves if the salary rate that they offer him/her elsewhere is higher than that in their contract.

$$\varphi(\cdot) = 0 \Rightarrow a_i^* = a_i^*(w, \omega, S, L) \quad \varphi(\cdot) = 0 \Rightarrow a_i^* = a_i^*(w, \omega, S, L) \tag{A32}$$

Absenteeism therefore depends on the salary rate  $w$  and  $\omega$  on their job security ( $S$ ) and on their understanding of the regulations ( $L$ )

→ Effect of the salary rate (w) on absenteeism

$$\frac{da_i}{dw} = -\frac{\varphi'_w}{\varphi'_{a_i}} = \frac{-U'(d) - (1 - a_i)(w - \omega)U''(d)}{-\varphi'_{a_i}}$$

$$= \frac{-U'(d)}{-\varphi'_{a_1}} \left[ 1 + \frac{U''(d)}{U'(d)} (1 - a_1)(w - \omega) \right]$$

Either finally  $\frac{da_1}{dw} = \frac{U'(d)}{\varphi'_{a_1}} [1 - R_A(1 - a_1)(w - \omega)]$  (A33)  
 $R_A$  being the coefficient of risk aversion.

$$1 - R_A(1 - a_1)(w - \omega) > 0 \text{ because } w < \omega, 1 - a_1 > 0 \text{ and } R_A > 0$$

Assuming a growth of  $U(\cdot)$ ,  $U'(d) \geq 0$

It follows that,  $\frac{da_1}{dw} < 0$  (A34)

**Conclusion:** An improvement in the salary rate of the worker in their main job contributes to reducing their absenteeism.

→ Effect of the salary rate  $\omega$  in an alternative market on absenteeism

$$\frac{da_1}{d\omega} = \frac{U'(d)}{-\varphi'_{a_1}} [1 - R_A a_1(\omega - w)]$$
 (A35)

$$\text{If } a_1(\omega - w) < \frac{1}{R_A} \frac{da_1}{d\omega} \geq 0$$

**Conclusion:** As long as the income generated by the differential of the salary rate between the two markets is lower than the risk tolerance, all increases in the salary rates  $\omega$  elsewhere have a positive impact on absenteeism by the worker.

→ Effect of job security  $S$  on worker absenteeism

$$\frac{da_1}{ds} = -\frac{\varphi'_S}{\varphi'_{a_1}} = \frac{\partial^2 c}{\partial a_1 \partial S} / \varphi'_{a_1} > 0$$
 (A36)

**Conclusion:** An improvement in job security would increase absenteeism just like in case 1, the workers employed on permanent contract are more prone to absenteeism than those employed on short-term contracts.

→ Effect of the understanding of regulations (L) on absenteeism by the worker

$$\frac{da_1}{dL} = -\frac{\varphi'_L}{\varphi'_{a_1}} = \frac{\partial^2 c}{\partial a_1 \partial L} / \varphi'_{a_1} < 0$$
 (A37)

**Conclusion:** Just like in case 1, a better understanding of the regulations (the laws) by the worker is dissuasive towards their absenteeism; indeed, being absent in order to go and work elsewhere is thus seen by the worker as a wrongdoing which would be more heavily punished were the regulations more strict.

**Case 4: The worker is paid according to the effective duration of working hours and dedicates their time to leisure**

$$V(\cdot) = U[w(1 - a_m)] + v(a_m) - c(a_m, S, L)$$

$$V(\cdot) = U[w(1 - a_m)] + v(a_m) - c(a_m, S, L) \quad (\text{Equation A4 of Table A1})$$

Either  $V(\cdot) = U(d) + v(a_m) - c(a_m, S, L)$  or  $V(\cdot) = U(d) + v(a_m) - c(a_m, S, L)$  by

giving  $d = w(1 - a_m)$ ,  $d = w(1 - a_m)$ , the total income of the worker

$$\left\{ \begin{array}{l} \frac{\partial V}{\partial a_1} = -wU'(d) - \frac{\partial c}{\partial a_1} = \varphi(w, a_m, S, L) = 0 \\ \frac{\partial^2 V}{\partial a_1^2} = \frac{\partial \varphi(\cdot)}{\partial a_1} = \varphi'_{a_m} < 0 \end{array} \right. \quad (\text{A38})$$

$$\left\{ \begin{array}{l} \frac{\partial^2 V}{\partial a_1^2} = \frac{\partial \varphi(\cdot)}{\partial a_1} = \varphi'_{a_m} < 0 \end{array} \right. \quad (\text{A39})$$

$$\varphi(\cdot) = 0 \Rightarrow a_m^* = a_m^*(w, S, L) \quad \varphi(\cdot) = 0 \Rightarrow a_m^* = a_m^*(w, S, L) \quad (\text{A40})$$

Absenteeism for leisure therefore depends on the salary rate  $w$  and on their job security ( $S$ ) and on their understanding of the regulations ( $L$ ).

→ Effect of the salary rate ( $w$ ) on absenteeism

$$\frac{da_m}{dw} = -\frac{\varphi'_w}{\varphi'_{a_m}} = \frac{U'(d) + w(1 - a_m)U''(d)}{\varphi'_{a_m}} \frac{da_m}{dw} = -\frac{\varphi'_w}{\varphi'_{a_m}} = \frac{U'(d) + w(1 - a_m)U''(d)}{\varphi'_{a_m}}$$

$$\text{So } \frac{da_m}{dw} = \frac{U'(d)}{\varphi'_{a_m}} [1 - R_A w(1 - a_m)] \quad (\text{A41})$$

As long as  $w(1 - a_m) < \frac{1}{R_A}$ , we have the relationship

$$\frac{da_m}{dw} < 0 \quad (\text{A42}).$$

**Conclusion:** As long as the revenue generated by his/her main job is lower to the risk tolerance, any increase to the salary rate which is proposed to the worker will lead to a reduction in their absenteeism.

→ Effect of job security ( $S$ ) on worker absenteeism

$$\frac{da_m}{ds} = -\frac{\varphi'_S}{\varphi'_{a_m}} = \frac{\partial^2 c}{\partial a_m \partial S} / \varphi'_{a_m} > 0 \quad (\text{A43})$$

**Conclusion:** An improvement in job security would increase absenteeism just like in case 1, the workers employed on permanent contract are more prone to absenteeism than those employed on short-term contracts.

→ Effect of the understanding of regulations ( $L$ ) on absenteeism by the worker

$$\frac{da_m}{dL} = \frac{\partial^2 c}{\partial a_m \partial L} / \varphi'_{a_m} < 0 \tag{A44}$$

**Conclusion:** Just like in case 1, a better understanding of the regulations (the laws) by the worker is dissuasive towards their absenteeism; indeed, being absent in order to go to leisure is thus seen by the worker as a wrongdoing which would be more heavily punished were the regulations more strict.

## Appendix 2: Characteristics of the sample

Indicator	Number of obs.		Average/ Proportion	Standard deviation	Min	Max
Gender of the teacher	2543	Man	.8788832		0	1
		Women	.1211168		0	1
Age of the teacher	2543	In years	43.73692	9.789102	22	59
Highest class reached by the teacher	2543	5ème	.0924105		0	1
		4ème	.0617381		0	1
		2nde	.0373575		0	1
		1ère	.5265435		0	1
		Terminale	.0078647		0	1
		Bac + 2	.1053873		0	1
		Bac + 3	.1187574		0	1
		Bac + 4 et plus	.049941		0	1
Academic certificate held by the teacher	2543	None	.0707825		0	1
		CEAP	.7074322		0	1
		CAP	.2060558		0	1
		Others	.0157295		0	1
Duration of professional training of the teacher (*)	2543	In days	3.686591	1.333348	1	6
Type of contract	2543	Permanent	.6075501		0	1
		Contractual	.2245379		0	1
		Community based	.167912		0	1
Professional experience of the teacher (*)	2543	In years	18.15729	9.999195	1	32



Indicator	Number of obs.		Average/ Proportion	Standard deviation	Min	Max
The monthly salary of the teacher	2543	15 to less than 30	.2152751		0	1
		30 to less than 60	.067025		0	1
		60 to less than 90	.0092192		0	1
		90 to less than 120	.0159042		0	1
		120 to less than 150	.115393		0	1
		150 to less than 200	.1562896		0	1
		250 to less than 300	.115393		0	1
		300 to less than 350	.0709573		0	1
		350 to less than 400	.2345436		0	1
House allowance benefits	2543		.7031066		0	1
Practice of income generating activities (IGA)	2543		.2151003		0	1
Type of IGA practiced	2543	Agricultural activities	.1144318		0	1
		Artisanal/trade	.0239874		0	1
		Tuition	.1026347		0	1
Number of days absent in the previous month (*)	2543		1.686984	2.396959	0	12
Existence of PTA in the school	2543		.0739874		0	1
Type of school	2543	Public	.8474243		0	1
		Private mission school	.0369642		0	1
		Private secular school	.1207236		0	1
Geographic location of the school	2543	Urban	.3440818		0	1
		Peri-urban	.0302792		0	1
		Large City	.3857648		0	1
		Small village	.2398742		0	1

(\*) quantitative variables.

### Appendix 3: Results of the estimations

\* estimation step 1 endogeneity test\*

```
. logit mt_agr IPRIX salaire_90_119 salaire_120_149 salaire_150_199
salaire_250_299 salaire_300_349 salaire_350_399 mt_contractuel ecole_p
> ubl ecole_ville
```

```
Iteration 0: log likelihood = -1558.9233
Iteration 1: log likelihood = -1064.9502
Iteration 2: log likelihood = -1014.9306
Iteration 3: log likelihood = -1007.5605
Iteration 4: log likelihood = -1007.3747
Iteration 5: log likelihood = -1007.3746
```

```
Logistic regression                                Number of obs =      2543
                                                    LR chi2(10)      =    1103.10
                                                    Prob> chi2      =    0.0572
Log likelihood = -1007.3746                       Pseudo R2       =    0.3538
```

mt_agr	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
IPRIX	.0019921	.0011179	1.78	0.075	-.0001989	.0041831
salaire_90_119	-3.427403	.4130344	-8.30	0.000	-4.236936	-2.617871
salaire_120_149	-1.681795	.3390195	-4.96	0.000	-2.346261	-1.017329
salaire_150_199	-2.747628	.3726332	-7.37	0.000	-3.477976	-2.017281
salaire_90_119	-3.427403	.4130344	-8.30	0.000	-4.236936	-2.617871
salaire_300_349	-.6510965	.2941128	-2.21	0.027	-1.227547	-.074646
salaire_350_399	-.4059976	.189642	-2.14	0.032	-.7776891	-.0343062
mt_contractuel	.0990875	.1886228	0.53	0.599	-.2706065	.4687814
ecole_publ	-4.50285	.3225683	-13.96	0.000	-5.135073	-3.870628
ecole_ville	-.4370278	.1414412	-3.09	0.002	-.7142474	-.1598082
_cons	2.721474	.3148364	8.64	0.000	2.104406	3.338542

```
. predict mt_agr_res, re
```

\* estimation step 2 endogeneity test\*

```
. tobit tx_absence mt_agr agricult repetit mt_age mt_homme mt_max_tle mt_
max_lere mt_max_bac_2 mt_max_bac_3 mt_max_bac_4p mt_ceap mt_contractuel
mt_experi
> ence salaire_90_119 salaire_120_149 salaire_150_199 salaire_250_299
salaire_300_349 salaire_350_399 ecole_publ ecole_ville ape mt_indice_ct
```

```
> mt_agr_res, ll(0) ul(1)
```

```
Tobit regression                               Number of obs   =       2543
                                                LR chi2(10)    =       1103.10
                                                Prob> chi2     =       0.0572
Log likelihood = -504.69602                    Pseudo R2      =       0.3003
```

```
-----+-----
```

tx_absence	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
mt_agr	.1341525	.0160568	8.34	0.000	.1026692	.165636
agricult	.0578733	.0101290	5.71	0.000	.0487709	.1237652
commerce	.0622566	.0296112	3.30	0.000	.0287691	.0870176
mt_age	-.0014672	.0010160	-1.44	0.149	-.0034594	.0005245
mt_homme	.0313638	.0114993	2.73	0.006	.008817	.0539109
mt_max_tle	.1492075	.0278616	5.36	0.000	.0945782	.2038373
mt_max_1ere	.021845	.0107384	2.03	0.042	.000794	.0429039
mt_max_bac_2	-.0486023	.0159575	-3.05	0.002	-.0798915	-.0173126
mt_max_bac_3	.0578933	.0148539	3.90	0.000	.0287691	.0870176
mt_max_bac_4p	.0406315	.0193964	2.09	0.036	.0026001	.0786621
mt_ceap	.0622969	.015825	3.94	0.000	.0312676	.0933256
mt_contractuel	.086265	.0191234	4.51	0.000	.0487709	.1237652
mt_experience	.0041803	.0012782	3.27	0.001	.0016743	.0066867
salaire_90_119	-.1521505	.0453051	-3.36	0.001	-.240983	-.0633186
salaire_120_149	-.0564328	.0181144	-3.12	0.002	-.0919507	-.0209146
salaire_150_199	.0181644	.0153372	1.18	0.236	-.0119077	.0482374
salaire_250_299	-.0027437	.0230936	-0.12	0.905	-.0480248	.0425369
salaire_300_349	-.0099236	.0185604	-0.53	0.593	-.046316	.0264687
salaire_350_399	-.0201324	.0162193	-1.24	0.215	-.0519346	.0116695
ecole_publ	.1426362	.0264421	5.39	0.000	.0907898	.1944831
ecole_ville	.0079105	.0088769	0.89	0.373	-.0094953	.0253155
ape	-.1521508	.0652200	2.33	0.006	.008817	.0539109
mt_indice_ct	-.0033295	.0005288	-6.30	0.000	-.004366	-.0022924
mt_agr_res	-.00964	.001252	-7.68	0.000	-.0120649	-.0071552
_cons	-.0891378	.0569039	-1.57	0.117	-.2007121	.0224371
/sigma	.1788959	.0036112			.1718145	.1859768

```
-----+-----
```

Obs. summary:           1278 left-censored observations at tx\_absence<=0  
                  1265 uncensored observations  
                      0 right-censored observations



## Mission

To strengthen local capacity for conducting independent, rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

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