Regulation of noise emitted by revival churches and the neighboring population’s wellbeing in the Cameroon urban area

Abstract:
This paper examines the effect of the regulation of noise emitted by the revival churches (EDR) on the surrounding populations' wellbeing. The analysis entails a sample of 726 individuals not belonging to EDR and residing in the towns of Yaounde and Douala, gotten from an investigation ground. Being inspired from the theoretical and empirical literature, especially in the Economics of religion, Economics of regulation and experimental Economics, the econometrical results obtained with the help of a method of experience of choice, and of a nested logit model, reveal that the setting up of a control plan against noise nuisances produced by EDR allows the well-being increase of individuals not among EDR. These surrounding populations are ready to pay FCFA 523 for the "the regulation of church service opening hours", FCFA 491 for "the building of soundproof church grounds" and FCFA 238 for "the sensitization of EDR’s officials on the bad effects of the sound nuisance produced".

Keywords: Religion, wellbeing, sound noise, régulation, choice experience method

JEL Code: C25, D62, H00, R38, Z12
1. Introduction

This study aims to examine how individuals residing in urban milieu in Cameroon value the setting up of regulation aiming the reduction of noise nuisances produced by EDR. To attain this objective, we used the experience method of choice and the nested logit model. This study finds its rationale in religion’s contribution on individuals’ well-being (Mpabe, 2015) and the necessity to carry out actions to reduce noise nuisances, unwholesome for individual’s public health and well-being.

It is in an economic and social crises environment that got significantly developed the market of religion in Cameroon (Akoko, 2007). The Cameroonian constitution and the law N° 90-053 of December 19, 1990 relative to freedom of association also contributed to the liberalization of the market of religion in Cameroon. The constitutional provisions besides acknowledge that "none can be worried based on his origins, opinions or beliefs in religious, philosophical or political matters provided that public order is respected". Other (economical, sociodemographical ..) factors equally favored the proliferation of EDR and the creation of a wide market of religion in Cameroon (Seraphin, 2004 ; Lasseur, 2010) : the expansion of (internal and external) migratory movements and the development of urbanization. Mpabe & Ibrahim (2018) reveal that the number of EDR fellows in Cameroon « in 2015 is 27.65 times higher than those of 1970 ».

About twenty years after the adoption of the law on the freedom of association, the market of religion in Cameroon admits imperfections, notably noises (Mpabe, 2015). In some Cameroonian cities, one notices that since long public authorities go into closing down churches most often belonging to pentecostal EDR (Mpabe, 2015). This EDR church closures were motivated by : the unrespect of the rules set out in the law of 1990, the lack of legal existence, interference and troubles within families, the imposture of some church ministers, complaints over noise mostly nocturnal, etc. (Lasseur, 2010 ; Mpabe, 2015). Some individuals in Cameroon consider pentecostals like witches (Batibonak, 2012).

EDR are often fitted out with sophisticated sound system equipments to pace singing during praises and worship (Mpabe & Ibrahim, 2018). Noise emanating from these sound system equipments mixed with shouts of joy and whining to produce noise likely to annoy these surrounding populations. To that, one should add nocturnal services (for instance night prayers) which also generates noise likely to negatively impact health, school success, incomes (Nweze,
In Cameroon, the immediate household environment is not sufficiently cleansed since a much important proportion of households, that is to say 42.4 %, is victim of sound nuisances (INS, 2014). Health and education issues of the poor is an essential aspect of the development problematic. In health matters, the 2017 IDH\(^1\) ranking reveals that Cameroon appears to rank 230\(^{th}\) with a life expectancy of 55.02 years. As for education, it ranks 62nd with a score of 3.8 at the level of the educational system quality\(^2\). Notwithstanding its drawback, the poverty rate is even higher in Cameroon (39.9% in 2007 and 37.5% in 2014). A church may think that it has the right to emit noise all the times without caring about the quietude of surrounding people. Practical problems with externalities emerge because the property rights of economical agents are not well defined (Hal Varian, 2000).

As producers responsible for the negative effect, EDR has no reason to integrate in its decision (its cost benefit computation) the diminishing or improvement of well-being for the other agents (surrounding populations). Given that the neighbouring populations of these church premises … of numerous negative externalities reducing their well-being, some authors (Devoue, 2002 ; De Rosny, 2004 ; Mpabe, 2015), however without calling into question the principle of secularity, think that it is time for the public authorities to implement the instruments of the religion market regulation. As an activity is accompanied of a negative external effect, it must be scrapped because collective well-being happens to be reduced. Contestation movements have often been organized by the populations victims of noise nuisances (Dobruszkes, 2008). Unconsidering these externalities by the market justifies the State’s action which can internalize the outer effects by the way of 3 instruments (Depret & Hamdouch, 2009): economical instruments (tax, subvention, tradable permits) and the institutional instruments (casting standards or quotas, regulations, information and sensitization campaigns). Some of these instruments are more or less restrictive or incentive.

Lasseur (2010) reconnait que la laïcité est une chance pour les associations religieuses conquérantes ; mais, il semble aussi important pour les pouvoirs publics de « prévenir les dérives » auxquelles s’exposent les populations les plus vulnérables. Lasseur (2010) acknowledges that secularism is a luck for conquering religious associations; but it also seems important for public powers to "prevent abuses" upon which are exposed the most vulnerable

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1 IDH : Index of Human Development
2 Read the world report on competitiveness 2014-2015
populations. This regulation which must be undertaken by the civil powers, in case of market defects, is often questioned by the proponents of the School of Public Choice. The latter blames the public authorities for facts of corruption, the lack of financial or material means and the lack of information (Laffont, 2003; Lévêque, 1998). Furthermore, on the legal plan, contrary to the advocates of "radical secularism" (Hervieu-Leger, 2001), the partisans of “moderate secularism” (Burdeau, 1972; Momo, 1999) consider as a doctrine which considers religions and church services as phenomena strange to the State. Public powers must not intervene in the market of religion as long as public order is not disrupted. Momo (1999) in this respect backs that the State should “intervene or forcast its interventions in religious matters so as to saveguard and maintain public order. It should ensure individual and public liberties for the citizens, while preserving public order and general interest”.

This study contributes to economics on several aspect. Firstly, to the best of our knowledge, it is the first study in Economics which tackles the problematic of sound nuisances from EDR. In western countries, some economical studies looked into noise nuisances mostly in the transports domain (Faburel & Luchini, 2000; Bureau, 2005; Lijesen & al, 2010; Püschel & Evangelinos, 2012). No extension has been done for the moment in the religious sphere. Secondly, it proposes solutions to public authorities in the perspective of the reduction of noise emitted by EDR. These noise from EDR induce expenses for the surrounding non member personsThe latter currently support the total cost since they are not billed upon the accountable namely EDR. The evaluation of the said price shows out to be useful insofar as it can contribute to political arbitrations and to public decisions (especially the application of the principle of polluter payer regulation) aiming to reduce social inequalities and to increase the well-being of people (Faburel & Luchini, 2000).

The empirical approach lies on the use of the choice experience method and of a nested logit model applied to the collected data by Mpabe (2015) with the concours of CEREG/ University of Yaounde 2. We come out with the results having that individuals are favourable to the setting up of a device for information assymetries reduction upon the attributes: (i) regulation to fix church service opening hours between 6 a.m and 8 p.m (yes or no); (ii) building of sound proof church halls (yes or no); (iii) regular sensitization of EDR officials on the harmful effects of noise nuisances (yes or no).

To attain this goal, the study’s second section is consecrated to the description of the regulation device aiming the noise nuisance reduction, the third to the econometrical model specification,
the fourth to the data analysis description, the fifth to the econometrical results’ analysis, and
the sixth to the conclusion.

2. Regulation plan aiming the noise nuisance reduction: choice experience

2.1. Identification of relevant attributes

In the light of literature (Dorier-Aprill & Ziavoula, 2005; etc.), a dozen of regulation
instruments for noise nuisance were in the one hand retained. Among these sound nuisance
regulation instruments, there were economical instruments of regulation like tax. A pilot query
was later carried out firstly directed toward individuals residing within a radius of 300 m from
the church places belonging to EDR, and lastly over 20 pastors from EDR in the Douala and
Yaounde cities. It is at the end of this pilot investigation that 3 noise nuisance regulation
instruments were retained: (i) regulation fixing church hours from 6 a.m to 8 p.m (yes or no);
(ii) construction of soundproof church areas (yes or no); (iii) regular sensitization of EDR
officials as to the … effects of noise (yes or no). The three retained sound nuisance regulation
instruments are the regulatory ones (norms). They were privileged at the expense of
economical instruments (especially tax) to reduce sound nuisance. This choice is not grounded
on the comparison of the said instruments in economical and environmental efficiency matters,
but on the acceptability conditions. Chiroleu-Assouline (2007) acknowledges that "the
argument of efficiency is not always enough to uplarge the use of an instrument wherein the
acceptability considerations prevail".

In environment regulation matters, the comparison debate between the economical instrument
and the regulatory ones on the environmental and economical efficiency plan is not over. The
environmental regulation remains "the privileged instrument of environmental policies"
(Bureau, 2005).

In economical efficiency and environmental efficiency matters, the at times attributed relative
superiority of economical instruments does not seem systematic insofar as it is tributary to
some factors, notably competition, perfect information, uncertainties, surveillance and
application costs (Bovenberg & Goulder, 2002; Bontems & Bourgeon, 2003; Rozec & Ritter,
2003; Chiroleu-Assouline, 2007). Specifically:

- in terms of environmental efficiency, Chiroleu-Assouline (2007), (i) the economical
  and regulatory instruments are in theory equivalent, under perfect information and
  absence of uncertainty situation and (ii) the regulatory instruments are naturally better
than environmental tax in all real situations, and not theoretical. For illustration, Chiroleu-Assouline (2015) asserts that « the french environmental tax system presently answers less to the ecological tail end than to a more traditional objective of taxation yield »;

- in terms of economical efficiency, according to Chiroleu-Assouline (2007), (i) the fiscal environmental instrument is preferably to the regulatory ones, (ii) the fiscal environmental instrument is theoritically equivalent to the emission permit system negociable in the absence of uncertainties and information imperfection.

To these 3 regulatory instruments, the regulation device cost against noise nuisances was added. The regulation device against noise nuisances comprises wholly 4 attributes. These attributes answer to the criterias defined by Liquet (2001). For illustration, they are operationalizable by the public authorities.

Table 1 : Description of noise nuisance regulatory instruments

<table>
<thead>
<tr>
<th>Attributes or regulatory device instruments against noise nuisance</th>
<th>Definition</th>
<th>Level of attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The regulation to fix church service opening hours from 6 a.m to 8 p.m</td>
<td>This regulation shall enable reduce the nocturnal noise volume emitted by EDR.</td>
<td>Yes No</td>
</tr>
<tr>
<td>The construction of sound proof church places</td>
<td>The construction of sound proof church area buildings means that every church place belonging to EDR must be sound proofed. To recall, some night clubs located in Douala and Yaoundé are not sound proofed in the keeping with the regulation in force</td>
<td>Yes No</td>
</tr>
<tr>
<td>The sensitization of EDR pastors on noise nuisances</td>
<td>Public powers should regularly sensitize pastors and other officials of EDR relating to the noise nuisance effects which the emit on the surrounding populations’ well-being</td>
<td>Yes No</td>
</tr>
<tr>
<td>The daily cost of the regulatory device against EDR noise nuisances</td>
<td>The daily cost of the regulatory device against EDR noise nuisance</td>
<td>1 dollar 2 dollars</td>
</tr>
</tbody>
</table>

Source: Authors

2.2. Construction of profiles and unrolling of experimental sessions

After the attributes’ identification, we can proceed to the construction of profiles which often face a so important combinatory problem. Given that 4 attributes having each 2 modalities were retained, 16 profiles were established (else $2^4$). As it is naturally impossible for a respondent to compare such a number of profiles (the cognitive task being too complex for it), we opted for their reduction by an experience plan with the help of an Orthoplan order of the IBM SPSS software. The latter permits to obtain orthogonal factorial plans.
The experimental protocol gets organized around a discrete choice exercise which relies on the complete profiles’ method which consists in presenting to every enquiry a complete set of attributes’ combination. Before asking questions to the inquired on their preferences, different scenarios and the selection procedures of profile were detailly explained to them.

The conjoint analysis and the contingent valuation are often confronted to a hypothetic angle which emerges while at the course of a query by question sheet, the inquired does not consider all the constraints which could weigh on their choice in real situation, notably the available budget, the financial sanctions in the event of erroneous choice, the availability of the product. The experience being carried out in Cameroon, developing country with a monetary poverty rate of 37.5% at the enquiry moment, to override this hypothetic bias, it was assumed during every experiment that the inquired receives from the investigating agent the amount of FCFA 2000 (so 4 US dollars) destined to the payment of a regulation device aiming the reduction of sound nuisances. The idea is to know if the inquired receives daily this amount, how much are they ready to consecrate every day to to get protected from sound nuisances emitted by the surrounding EDR.

In the experimental instructions, those inquired were sufficently informed of the fact that they must (i) behave as though the payment of the profile ranked first was real and obligatory after having received the amount of FCFA 2 000 and (ii) evaluate every scenario with scenario with precaution, for all the scenarios were equally chanced to be binding.

After having made the choice of the regulation service for every profile, each queried has classified the profiles by decreasing order in prefernce. This also allows to correct the hypothetic bias. This ranking possesses the advantage of being more playful and more simple for the answerer (Auty, 1995 ; Liquet, 2001). These profiles are presented in this study in the form of cards. In literature, (Green & al, 2001), the representation of profiles can also be done in the form of (i) descriptive written texts, (ii) images and (iii) physical objects.

Every choice of profile moreover includes the possibility of not prefering any regulation service against noise nuisances. The fact for an inquired "not prefer any regulation service against noise nuisances" does not always mean that they are not worried by the noise. Hence, it can be inconvenienced by the sound nuisance but not tilt for any of the proposed devices.

Table 2: Example of choice of profile card

<table>
<thead>
<tr>
<th>Scenario:</th>
<th>Attributes or instruments of the control device of sound nuisances</th>
<th>Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Service A</td>
<td>Service B</td>
</tr>
</tbody>
</table>

7
Regulation fixing church opening hours between 6 a.m and 8 p.m | Yes | No | I prefer none of the two services (A and B)
Construction of sound proof areas | Yes | No
Regular sensitization of EDR officials on the harmful effects of noise nuisances | Yes | Yes
Individual cost of the regulation device against noise nuisances | 1 dollar | 2 dollars

Source: Author

The then obtained data shall be analyzed within the framework of a discrete choice model (the nested logit model) which explains the choice made with respect to the attributes of products and individual characteristics of the queried. Furthermore, it equally has the special advantage to sequentially structure the decision model, as to the tree represented by the figure below.

Figure 1: Decision tree of the nested logit model of the regulation equation of sound nuisances

In the first hand, the inquired chooses or not the regulation apparatus against noise nuisances. If they take the decision to opt for a regulation apparatus against noise nuisances, they subsequently choose between 2 offered regulation services (service A or service B). The nested logit model has proved its efficiency to treat data of choice including an option of the type "no preference" or "no choice". This model in addition considers that alternative services (service A and service B) are substitutable.

2.3. Computation methodology of the wellingness to pay

In literature, the computation methods of the wellingness to pay can be seried into 2 groups: the methods of declared or hypothetical choices (contingent valuation and conjoint analysis) and the observed or unhypothetical choice methods (first auction price, second auction price, BDM mecanism, nth auction price and the experience of choice method). The declared choice methods consist to question individuals on their preferences for goods and goods’ characteristics by presenting to them products and hypothetical situations. The answers they
give don't imply any financial engagement and have no objective consequence for them. The monetary equivalents of goods for individuals "can be directly requested (contingent evaluation) or estimated through choices among several options (conjoint analysis) » (Javaheri, 2009). The main inconvenience of methods based on the declared choices is the "hypothetical bias" that is nothing impedes the questioned individuals to hamphazardly answer or to reply in the sense of the expectations of the investigated. This bias can also induce a gap between what is stated by the quierred and what they may pay in a real situation (Le Gall-Ely, 2009). Moreover, the contingent valuation suffers further of a bias of strategic nature emerging when the inquired deliberately model their replies and inducing an overestimation or an underestimation of CAP in the way of their self interests (Le Gall-Ely, 2009).

The methods of the observed choices or experimental methods are grounded "not only on what individuals assert they will do under the hypothetical situations but also on the observation of choices they make in real life or in the artificially created situations in which their choices entail an objective consequence for them" (Javaheri, 2009). We shall go in for the experience of choice method in this study which is assimilated as the conjoint analysis accompanied by a real stake which enables to correct the hypothetical bias (even if the choice situations are artificially created, the choices are real and not hypothetical, and this uplarges the quierred officials to consider their budgetary constraints). The experience of choice method was used by Lusk & Schroeder (2004) and Alfnes & al (2007). The conjoint analysis for instance allows to calculate willingness to pay (WTP) as well as the price elasticities by showcasing the realized compromises between the different attributes of a product. Compared to the experimental methods, the experience of choice method also presents the advantage (Lusk & Schroeder, 2004): (i) of being useable on goods and services which don't exist or which are not sellable in the market and (ii) of gather a more important number of data to perform more complete statistical analyses thanks to their relatively lower costs. Faburel & Luchini (2000) refered to the analysis in contingent evaluation to evaluate the social cost of the aeroplanes’ noise at Orly.

In this study, contrarily to a good number of studies led in developed countries and on the consumer’s choice preferences, the experiences are not carried out in computer equipped experimental laboratories. Budgetary constraints and the size of the study’s sample don’t permit laboratory experiences. To circumvent this pitfall, the investigated individuals were submitted, during face-to-face talks, to question sheets comprising cards of profiles’ choices like in computers. Face-to-face chats are often priviledged in conjoint analysis or in the

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3 Michaud (2010)
experience of choice method since it offers due to the good management of the answerer’s tiredness, the possibility to better get evaluated cards of profiles’ choices (Auty, 1995).

2.4. Data collection

In the absence detailed informations in ECAM3 (INS, 2007) and BUCREP (2010), the study takes into the inquiry’s data realized by Mpabe (2015) between September and December 2012 in all the towns’ councils of Yaounde and Douala. They are the 2 big Cameroonian cities in terms of the population’s size and we find therein the head office of 26 out of 47 religious associations authorized by MINATD. This query is a targeted inquiry which was performed on persons residing in a radius of 300 m from EDR. This enabled fetch useful informations for a detailed analysis of the religious freedoms’ effects and of the setting up of the regulation device of the market of religion on individuals’ well-being in Cameroon. Going from this data base, we extracted 726 individuals that donot belong to EDR and that lived close to the worship places of these ones.

The choice of the investigation unit is justified by the fact that at the end of the pilot inquiry carried out by Mpabe (2015), the EDR members residing close to this EDR are not for the most part minded by noise nuisances emitted by it. Furthermore, we prefered to interview neighbours not belonging to EDR, rather than their members (on their WTP for maintaining their current church service conditions) because during the pilot query performed by Mpabe (2015), EDR pastors were not conscious of the noise nuisance harmful effects on the surrounding people’s well-being. They even intimidate and threaten in their sayings the neighbouring complainants. The choice of the distance between the residence of the inquired person and EDR emanates from the pilot investigation. The quasi-majority of persons residing 300 m from an EDR donot complain about the latter’s noise. There is besides need to indicate that in Cameroon in Cameroon the Decree N° 90/1483 of 09th November 1990 to fix the conditions and exploitation modalities of off licences forbids in its section 14, the opening of a drinking spot less than 200 m from a hospice, a hospital, a health unit, a school or a buiding consecrated to worship.

3. The econometrical model specification

The discrete choice decisions of consumers are often analyzed within the framework of a choice model which shows that every consumer grants a value to each alternative among a set of choices and chooses the option or alternative which procures it the the greatest utility.
The nested model, which here shall serve as operatory framework for the econometrical estimations, is often utilized when some modalities are similar to others with respect to other unobserved factors. The modalities are regrouped under subgroups, in such a manner that the independence hypothesis of unrelevant states (IIA) be valid within each group. If a modality is eliminated, the probabilities of other modalities must increase.

This model is represented by a decision tree where each branch constitute a subset of modalities in the IIA hypothesis is respected (Mc Fadden, 1974). This model was applied in several domains of political science, especially environment economics (Michaud, 2010; De Blaeij & al, 2007), the Economics of health (Ryan & Skätun, 2004), Economics of transport (Hercher & Greene, 2002), etc.

While observing the individuals’ choice, we can deduce a latent decision process by assuming that consumers have revealed their preferences through their consumption choice. This model enables to regroup alternatives under subgroups. The alternatives are assumed to be more similar among them within the very group than between groups. Statistically, that implies alternatives have potentially correlated error terms in the midst of a same group, but not between two different groups.

The decision of choice is made at several levels. The decisions’ first level concerns the choice between "prefering a noise nuisance regulation service" and "prefering nothing". The second level of decisions concern the choice between a service A and a service B when the decision to prefer a regulation apparatus has previously been made.

The use of individuals are dependent on characteristics of alternatives j and of characteristics of the individual i. The utility function $U_{ij}$ is constituted of a deterministic part $V_j$ and of a random part $\varepsilon_{ij}$:

$$U_{ij} = V_{ij} + \varepsilon_{ij}$$  \hspace{1cm} (3)

The determinist part of of utility can be written as a linear function of the characteristics of the regulation device against noise nuisances and individuals’ characteristics ; and can be specified in the following manner :

$$V_{ij} = \alpha_0 + \beta_1 RHC_{ij} + \beta_2 CMI_{ij} + \beta_3 SENS + \beta_4 COUT_{ij} + \alpha_1 SEX_{ij} + \alpha_2 REV_{ij} + \alpha_3 AGE_{ij} + \alpha_4 IDR_{ij} + \alpha_5 LAIC_{ij} + \alpha_6 EDS_{ij} + \alpha_7 AEAC_{ij}$$

Where = $(service A or service B)$and $U_j = 0$ with $j = 0$. \hspace{1cm} (4)
$\beta$ and $\alpha$ are the estimated coefficients of the econometrical model.

**RHC, CMI, SENS** and **COUT** are the attributes of the control device against noise: (i) **RHC** is the variable which captures the regulation fixing church service hours between 6 a.m and 8 p.m; (ii) **CMI** represents the variable which captures the construction of sound proof church areas; (iii) **SENS** is the variable which captures the regular sensitization of EDR officials on the harmful effects of noise and (iv) **COUT** represents the cost of the control apparatus against noise.

Variables which represent individual characteristics of the inquired persons are **IDR, REV, LAIC, AGE, EDS, AEAC, SM, QOR, EDU** and **SEX**.

**IDR** is the qualitative variable which captures the religious participation degree of the queried individual. It admits 2 modalities: 0 = low religious participation; 1 = high religious participation. It entails an index constituted of 8 indicators of religious participation, calculated by Mpabe (2015) as from the analysis method of multiple component: (i) the belief in a god, (ii) the importance of a god in life, (iii) the belief in the afterlife, (iv) the belief in paradise, (v) the prayer frequency, (vi) the financial and material contribution frequency in the midst of the religious community, (vii) the physical presence frequency in religious services and (viii) the religious issue reading frequency.

One expects that individuals of high religious participation be less favorable to the setting up of a regulation device aiming to reduce the revival churches’ noise nuisances. Persons of high religiosity estimate that the Bible in the book of Psalms, notably in chapter 150, orders to the faithful christians to worship the Lord with trumpets, as well as lute, tambourine, danses, string instruments, blowpipe, resounding cymbals. This worship must be done according to them everytime and everywhere. Besides, the latter tend to lower down extent of the EDR noise. As a matter of fact, for them, EDR make equal or less noise than off licences that abound in the big cameroonian cities. Consequently, for these persons, "accusing revival churches as sole noise nuisances’ emitter seem to be a conspiration against them".

**REV** is a qualitative variable which captures the monetary well-being of the inquired individual. We suppose that this variable is measured by the income quartile. Consequently, it admits 4 modalities: 0 = if the individual’s income belongs to the quartile of ordre 1, 1= if they belong to the quartile of ordre 2, 2= if they belong to the quartile of ordre 2; 3 = if they belong to the quartile of ordre 4. Faburel & Luchini (2000) use a quantitative variable to appreciate income. Other empirical works make use of a binary variable (of which the modalities are poor
or unpoor) to measure monetary well being. We expect that the probability to be to the implementation of a regulation device aiming the lowering of EDR noise nuisances be relatively high for unpoor monetary individuals. This result can especially be justified by the fact that individuals most of the times have a job which impose to them, after a burdensome day at work, resting and quietude ones back home in the evening. Resting allows workers to regain alertness and seems necessary for memorisation and stabilization of the daily acquired knowledge, weight regulation, immunitary development and even the correction of some genetic abnormalities. It is useful for the workers’ health.

**LAIC** is a qualitative variable that permits to appreciate the exact knowledge level of secularism by the person quierred. It admits 2 modalities: 0 if the individual does not exactly know the notion of secularism and 1 in the contrary case.

**AGE** is a quantitative variable which measures the individual's age. In some empirical works, the variable which enables to appreciate individuals' is often of qualitative type. The age of individuals in the used data base is comprised between 20 and 60 years old. **SEX is the dichotomic variable that allows to appreciate the quierred person's sex.** It admits the modalities: 0 if the individual is male and 1 if they are female. **EDS** is a qualitative variable which permits to capture the inquired person's health status. It admits 2 modalities: 0 if the individual is not in good health and 1 if not. **AEAC** is a dichotomic variable that permits to appreciate the number of children under the quierred person's care. **SM** is dichotomic variable which enables to appreciate the quierred matrimonial situation. It admits like modalities: 0 if the individual is not maried and 1 if they are maried. **EDU** is a qualitative variable which permits to capture the inquired person's level of instruction. It admits 3 modalities: 0 if the individual is unlearnded, 1 = if they have the primary education level and 2 = whether they have the secondary or higher education level.

**QOR** is a qualitative variable that allows to appreciate the individual's perception of the quality of the offer of religious services. It admits 3 modalities: 0 if the individual finds this quality low, 1 = if they find it average and 2 whether they judge it high.

The nested logit model supposes that the probability to choose device j (or altenative j) is with respect to the probability to prefer a regulation apparatus against noise nuisances versus that of not prefering any control device against noise.

While considering that 2 alternatives regulation apparatus are grouped under a branch B, the probality of choosing an apparatus j is written:
\[ P_{jB} = P_{j/B} P_B = \left( \frac{\exp(V_{jB})}{\exp IV_B} \right) \left( \frac{\exp(\sigma_B IV_B)}{\sum_{k=B,N} \exp(\sigma_B IV_B)} \right) \]  

(5)

\[ IV_B = \log \left[ \sum \exp \left( \frac{V_{ij}}{\sigma_B} \right) \right] \]  

(6)

whereby \( P_B \) stands for the probability to choose a regulation device against noise nuisances; \( P_{j/B} \) is the probability of choosing regulation device \( j \) against noise knowing that the decision to choose a device was already taken; \( V_{jB} \) represents the utility drawn from regulation device \( j \) against noise nuisances; \( \sigma_B \) is the coefficient of the inclusion variable measuring the substituability among the alternative devices; \( IV_B \) is the inclusion variable parameter measuring the expected value of utility obtained from the alternatives contained in the branch "prefers a regulation device against noise".

After having computed the coefficients of the regulation device attributes against noise nuisances, the marginal rate of substitution between the 3 instruments (main attributes) is the ratio of their estimated coefficients. According to Louviere & al (2000), the ratio between the coefficient of each "main attribute" of the control device against noise nuisances and the "regulation device cost against noise nuisances" coefficient can be considered as the marginal welllingness to pay this attribute :: (i) the marginal wellningness to pay for RHC (the regulation of church service hours between 6 a.m and 8 p.m) noted \( WTP_{RHC} = \frac{\beta_1}{\beta_4} \); (ii) the marginal wellningness to pay for CMI (the construction of sound proof church places) noted \( WTP_{CMI} = \frac{\beta_2}{\beta_4} \); (iii) the marginal wellningness to pay for SENS (regular sensitization of EDR officials on the harmful effects of noise nuisances) noted \( WTP_{SENS} = \frac{\beta_3}{\beta_4} \).

4. Description of the data analysis

Each individual having taken part in field experimental sessions was submitted to 11 scenarios or decisions of the regulation device choice aiming to reduce EDR noise nuisances. In each scenario, they should choose a service among the 3 services proposed to them. At the end, for econometrical estimations needs, we will only retain one scenario. Hence, a total of 2178 observations (726*3) were obtained. The option "prefers a regulation apparatus aiming the reduction of noise nuisances emitted by EDR" was retained 645 times (88.84 % of situations of choice). This relatively high percentage indicates that the setting up of a regulation device.
to aim reducing EDR noise nuisances seem to be important for individuals not part of NMR. This regulation device can enable reduce some illnesses such as sleep disorders.

On the contrary, the option "not preferring any regulation device aiming the reduction of EDR noise nuisances" was retained 81 times (11.16 % of choice situations).

Table 3: Specified structure of the tree of choice for the nested model: the noise regulation case

<table>
<thead>
<tr>
<th></th>
<th>Number of observations</th>
<th>Service</th>
<th>Number of observations</th>
<th>Number of the alternative or service choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefers the noise nuisance regulation setup</td>
<td>1452</td>
<td>A</td>
<td>726</td>
<td>467</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>726</td>
<td>178</td>
</tr>
<tr>
<td>Prefers no noise nuisance regulation setup</td>
<td>726</td>
<td>C</td>
<td>726</td>
<td>81</td>
</tr>
</tbody>
</table>

Source: Authors, from Stata 11.0

The observation rate of the econometric model's variables is 100%. Close to 80.51% of individuals besides deem useful the setting up of a regulation apparatus against EDR noise nuisances. Talking of the instruments of the said device, individuals are favourable to (i) the control of church service operating hours (48.06%), (ii) the construction of sound proof worship places (49%) and (iii) the sensitization of EDR officials (50.73%).

Table 4: Elements of descriptive statistics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choice</td>
<td>0.333</td>
<td>0.471</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Sex</td>
<td>0.492</td>
<td>0.500</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Instruction level</td>
<td>1.404</td>
<td>0.607</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Age of the individual</td>
<td>31.161</td>
<td>8.448</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>Matrimonial situation</td>
<td>0.626</td>
<td>0.483</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Quality of the religious service offer</td>
<td>1.057</td>
<td>0.720</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Health status</td>
<td>0.909</td>
<td>0.287</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Level of religiosity</td>
<td>0.720</td>
<td>0.448</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Number of children under care</td>
<td>0.487</td>
<td>0.499</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Monetary well being</td>
<td>1.647</td>
<td>1.141</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Exact knowledge of secularity</td>
<td>0.344</td>
<td>0.475</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Regulation of service working hours</td>
<td>0.440</td>
<td>0.496</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Construction of sound proof walls</td>
<td>0.448</td>
<td>0.497</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Regular sensitization of EDR promoters</td>
<td>0.444</td>
<td>0.497</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>COST</td>
<td>1</td>
<td>0.816</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: Authors, from Stata 15

We notice that persons of low religious participation find relatively more useful the implementation of a control device to aim reducing EDR noise nuisances than high religious participation persons. As a matter of fact, 84.22% (respectively 79.07%) of persons are favourable to this device knowing that they have a low level (respectively high) of religious participation.
Relating to men, women better valourize the setting up of a control device aiming to reduce EDR noise nuisances. 82.38 % of women in effect (respectively 78.69% of men) deem important the setting up of the said plan. Besides, compared to individuals not having good information, persons having proper knowledge of the secularity's notion as well find useful the regulation device implementation to aim reducing EDR noise nuisances.

Youths look relatively more interested by the setting up of a control device aiming the reduction of EDR noise nuisances. 81.20 % of youths by fact (78.38% of aged persons respectively) are favorable to the setting up of such a device.

The monetary unpoor persons relatively grant more interest to the setting up of a control device aiming the reduction of EDR noise nuisances. As a matter of fact, 81.38% of monetary unpoor persons (77.24% of monetary poor persons respectively) valorise a plan of this nature.

5. Econometric results

The nested logit model used here is specified correctly since it appears that the test of... rapport de vraisemblance establishes that the model is globally significant. The upper part of the illustrated table of econometric results presents marginal use of the control device attributes aiming to reduce EDR noise nuisances.

The downer part of the table below gives the unsimilarity parameter value and the results of the hypothesis test IIA. With a 10 % significant coefficient, we reject the hypothesis IIA. The rejection of this hypothesis implies that it is preferable to make use of a nested logit model rather than to a conditional logit model or a multinomial logit model (Heiss, 2002; Hensher, Rose & Greene, 2005). Moreover, we ascertain that dissimilarity parameter is less than 1. The dissimilarity parameter in econometric analysis takes a dual interest. Stressing on the works of Daly & Zachary (1979), on the one hand, showing that de dissimilarity parameter is inversely linked to the variances of the indirect utilities differences, it provides a base for the identification of the relation between the alternatives the different ... d’emboitement level. On the other hand, it permits to notice the compatibility of the nested logit with the utility maximisation principle. According to Daly & Zachary (1979) and Mc Fadden (1981), the structure of the decision tree is not judged compatible with the principle of utility maximisation than when the coefficients of the dissimilarity parameter are comprised within 0 and 1.

The estimated coefficients is proven significant for the 4 regulation device attributes aiming to reduce EDR noise nuisances. Therefore, « the service hours regulation », « the construction
of sound proof church areas », « the regular sensitization of EDR officials on the noise nuisance harmful effect » and « the control apparatus cost to aim the reduction of EDR noise nuisances » significantly influence individuals’s choices. In numerous Yaounde and Douala neighbourhoods, the populations residing close to EDR complain over the noise and …tapages caused by the latter. To attract faithfuls, EDR pastors perform to each other a tough resounding contest. Night vigil and preaching with the most performant sound system is thus multiplied, accompanied by a music broadcasted by loud speakers of which some are oriented towards the church's outing. It is a thunderous music that the latter offers to neighbours and which pertubates night sleep. Pupils and students are not spared by this music which impedes home work and studies. Just as the sick interned in health centers based in the immediate vicinity of revival churches. Each church wants to be better heard and the most famous of the milieu. Some surrounding individuals incessantly denounce these facts to the civil powers. The Cameroon civil authorities in the past have have taken upon them the initiative to close these incriminated worship places, but it unsuccesful. On the 1\textsuperscript{st} August 2013, the Yaounde 1 Divisional Officer, Jean-Paul Tsanga Foé, proceeded to closing 5 illegally opened EDR in his zone of jurisdiction. This banning just lasted for few days, for on August 26 of the same year, the Territorial Administration and Decentralization Minister asked to the various Center Region Subdivisional Officers to halt their decision. There is then an administrative tolerance on this issue which can be explained by the proximity among EDR promoters and civil authorities (Mpabe & Abba, 2018) on the detriment of the respect of Decree N°2011/2583/PM of 23 August 2011 on the regulation of noise.

The coefficient of the attribute « church service hours regulation » is of 10% positive and significant threshold. This means that the surrounding populations would find opportune the church service hours control in the perspective of noise reduction. A regulation to fix service hours between 6 o'clock in the morning and 8 o'clock in the evening can for sure just partially reduce EDR noise. Nevertheless, it is likely to head to the suppression of « night prayers for delivrance ». The complete banning « of night prayers for delivrance », featured religious service of EDR, can be detrimental to these ones by instilling a reduction of their market shares and their church service revenues.

The coefficient of the attribute « construction of sound proof worship areas » is positive and significant at the threshold of 10%. Surrounding populations would then favorable to the construction of EDR sound proof service places with the goal of total noise nuisance reduction. The construction of sound proof worship places is an instrument which imposes to EDR
officials to build temples that impedes the outward broadcasting of noise from church mass. The strict application of this measure imposes to EDR a supplementary expense for landscaping. In the first term of the year 2018, the President of Rwanda, Paul Kagame, was uncompromising by authorizing the closure of 700 worship areas belonging to EDR for non respect of security and hygiene standards, and requirements relating to their legal status.

Likewise, individuals positively valorise the regular sensitization of EDR officials on the noise nuisance harmful effects. This sensitization could enable progressively reduce noise nuisances. The coefficient of the attribute «regular sensitization of EDR officials on the harmful effects of noise nuisances » is significant at a threshold of 5%. Besides, this sensitization could be done in several manners, especially through media sensitization campaigns and concertation meetings between public powers, neighbouring populations and EDR officials. To illustrate, under the government of Lionel Jospin in 2002, it was decided, in France, to regularly organize meetings between civil authorities and the Catholic Church in order to tackle, to analyze and to resolve problems likely to appear in the relations between the Church and the public authorities. As recall, to defend themselves from noise nuisance incriminations towards them, EDR promoters during the preliminary inquiry led by Mpabe (2015) maintained that (i) Cameroon is a secular State that advocates freedom of speech and religion, (ii) every authority comes from God who deserves worshiping and adoration at any time and (iii) prayers of EDR allow to hand Cameroon to the Lord and their teachings free them from ignorance.

The choices of the inquired individuals reveal for instance that the marginal utilities of the attributes «construction of sound proof church areas » and « regulation of service hours » are higher than the marginal utility of the attribute « regular sensitization of EDR officials on the noise nuisance harmful effects ». These results reveal that individuals seem more sensible to actions targeting the total or partial reduction of EDR noise nuisances.

The coefficient of the attribute « cost of the regulation apparatus » has a positive sign; this indicates that the probability, to prefer a control device aiming to reduce EDR noise nuisances, augments with its cost. This regulation plan can then be considered as a « good of giffen ». This owing to the fact that there currently exist no service substitutable to it or because it represents an unconsiderable share of the poor consumer's income.

The second part of the table below entails estimations of coefficients of control variables of the econometric model. All these variables which are of economical, social or demographic nature, (in this case the individual's sex (SEX), their age (AGE), their level of instruction (EDU), their
health status (EDS), their exact knowledge of secularity (LAIC), their matrimonial situation (SM), their level of religiosity (IDR), their monetary well being (REV), their appreciation of the quality of the religious service offer (QOR) and the number of care taken children (AEAC) and the religiosity level (IDR)) are non significant at 10% threshold.

Table 5: Results of the estimation of the nested logit model

<table>
<thead>
<tr>
<th>Choice</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Standard deviation</td>
</tr>
<tr>
<td><strong>Services (attributes of services)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulation of service hours (Ref : No)</td>
<td>0.682*</td>
<td>0.406</td>
</tr>
<tr>
<td>Construction of sound proof walls (Ref : No)</td>
<td>0.639*</td>
<td>0.373</td>
</tr>
<tr>
<td>Regular sensitization of EDR promoters (Ref : No)</td>
<td>0.310*</td>
<td>0.171</td>
</tr>
<tr>
<td>COST</td>
<td>0.683*</td>
<td>0.401</td>
</tr>
<tr>
<td><strong>Equation type</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prefers a control device against noise nuisances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monetary well being (Ref : quartile of order 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>quartile of ordre 2</td>
<td>0.146</td>
<td>0.341</td>
</tr>
<tr>
<td>quartile of ordre 3</td>
<td>0.340</td>
<td>0.374</td>
</tr>
<tr>
<td>quartile of ordre 4</td>
<td>0.257</td>
<td>0.347</td>
</tr>
<tr>
<td>Religiosity level (Ref : low level of religious participation)</td>
<td>-0.238</td>
<td>0.281</td>
</tr>
<tr>
<td>Sex (Ref : masculine)</td>
<td>0.029</td>
<td>0.241</td>
</tr>
<tr>
<td>Matrimonial situation (Ref : not married)</td>
<td>-0.460</td>
<td>0.330</td>
</tr>
<tr>
<td>Level of instruction (Ref : Illiterate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of primary education</td>
<td>0.495</td>
<td>0.495</td>
</tr>
<tr>
<td>Level of secondary or higher education</td>
<td>0.135</td>
<td>0.494</td>
</tr>
<tr>
<td>Health status (Ref : not fine)</td>
<td>-0.005</td>
<td>0.435</td>
</tr>
<tr>
<td>Number of children under care (Ref : At most 2 children)</td>
<td>0.255</td>
<td>0.292</td>
</tr>
<tr>
<td>Exact knowledge of secularity (Ref : Not exactly knowing)</td>
<td>-0.147</td>
<td>0.247</td>
</tr>
<tr>
<td>Quality of the religious service offer (Ref : low)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>-0.161</td>
<td>0.303</td>
</tr>
<tr>
<td>High</td>
<td>0.141</td>
<td>0.351</td>
</tr>
<tr>
<td>Age</td>
<td>-0.008</td>
<td>0.019</td>
</tr>
<tr>
<td><strong>Parameters of dissimilarity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferring a control apparatus against noise nuisances</td>
<td>-0.645</td>
<td>0.768</td>
</tr>
<tr>
<td>LR test for IIA (tau = 1):</td>
<td>Chi2 (1) = 3.86</td>
<td>Prob&gt; Chi2 = 0.049**</td>
</tr>
</tbody>
</table>

**Source:** Authors (***, ** and * respectively correspond to the significance at the threshold of 1%, 5% and 10%)

Estimations of coefficients permit to compute the implicit prices of attributes of the regulation device aiming the reduction of EDR noise nuisances. The used estimation method of wellingness to pay is the Delta\textsuperscript{4} method. Given that the cost if the device is one of the control device attributes aiming to diminish noise nuisances by EDR, the ratios between the

\\textsuperscript{4} Read Hole (2007) for a review of the consentments to pay literature
coefficients of other attributes and the coefficient associated to the device's cost can be interpreted as the wellingnesss to pay marginal ... for the attributes (Louviere & al, 2000 ; Bennett & Blamey, 2001).

Thence, the marginal wellingness to pay for the attribute « regulation of hours of worship » is of 0.997 dollars, giving 523 FCFA. This shows that the implicit price for a regulation apparatus having this attributes is higher than 523 FCFA superieur to the apparatus not posseding it. The marginal wellingness to pay for the attribute «construction of sound proof service houses » is of 0.935 dollar US, that is 491 FCFA. This result reveals that the wellingness to pay for a regulation device having this attribute is higher by 491 FCFA than that of the regulation device which does not possess it. The marginal wellingness to pay for the attribute « regular sensitization of EDR officials on the effects of noise nuisances » amounts to 0.454 US dollar, giving 238 FCFA. This result indicates that the wellingness to pay for a control device having this attribute is higher than by 238 FCFA to that of the regulation device not possessing it.

**Table 6: Wellingnesss to pay**

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Average wellingness to pay in US dollars</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation if service opening hours</td>
<td>-0.997*</td>
<td>0.603</td>
</tr>
<tr>
<td>Construction of sound proof walls</td>
<td>-0.935*</td>
<td>0.529</td>
</tr>
<tr>
<td>Regular sensitization of EDR promoters</td>
<td>-0.454***</td>
<td>0.147</td>
</tr>
</tbody>
</table>

**Source:** Authors (***, ** and * respectively correspond to the significance at the threshold of 1%, 5% and 10%)

These values reflect the average gains, in monetary value, of an individual not belonging to NMR in relation to the implementation of a control device against noise nuisances emitted by EDR. Th lowness of this gains donot mean that the implementation of the control device against noise nuisances is not important enough for individuals not belonging to NMR. On the contrary, it can find an explanation in the underdevelopment context in which Cameroon is found. As a matter of fact, the monetary poverty rate in Cameroon still seems relatively high (INS, 2007).

6. Conclusion

This study intended to perform an a economical analysis of the noise nuisance regulation influence emitted by EDR on the surrounding populations' well being in the Cameroon urban milieu. To attain this objective, the adopted approach was done in 3 steps.

In the first step, we highlighted the debate on the choice of environment regulation instruments. In the second step, a formal framework enabling to modelize the preference choices of the noise nuisance control device emitted by EDR was elaborated. In the third step, the estimation of the
nested logit model in the third section of this dans article reveals that the regulation of EDR worshipping hours, the sensitization of EDR officials on the harmful effects of their noise nuisances and the construction of sound proof church areas significantly favour the reduction of noise nuisances and consequently the improvement of surrounding populations well being.

These results could be improved in upcoming research works if the take into account some factors, especially (i) the characteristics of the neighbouring populations' housing and (ii) the distance between their residences the nearest EDR. The recommendations of the economical policy likely to be sent up to the public authorities are:

✓ to adopt and ensure the respect of a text of law which fixes service hours to EDR and imposes to EDR the building of church places with soundproof houses ;
✓ to undertake regular sensitization campaigns of EDR officials as to the noise nuisance harmful effects on the well being of surrounding populations. They can be done through (i) the organisation of seminars regrouping EDR officials and the neighboring populations' representatives not belonging to EDR and (ii) the broadcasting of media spots on the noise nuisance issue.

Upcoming works could focus on: (i) the wellingnesss to receive EDR members for the setting up of the control apparatus against sound nuisances they emit. Furthermore, a comparative analysis of the noise nuisance effects emitted by off licenses, mosques and EDR could turn out to be interesting.

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