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Tobacco consumption influence on spending patterns within Costa Rican households

Influencia del consumo de tabaco en los patrones de gasto de los hogares costarricenses

Erick Sequeira-Benavides¹ 

Abstract: Tobacco consumption implies a dilemma in the allocation of the family budget. Hence, the objective of this study is to determine the effect of tobacco consumption on expenditure patterns within Costa Rican households. The 2018 National Household Income and Expenditure Survey is used to estimate Engel curves through a Quadratic Almost Ideal Demand System, using the Seemingly Unrelated Regression model for a set of 11 expenditure categories. Due to heteroskedasticity and endogeneity, the Generalized Method of Moment Three-Stage-Least-Squares (GMM-3SLS) is used since it provides more efficient parameter estimates. Results show that tobacco consumption is associated with a crowding-out effect on health expenditure and with a crowding-in effect on restaurant and hotel expenditures. Furthermore, tobacco consumption shows a crowding-in effect on alcoholic beverages for every income quintile. This suggests that tobacco consumption could harm the country's standard of living and not only the realm of health.

Keywords: tobacco consumption, alcohol expenditure, crowding out, expenditure shares.

Resumen: El consumo de tabaco implica una disyuntiva en la asignación del presupuesto familiar. Por ende, el objetivo de este estudio es determinar el efecto del consumo de tabaco sobre los patrones de los hogares costarricenses. Este artículo utiliza datos de Costa Rica de la Encuesta Nacional de Ingresos y Gastos de los Hogares de 2018 para estimar curvas de Engel a través de un sistema cuadrático de demanda casi ideal, empleando el modelo de Ecuaciones Aparentemente No Relacionadas para 11 categorías de gasto. Debido a la presencia de problemas de heterocedasticidad y endogeneidad, se utiliza Mínimos Cuadrados en Tres Etapas por el Método Generalizado de Momentos (MC3E-MGM), ya que provee estimaciones más eficientes. Los resultados muestran que el consumo de tabaco se asocia con un efecto desplazamiento sobre el gasto en salud y con un efecto atracción sobre el gasto en restaurantes y hotelería. Además, el consumo de tabaco muestra un efecto atracción sobre el gasto en bebidas alcohólicas para cada quintil de ingreso. Esto sugiere que el consumo de tabaco puede perjudicar la calidad de vida del país y no solo el ámbito de la salud.

Palabras clave: consumo de tabaco, gasto en alcohol, efecto desplazamiento, razones de gasto.

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1. Introduction

Various effects of tobacco use have been studied, mainly related to health status and economic costs. However, neoclassical consumer theory incorporates rationality into its foundations, which assumes that utility is maximized and validates the choice of an optimal basket of goods, whatever it contains. Although it is possible to consider externalities in these models, the rationality assumption and the effectiveness of intra-familial compensations are questionable. The full consumer sovereignty is also arguable since the human has social needs. These are not physiological or biological but must be satisfied because innate sociability marks us (Fernández, 2005). This allows smoking to become a transmissible habit. Moreover, there is coercive use caused by addiction to nicotine, with evidence of attempts by individuals to eliminate their consumption.

At the individual level, tobacco consumption is one of the leading causes of death while being preventable and is the only legal product that can cause death when used as its manufacturers indicate (U.S. National Cancer Institute & World Health Organization, 2016). However, it generates external costs. The negative externalities involve damage to health, costs for social security systems financed by taxes, material damages, and loss of human lives. Part of the externalities are considered internal if the smoker's relatives obtain some compensation, but others remain uncompensated. For example, diseases and consumption decisions affect the capacity to acquire other goods and to invest in physical and human capital. In this sense, an externality occurs through the distribution of household income. Since resources are limited, tobacco consumption creates a dilemma: a share of the family income must be allocated to the purchase of this good and it could not be used to buy basic goods and services. Expenditure reductions on food, housing, or even health and education can occur, to the detriment of the human capital accumulation that allows the breaking of poverty circles (John et al., 2011).

All these implications justify direct censorship against tobacco consumption. Thus, this study is based on a critique of consumer sovereignty and the externalities caused. It is based on a social value over the individual one. Likewise, voluntary control mechanisms tend to be ineffective, and this makes it possible to justify interventions (López & Viudes, 2009). Therefore, this paper aims to determine the effect of tobacco consumption on the expenditure patterns within Costa Rican households, through the reallocation of the expenditure to other goods and services, based on the 2018 National Household Income and Expenditure Survey (NHIES). Studies that have investigated these effects in countries such as Ghana, China, Turkey, Bangladesh, Zambia, and Chile, find that tobacco use is associated with a crowding-out effect in education, health, and housing expenditure. Moreover, it is common to find a crowding-in effect in alcoholic beverage expenditure.

As detailed below, the studies related to tobacco consumption in Costa Rica focus on the effects on health or the smoker profile, but there are no known studies of this nature. This is the first contribution proposed in the country that examines the effect of tobacco consumption on the expenditure share of other goods and services. This research uses information on household income and expenditure contained in the 2018 HNIES to estimate a Quadratic Almost Ideal Demand System (QUAIDS) and thereby approximate Engel curves by implementing the Seemingly Unrelated Regression (SUR) model. Given the presence of heteroskedasticity and endogeneity, it is necessary to adjust the errors and to use an instrumental variable, so that the estimate corresponds to the Generalized Method of Moment Three-Stage-Least-Squares (GMM-3SLS).

The results indicate that in Costa Rica tobacco-consuming households show a crowding-out effect on health expenditure. Likewise, there is evidence of a positive relationship between tobacco consumption and expenditure on alcoholic beverages, so tobacco-consuming households have a higher expenditure share on these substances. This crowding-in effect holds when analyzing every income quintile.

2. Literature review

Economic literature has addressed tobacco consumption and its effects from different perspectives. On the one hand, there are theoretical developments that model smoking as a rational decision by incorporating externalities. For instance, Becker & Murphy (1988) proposed a model of rational addiction, and Gruber & Köszegi (2001) proposed a model in which agents act with temporal inconsistency; that is, while making the decision, they value the immediate benefit of consuming tobacco more than the future health benefit. Nevertheless, there are also criticisms related to the market failures, such as that of López and Viudes (2009): assuming that smokers are aware of the costs and that they consider them is incompatible with the efforts made by consumers themselves to quit smoking. On the other hand, there are empirical studies that analyze the crowding-out generated by tobacco consumption. The latter studies base their methodology on empirical analyses that approximate demand curves in cases in which there is no information on prices and use appropriate curves for the data according to the several types of goods, as well as empirical studies that analyze the household expenditure structure.

In Costa Rica, there are studies on the possible impacts of restricting tobacco consumption and the factors that influence it. Monge (2012) described the Costa Rican tobacco market and the implications of strict tobacco control on employment and consumption. Fonseca et al. (2017) found that the susceptibility and prevalence of smoking have decreased, but also found an increase in the proportion of young people with tobacco addiction. Additionally, being a woman, and living with

children under 15 years old or with older adults are factors that reduce the probability of consuming tobacco (Espinoza et al., 2020). Even so, there is no research on the crowding-out effect of tobacco consumption over the family budget allocation.

In contrast, there are empirical studies in other countries that analyze this relationship. Nevertheless, they use previous literature associated with Engel curves and QUAIDS. More specifically, Engel (1857) studied the behavior of families and the allocation of income in various categories of goods, using the expenditure share in these groups as a proxy for welfare; however, there was no established specification for the equation. Later, Working (1943) and Leser (1963) proposed a linear form that relates the expenditure share of one good in the family budget to the natural logarithm of total expenditure. Subsequently, Banks et al. (1997) observed that for some commodities the data did not fit precisely and then developed the QUAIDS, which consists of including a quadratic term for the logarithm of total expenditure. Thus, it is possible to obtain Engel curves consistent with consumer behavior. This considers goods and services that are a luxury for certain income levels and a necessity for others, which adapts the curves for budget shares whose relationship is strongly non-linear.

Several studies use the QUAIDS to estimate conditional Engel curves. The theoretical framework that justifies this implementation is summarized in the difficulty to estimate conditional demand functions since it is necessary a specification of a utility function and information on prices (John, 2008; Nguyen & Nguyen, 2020; Wang et al., 2006). In the literature, it is common to use the SUR model, but the estimation method may vary. The usual one is to implement Three-Stages-Least-Squares (3SLS), although some authors use methods such as Fractional Logit (Pu et al., 2008; Wang et al. 2006) or the combination of 3SLS with a Probit model (Chelwa & Walbeek, 2014).

John (2008) and San & Chaloupka (2016) included tobacco expenditure and total non-tobacco expenditure as covariates but found an endogeneity issue; this was solved through the instrumental variable (IV) method, using the ratio of adult men to adult women and total expenditure or income as instruments. Then, a 3SLS was implemented. Other studies found heteroskedasticity issues, so to correct the errors they used Feasible Generalized Least Squares (Husain et al., 2018; John et al., 2011). In cases where both endogeneity and heteroscedasticity problems arose, authors use GMM-3SLS (Masa et al., 2020; Nguyen & Nguyen 2020).

It is also common to consider the effects according to different income levels. Although John (2008) found that tobacco expenditure had a crowding-out effect on per capita food intake, education, and entertainment expenditure, the estimated effect was similar for low-income and high-income households. On the other hand, Pu et al. (2008) found that low-income households are most vulnerable since they are more affected in terms of food and health. John et al. (2011) found a

crowding-out effect in education and clothing expenditure at the country level, and in food in low and middle-income households. Nguyen & Nguyen (2020) found a modest decline in the education expenditure share, but mainly in low-income households. Finally, Paraje & Araya (2018) obtained similar results: a lower expenditure share allocated to education and health for poorer households.

For some studies, the most affected categories were food, health, and education (Wang et al., 2006; San & Chaloupka, 2015; Masa et al., 2020), but in some cases, the crowding-out also occurred in categories such as recreation, transportation, communication, housing, clothing, and financial security (Wang et al., 2006; Husain et al., 2018; Masa et al., 2020). However, a crowding-in effect is also possible, as Husain et al. (2018) found; this crowding-in was in food and health, while others found it in alcohol (Masa et al., 2020; Nguyen & Nguyen, 2020; Paraje & Araya, 2017; Wang et al., 2006). Chelwa & Walbeek (2014), on the other hand, did not find any category in which tobacco implied a crowding-in effect.

3. Methodology

3.1. Approach

This study follows a quantitative and empirical approach. The primary focus is to determine the effect of tobacco consumption on the expenditure patterns within Costa Rican households. This investigation does not delve into the broader health or social implications of tobacco consumption but instead focuses on understanding how households prioritize spending when tobacco is consumed, through the estimation of Engel curves. In other words, it identifies which categories are influenced by tobacco consumption. Besides, since cross-sectional data is used, the aim is not to explain how individuals' behavior changes over time, nor is it intended to explain the mechanism through which expenditure in these categories changes.

3.2. Data

This research uses the 2018 Encuesta Nacional de Ingresos y Gastos de los Hogares (National Household Income and Expenditure Survey or NHIES), carried out by the Instituto Nacional de Estadística y Censos (INEC or National Institute of Statistics and Censuses), whose effective sample corresponds to 7,046 households selected through a probabilistic design of areas, stratified, two-staged, and replicated, with immediately captured interviews that included sociodemographic and socioeconomic characteristics, purchasing and consumption habits, and personal expenditures (INEC, 2020). This data is divided into three distinct datasets: expenditures, individuals, and households. However, only the household dataset is used, which consists of 341 variables and 7,046 observations and gathers information on expenditures and socioeconomic characteristics for each

household.² Of the total, there are 184 households with reports of having consumed tobacco through cigarettes, tobacco cigars, chewing tobacco or snuff, pipe, and other tobacco products.

3.3. Selected variables

It is necessary to define the total household expenditure and its composition to divide it into various expenditure categories. In this case, the selected variable is total monthly consumption expenditure. This is made up of total expenditure on food and non-alcoholic beverages; alcoholic beverages; tobacco; clothing; housing; water and electricity, grouped as utilities; furniture and home maintenance, renamed as equipment; communication; recreation and culture; education; restaurants and hotels; and, finally, miscellaneous expenditures. All of these, except for total consumption and tobacco expenditure, are divided by net expenditure on tobacco (total consumption expenditure minus tobacco expenditure) so that the expenditure share can be obtained in every category.

As covariates, and following Banks et al. (1997), it is necessary to include the logarithm and the squared logarithm of total consumption expenditure, but this expenditure is eventually instrumented by current gross income. Moreover, control variables are essential. The age and years of education of the household head do not receive any transformation; the number of household members is log-transformed; marital status is converted into a set of dummy variables for each status except married; the number of older adults members is also transformed into a dummy, taking value 1 to indicate the presence of older adults and 0 if not; the number of minors is converted into a dummy to indicate their presence; and, finally, the gender variable is recoded so it takes the value 1 for women and 0 for men.

3.4. Estimation

To estimate the effect of tobacco consumption on expenditure shares, it must be possible to establish a statistical relationship between every expenditure category and a set of explanatory variables. In addition, the expenditure of every group does not have the same behavior, since there are goods that represent luxuries at certain income levels and necessities at other levels. For this reason, this research follows the empirical demand curves used by Engel (1857), which are presented in the form of a quadratic equation system by including a linear and a quadratic term for the logarithm of the expenditure, as developed by Banks et al. (1997). This makes it possible to

² There were 51 negative consumption expenditure observations, as a result of automatic calculations in furniture and transportation expenditure. To avoid altering the construction method of variables and to avoid adding noise to the estimation, the decision was to eliminate those negative observations. Furthermore, it was necessary to eliminate 5 more observations due to missing values. Thus, 6,990 observations remain. None of the eliminated ones affects the total of tobacco-consuming households.

simultaneously model household decisions and control for sociodemographic characteristics, and thus determine whether there is a different budget allocation among the distinct groups of goods and services in those tobacco-consuming households.

To estimate the Engel curves for the various categories, the functional form is specified as follows:

$$w_{ih} = \beta_{i0} + \beta_{i1} \cdot T_h + \beta_{2i} \cdot \ln(M_h) + \beta_{3i} \cdot \ln(M_h)^2 + B_{i4} \cdot X_h + \varepsilon_{ih} \quad (1)$$

where w_{ih} represents the expenditure share excluding tobacco of category i for household h . T_h is a dummy variable that indicates whether the household consumed tobacco and equals 1 if the household was observed with positive tobacco expenditure. M_h is total household expenditure excluding tobacco. X_h is a vector of characteristics that includes gender; age; years of education; marital status of the head of household (in 5 dummies terms: free union, divorced, separated, widowed, or single); a dummy that indicates the presence of minors and another for older adults. Finally, ε_{ih} corresponds to the error term.

There is evidence of endogeneity across $\ln(M_h)$, since the expenditure structure changes as total expenditure increases (Pu et al., 2008). In this case, the Durbin-Wu-Hausmann test rejects the null hypothesis of exogeneity so total current income is used as the instrumental variable, following Banks et al. (1997) and Masa et al. (2020). Moreover, it is important to test the validity of this instrument since it can lead to inconsistent estimates; in particular, the first stage and the F statistic support that this is a valid instrument.

Due to the nature of these data, it is necessary to test for heteroskedasticity. The Breusch-Pagan test rejects the null hypothesis of homoscedasticity, so it is required to correct the standard errors. Besides, the allocation of household expenditure in one category is correlated with the other categories since households make these decisions simultaneously. This implies that it is likely that the error term of the various categories in (1) is also correlated. The common approach to resolve this is through an equation system using the SUR model. Nevertheless, to consider both heteroskedasticity and endogeneity, the estimation is via GMM-3SLS.

The idea is to determine whether there are categories affected by tobacco use through budget reallocation, considering the income levels. Specific categories are food; clothing; utilities; equipment; communication; recreation and culture; education; restaurants and hotels; and miscellaneous expenditures. This estimation is performed both for the total number of households and for every income quintile. However, all regression equations are estimated simultaneously, so the miscellaneous category is dropped to ensure the adding up restriction and, thus, to avoid collinearity issues.

In equation (1) the dependent variable corresponds to the expenditure share in the previous categories. The coefficient β_{i1} measures the effect of tobacco consumption on the specific share. Thus, β_{i1} is understood as the difference between the mean of the expenditure share in category i of tobacco-consuming households and the non-tobacco-consuming households. Considering that w_{ih} is expressed as a percentage, the coefficient β_{i1} says how the expenditure share for category i changes in percentage points when the household consumes tobacco.

As a hypothesis, a crowding-out effect is expected in food, health, and education expenditures. Yet, this effect is expected to be higher in the first income quintiles. Similarly, a particular interest presumes to demonstrate whether there is indeed a crowding-in effect in alcoholic beverages; this relationship is expected to be positive regardless of income level.

4. Results

Table 1 and Table 2 provide the mean values and the corresponding standard deviations (s.d.) for the variables used in the estimation. These values are presented for three distinct groups: the entire country, households that do not consume tobacco, and households that do consume tobacco.

Table 1
Descriptive measures of household and household head characteristics

Variable	Country		Non-consuming		Consuming	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
Head of household age	50.47	15.71	50.45	15.73	51.24	14,81
Years of education	7.89	4.42	7.88	4.42	8.08	4,50
Number of household member	3.22	1.63	3.22	1.63	3.21	1,86
Female-headed households	0.38	-	0.39	-	0.37	0,48
Tobacco-consuming households	0.03	-	0.00	-	1.00	-
Older adults' presence	0.25	-	0.25	-	0.27	-
Minors' presence	0.50	-	0.50	-	0.40	-

Source: the author, based on NHIES 2018.

Note: since the last four variables are dummies, the mean represents the percentage of households that meet that characteristic.

Table 2

Descriptive measures of income and the various expenditures (in colones)

Variable	Country		Non-consuming		Consuming	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
Current income	841 966	1 106 432	840 010	1 107 859	914 375	1 052 539
Consumption	524 650	480 724	522 817	479 277	592 517	528 588
Tobacco	578	5 377	-	-	21 989	25 134
Net tobacco	524 072	480 558	522 817	479 274	570 528	525 203
Food	130 661	107 259	130 590	107 228	133 279	108 644
Alcohol	2 033	12 186	1 859	11 872	8 493	19 689
Clothing	24 234	44 437	24 215	44 518	24 948	41 418
Utilities	63 358	81 851	63 213	82 220	68 699	66 738
Equipment	30 808	55 581	30 786	55 724	31 613	50 127
Health	26 757	72 296	26 588	70 461	33 008	122 319
Transportation	82 401	176 759	82 289	176 483	86 559	187 140
Communication	32 286	31 560	32 172	31 503	36 494	33 407
Recreation	32 111	59 022	32 026	58 906	35 272	63 282
Education	22 137	80 282	22 114	80 319	22 979	79 127
Rest. /Hotels	38 108	68 417	37 799	68 094	49 569	78 842
Miscellaneous	39 177	59 371	39 165	59 618	39 614	49 546

Source: the author, based on NHIES 2018.

Note: all amounts are rounded and expressed in colones.

Table 1 shows that around 3 % of households reported tobacco consumption during the survey period. Additionally, as seen in Table 2, both the average current income and the average of the several types of consumption expenditure are higher for tobacco-consuming households. The same occurs with the average age of household heads, but not with years of education. Concerning the number of household members, the average is the same, but tobacco-consuming households have a lower average number of minors. In contrast, the presence of older adults is similar, although it is higher in tobacco-consuming households. Finally, most households are headed by men, but the percentage headed by women is lower for tobacco-consuming households.

Table 3 shows the expenditure share in every category for the country and for every income quintile. In categories such as food and utilities, a reduction is observed as the income quintile increases. However, others such as alcohol, equipment, health, transportation, communication, recreation, education, restaurants, and miscellaneous expenditures rise as the quintile increases. The expenditure share on tobacco and clothing remains similar.

Table 3

Expenditure by category as a percentage of total net tobacco expenditure, by income quintile

	Tobacco	Food	Alcohol	Clothing	Utilities	Equip.	Health	Trans.	Comm.	Rec.	Educ.	Rest. / Hotels	Misc.
Total	0.15	30.00	0.28	4.58	14.96	5.33	4.30	11.99	6.78	5.81	2.45	6.67	6.85
Q1	0.13	39.40	0.10	4.42	17.06	4.51	2.81	8.67	5.84	5.77	0.83	4.27	6.36
Q2	0.16	33.66	0.15	4.66	16.05	5.02	3.78	10.20	6.73	5.45	1.92	5.70	6.68
Q3	0.15	29.83	0.24	4.73	14.97	5.43	4.53	11.84	7.08	5.41	2.17	6.91	6.87
Q4	0.21	24.07	0.41	4.42	14.28	5.47	4.92	14.27	7.52	5.54	3.74	8.55	6.79
Q5	0.13	18.58	0.58	4.71	11.28	6.71	6.13	16.72	7.05	7.11	4.33	9.00	7.77

Source: the author, based on NHIES 2018.

Note: Q1, Q2, Q3, Q4, and Q5 represent every income quintile, ordered from the lowest to the highest income, while the total represents the entire sample.

As mentioned before, the coefficient of interest in equation (1) is β_{it} , since it allows estimating the effect of consuming tobacco on the expenditure shares. Thus, Table 4 presents the estimated effect in percentage points (p.p.) for every category, both for the country and for every quintile income. This shows that in most groups (food, clothing, services, furniture, transportation, communications, recreation, and education) there is no significant effect. However, at the country level, expenditure share on alcohol, health, and restaurants and hotels show statistically significant relationships with tobacco consumption in Costa Rican households.

Table 4

Effect of tobacco consumption on every expenditure category, by income quintile (in percentage points)

	Food	Alcohol	Clothing	Utilities	Equip.	Health	Trans.	Comm.	Rec.	Educ.	est. / Hotels
Total	0.10 (1.04)	1.34*** (0.28)	-0.49 (0.34)	0.38 (0.88)	-0.30 (0.44)	-0.97** (0.49)	-0.42 (0.88)	0.01 (0.41)	-0.11 (0.44)	-0.45 (0.48)	1.47* (0.86)
Q1	0.90 (2.53)	0.50* (0.30)	-1.31** (0.63)	0.80 (1.87)	-0.17 (0.67)	-0.53 (0.70)	1.53 (2.26)	-0.01 (0.89)	-0.51 (1.05)	-0.28 (0.40)	1.03 (1.31)
Q2	0.47 (2.34)	1.06*** (0.40)	-0.08 (0.91)	0.48 (2.07)	-0.37 (0.91)	-1.53* (0.91)	2.22 (2.31)	-0.86 (1.13)	-0.92 (0.73)	-0.33 (1.31)	-0.56 (1.72)
Q3	1.54 (2.55)	0.70** (0.34)	-0.43 (0.81)	0.68 (2.19)	-0.77 (0.72)	-0.86 (0.75)	-2.55* (1.50)	0.00 (0.98)	-0.64 (0.71)	-1.87*** (0.50)	3.75 (2.29)
Q4	0.84 (2.01)	2.46*** (0.91)	-0.49 (0.66)	-0.37 (1.86)	0.08 (1.22)	-1.16 (0.92)	-3.75** (1.87)	-1.12 (0.72)	-0.85 (0.73)	0.32 (1.42)	5.02** (2.48)
Q5	-3.85** (1.52)	1.67*** (0.63)	0.04 (0.94)	-0.97 (1.86)	-0.57 (1.17)	-0.15 (1.95)	1.90 (2.32)	1.75 (0.97)	2.64* (1.45)	-0.62 (1.26)	-1.50 (1.32)

Source: author, based on the estimation using NHIES 2018.

Notes: Q1, Q2, Q3, Q4, and Q5 represent every income quintile, ordered from lowest to highest income, while the total represents the entire sample. *p <0.10; **p <0.05; ***p <0.01.

A striking result is a crowding-in effect in the expenditure share allocated to alcoholic beverages, which is 1.34 p.p. This means that, if the household consumes tobacco, the alcohol expenditure increases 478 %.³ Moreover, this crowding-in is not only shown at the country level but in every income quintile. In the first one, the crowding-in effect is 0.5 p.p., a 500 % increase. In the second one, it is 1.06 p.p., a 707 % increase. In the third one, it is 0.7 p.p., a 292 % increase. In the fourth one, there is an increase of 2.46 p.p., a 600 % increase. Finally, in the fifth one, the increase is 1.67 p.p., a 288 % increase. Thus, a strong relationship between tobacco and alcohol consumption is evident, and it remains consistent across every income level. This can be reasonably explained by considering factors such as social habits, psychological interactions, and addictive tendencies.

Tobacco consumption shows a -0.97 p.p. effect in the health expenditure share, a 22.6 % decrease when the household consumes tobacco. However, this crowding-out is not found when analyzing every quintile except for the -1.53 p.p. effect in the second quintile, which is a 40.5 % decrease.

In restaurants and hotels, the effect is positive and reaches 1.47 p.p.; tobacco consumption leads to an increase of approximately 21.9 % in the expenditure share dedicated to restaurants and hotels. Similarly, this crowding-in is not found in every quintile but only in the fourth one; the effect is 5.02 p.p. or a 58.7 % increase.

In the first quintile, the tobacco consumption effect in the clothing expenditure share is -1.31 p.p., a 29.7 % decrease in the presence of tobacco consumption. In the second quintile, as mentioned, the only crowding-out effect is in the health expenditure share. In the third quintile, there is a result that stands out: the crowding-out in the transportation expenditure share, that is a -2.55 p.p. effect or a 21.5 % decrease, and the crowding-out in the education expenditure share, that is a -1.87 p.p. effect or an 86 % decrease. In the fourth quintile, there is a crowding-out in the transportation expenditure share, a -3.75 p.p. effect or a 26.3 % decrease. In the fifth quintile, the tobacco consumption effect in the food expenditure share is -3.85 p.p. or a 20.7 % decrease. This stands out because for these households there is a crowding-in effect in alcoholic beverages and recreation expenditure shares (2.64 p.p. or a 37.1 % increase), while other categories are not affected.

When comparing the hypotheses and the effects of tobacco consumption shown in table 4, there are mixed results. First, the literature indicates that tobacco involves a crowding-out effect in the expenditure share on food, education, health, and clothing, with special emphasis on the first three categories. This effect was expected to be observed in the expenditure share on education and health

³ Note that there is a significant difference between the effect measured by percentage points and by percentages. The first one could seem to be low due to the expenditure structure, so the impact is more evident when considering the effect relative to the expenditure shares in Table 3.

in lower-income households. However, this crowding-out effect was found mainly at the country level and in the health expenditure share but not in the food or education expenditure share. Second, the literature shows a crowding-in effect in the alcoholic beverages' expenditure, which is, in this case, confirmed, and it even holds for the different income levels. Finally, there is no effect in categories such as utilities and equipment, neither at the country level nor in the income quintiles.

5. Conclusions

This research addresses the effects of tobacco consumption on the expenditure allocation of Costa Rican households based on the 2018 HNIES. It aims to determine the effect of tobacco consumption on the expenditure patterns within Costa Rican households for various groups of goods and services, such as education, health, food, and housing. Given the presence of endogeneity and heteroskedasticity, the estimation was conducted using GMM-3SLS.

There is evidence in the literature of other countries that tobacco consumption has a significant reallocation effect on the household budget. For instance, there is influence on food, health, education, recreation, transportation, communication, housing, clothing and even alcohol. The findings from this research are consistent with the previous results, and contribute to the existing literature, shedding light on the crowding-out and crowding-in effect of tobacco consumption for Costa Rican households.

One of the key findings is the decrease in the health expenditure share among tobacco-consuming households. This indicates a potential adverse impact on the overall health of individuals and their families. Beyond the health risks associated with tobacco use, there is another dimension to consider, the reduced allocation of resources towards healthcare; that is, it is not only the consumption of tobacco as a harmful habit but also the detriment to the health care. Consequently, this may result in an increased burden on the Costa Rican public health system, as tobacco-related health issues may necessitate greater medical attention and resources.

Another consistent finding is the positive relationship between tobacco consumption and the expenditure share on alcoholic beverages. This underscores the complex dynamics between addictive behaviors, as families who consume tobacco may also be more inclined to allocate a higher proportion of their budget to other substances with known adverse health effects. This finding raises concerns about the cumulative impact of unhealthy habits on overall well-being. Therefore, the social cost imposed through the form of public health systems may increase due to a possible greater medical attention required.

One intriguing discovery is the crowding-out effect in education expenditure among households in the third-income quintile — often considered part of the middle socioeconomic class. Considering education as a crucial mechanism for human capital accumulation, in a society permeated by increasing inequality, it is essential to promote mechanisms that strengthen its access. Consequently, it is essential to tackle any source that hinders the achievement of educational tools. These results propose a framework to consider the application of stronger policies aiming to reduce tobacco consumption and alcoholic beverage consumption. In this way, it is possible to promote well-being through greater human capital and tools that allow the breaking of poverty circles and reduce social inequality.

In summary, this research underscores the multifaceted impact of tobacco consumption on households' expenditure patterns. The findings provide valuable information for policymakers, suggesting the need for comprehensive strategies to reduce tobacco consumption, so it is possible to promote well-being, enhance human capital accumulation, and work towards reducing inequality. However, further research and policy interventions are essential to mitigate the consequences of these harmful behaviors.

Finally, it is necessary to raise some limitations and considerations. First, it is not possible to follow the behavior of this phenomenon over time due to the nature of the database, because the sampling is random and varies from one period to another. In this sense, the observed effects are due to a specific period, but not to the general behavior of consumers in the country. In addition, the price of tobacco is low, and, consequently, expenditures on this product are as well, so, in some cases, it may not be reflected in an income reallocation. In closing, the number of consumer households is small, so the analysis by quintiles may reduce the precision of the estimates. However, the methodology allows conclusions concerning the dynamics of income reallocation through tobacco consumption.

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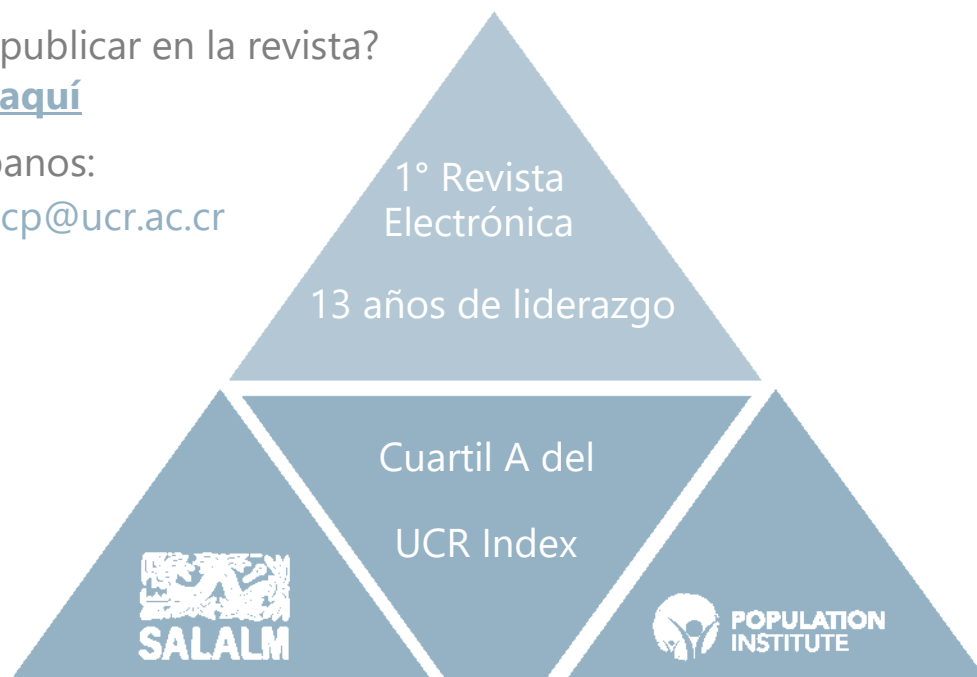
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