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The Relationship between Smoking and Household Expenditure: A Quantile Regressions Analysis

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ABSTRACT

Household Heads who smoke tend to use their income to buy cigarettes instead of needs such as food and education. Using methods of Moments Quantile Regression, this research analysed the impact of smoking on South African households' education expenditure. The National Income Dynamic Survey Dataset (NIDs) from 2008 to 2017 was utilised. The results revealed that tobacco smoking among the poorest households in South Africa typically results in decreased budgets for education. Smoking, in particular, has been shown to reduce spending on basics like education. In line with previous research, the study found that tobacco spending consistently outpaces other basic needs (education) across all income quartiles. The poorest tobacco-using households in South Africa typically spend less on education. Given that education is positively associated with quantiles of tobacco expenditure, policies focused on deterring well-educated people from smoking may be helpful. Persons who smoke heavily should be given special attention, while those who smoke less should not be disregarded. The study contributes to the scholarship by broadening the understanding of the harmful consequences of tobacco use on household resource allocation, particularly in a developing country context. It offers substantial empirical evidence demonstrating that smoking diminishes educational expenditure among the most impoverished households, a demographic frequently overlooked in current studies.

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INTRODUCTION

Cigarette smoking is a significant public health issue affecting both smokers and nonsmokers. It poses a significant threat to human health, as tobacco is a legally available product. Smoking cigarettes kills more people than any other recognised danger.[1] In 2017, the global prevalence rate of tobacco or smoking consumption was estimated to be 36%; Africa's prevalence rate was estimated to be 32%, the lowest among the continents.[2] South Africa's estimated tobacco smoking prevalence rate was 17.6 percent in

[1] Eyitayo Francis Adanlawo, Mike Megrove Reddy, and Hemduth Rugbeer, "Intercultural Business Communication: The Implications of Language Barriers," *Psychology and Education Journal* 58, no. 5 (2021): 6281–90.
[2] Fikile Xaba, Eyitayo Francis Adanlawo, and Nomusa Yolanda Nkomo, "Ecotourism Initiatives Contribution To Improved Livelihoods: A Case Of Umkhanyakude District Municipality," *International Journal of Innovative Technologies in Economy*, no. 2 (46) (2024); Davies Adeloye et al., "An Estimate of the Incidence of Prostate Cancer in Africa: A Systematic Review and Meta-Analysis," *PloS One* 11, no. 4 (2016): e0153496.

2021. However, it is expected that the prevalence will rise over the next few decades.[3] Tobacco smoking is a problem that is faced in South Africa because it affects public health. It is one of the causes of non-commutable diseases such as cancer and mortality. In each and every household, there are three main needs; food, education, and health. Individuals who smoke and who are household heads tend to use their income to buy cigarettes instead of buying needs such as food for the whole family; they prefer to use their money to satisfy their utility, hence the resources allocated to households are not effectively allocated.Tobacco usage has an adverse effect on households.[4] Tobacco-using households consumed fewer commodities, such as education.[5] Tobacco consumption displaced spending on food, health, housing, and education, according to the findings. According to Nguyen et al. and Arendt, the difficulty in drawing conclusions regarding spending patterns stems from the fact that figures are skewed because demographic and socioeconomic variables that differ between households with and without smokers are neglected.[6] Following that, econometric models are being used in the methodology (a modified version of Banks et al.'s Quadratic Almost Ideal Demand System), which took socioeconomic and demographic factors into account when estimating differences in household expenditure patterns. Tobacco was found to displace other expenditures, including those related to housing, savings, health, education, insurance, and farm productivity; however, tobacco and alcohol were complementary.[7]

The literature on this relationship abounds, but mostly for developed countries, and the existing studies have ignored the health consequences of tobacco consumption among adolescents in rural areas. This factor needs to be included when calculating the effect of tobacco consumption on household spending. This study seeks to analyse the effect of household smoking expenditure on households' consumption from the period between 2008 and 2017, more specifically on the effect of smoking expenditure on households' education.

EMPIRICAL REVIEW

The extant literature on the relationship between smoking and household expenditure is vast and has produced extensive conflicting outcomes. Some authors found negative relationships;[8] some authors found positive relationships,[9] and some even found them to be linear;[10] and nonlinear relationships.[11] The discrepancy in these findings could be caused by, among other things, the model specifications, data sets, estimation methods, or economic development level at which the relationship between smoking and household spending is being examined. These factors are all plausible explanations for the inconsistent findings in the literature currently in publication.

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[3] Nomusa Yolanda Nkomo, Mduduzi Biyase, and Beatrice D Simo-Kengne, "The Effects of Inequality on the Substitution of Essential Goods for Tobacco Smoking in South Africa," *Economies* 11, no. 6 (2023): 154.

[4] Mpho Chaka and Eyitayo Francis Adanlawo, "The Impact of Ethnicity on South Africa's National Unity," *African Renaissance* 20, no. 2 (2023): 315; Ankita Kankaria, Soumya Swaroop Sahoo, and Madhur Verma, "Awareness Regarding the Adverse Effect of Tobacco among Adults in India: Findings from Secondary Data Analysis of Global Adult Tobacco Survey," *BMJ Open* 11, no. 6 (2021): e044209.

[5] Hong Wang, Jody L Sindelar, and Susan H Busch, "The Impact of Tobacco Expenditure on Household Consumption Patterns in Rural China," *Social Science & Medicine* 62, no. 6 (2006): 1414–26.

[6] Minh Ngoc Nguyen et al., "Impoverishing Effect of Tobacco Use in Vietnam," *Tobacco Control* 31, no. Suppl 2 (2022): s146–51; Jacob Nielsen Arendt, "Does Education Cause Better Health? A Panel Data Analysis Using School Reforms for Identification," *Economics of Education Review* 24, no. 2 (2005): 149–60.

[7] Muhammad Jami Husain et al., "The Crowding-out Effect of Tobacco Expenditure on Household Spending Patterns in Bangladesh," *PloS One* 13, no. 10 (2018): e0205120.

[8] Nomusa Yolanda Nkomo and Eyitayo Francis Adanlawo, "The Effects of Education on Tobacco Consumption: A Panel Data Analysis," *Journal of Ecohumanism* 3, no. 3 (2024): 308–16; Kankaria, Sahoo, and Verma, "Awareness Regarding the Adverse Effect of Tobacco among Adults in India: Findings from Secondary Data Analysis of Global Adult Tobacco Survey"; Chaka and Adanlawo, "The Impact of Ethnicity on South Africa's National Unity."

[9] Guillermo Paraje and Daniel Araya, "Relationship between Smoking and Health and Education Spending in Chile," *Tobacco Control* 27, no. 5 (2018): 560–67; Mohammad Siahpush et al., "Socioeconomic Status and Cigarette Expenditure among US Households: Results from 2010 to 2015 Consumer Expenditure Survey," *BMJ Open* 8, no. 6 (2018): e020571; Anita Lal et al., "Household Expenditure of Smokers and Ex-Smokers across Socioeconomic Groups: Results from a Large Nationwide Australian Longitudinal Survey," *BMC Public Health* 22, no. 1 (2022): 1706.

[10] Erin S Rogers et al., "Tobacco Cessation and Household Spending on Non-Tobacco Goods: Results from the US Consumer Expenditure Surveys," *Tobacco Control* 27, no. 2 (2018): 209–16.

[11] Grieve Chelwa and Steven F Koch, "The Effect of Tobacco Expenditure on Expenditure Shares in South African Households: A Genetic Matching Approach," *PloS One* 14, no. 9 (2019): e0222000; Enayatollah Homaie Rad et al., "Cigarette Smoking and Its Financial Burden among Iranian Households: Evidence from Household Income and Expenditures Survey," *Journal of Research in Health Sciences* 20, no. 4 (2020): e00494.

Instead of using instrumental variables, Chelwa and Koch employed genetic matching to spending quartiles to ascertain the impact of tobacco on other family expenses.[12] Food was discovered to be replaced by tobacco in the poorest homes. By estimating Engel curves using survey data from the 2012/2013 South African Living Standards Survey, this work contributes to the literature by establishing whether tobacco has crowding-out or crowding-in effects in South Africa. Unlike previous studies, this one employs the GMM 3SLS estimator, which yields more efficient parameter estimates due to the heteroskedastic errors inherent in cross-sectional datasets of this type.

Xin et al. used the National Health Services Survey (NHSS) to investigate the influence of smoking on households' patterns of spending and medical care expenses in China.[13] According to their findings, every 5 packs of tobacco products smoked per capita per month affects household expenditures on other necessities, particularly schooling and medical care. Wang et al. used a fractional logit (flogit) model to assess the effect of tobacco consumption on household spending habits in rural China.[14] The socioeconomic and demographic features of the household served as control variables. Their findings suggest that tobacco spending has an influence on human capital investment (smokers also tend to spend more on alcohol, increasing the impact of addictive substances on spending on fundamental requirements).

However, an inconsistency appeared in Jumrani and Birtha's study, which examined whether tobacco consumption crowds out spending on essential necessities and its impact on households' distribution in India, using households's cross-section information that the National Sample Survey Organisation (NSSO) collected between 1999 and 2000.[15] Their findings imply that tobacco-using households consumed fewer commodities, such as schooling, and that smoking expenditure has a detrimental impact on per capita nutritional intake. Nyagwachi, Chelwa and Walbeek used data from the 2006 Living Conditions Monitoring Survey (LCMS) to examine the causal effect of smoking consumption on household expenditure habits in Zambia.[16] The author employed a stratified cluster sample design with two stages. Households in urban and rural locations are the controlling variables. According to the findings, smoking individuals spend less money on education, groceries, and clothing.

Donkoh et al. used the two-stage least squares method to examine the impact of food intake on household welfare in Ghana.[17] Their findings support theoretical and empirical evidence that households reduce their tobacco intake as a fraction of their food spending. San and Chaloupka investigated the effect of tobacco expenses on spending in Turkish households using data from a household budget survey conducted between 2007 and 2011.[18] The authors used a dummy variable for tobacco spending as an independent variable. Their findings showed that smoking families spent roughly 8% of their monthly income on cigarette smoking, while non-smoking households spent 9% more on food and housing than smoking households. The study concluded that tobacco spending leads to lower household spending on groceries, housing, durable/non-durable products, and schooling.

Nyagwachi et al. used data from two nationally representative surveys (2005/6 and 2015/16) to study the effect of tobacco on household spending habits in Kenya.[19] Between 2005 and 2015, tobacco control initiatives contributed to a decline in the share of tobacco-consuming families. The authors also discovered that tobacco-using households spent less money on medical care, education, communication, and certain food products. Kostakis investigated the effect of tobacco spending on other household

[12] Chelwa and Koch, "The Effect of Tobacco Expenditure on Expenditure Shares in South African Households: A Genetic Matching Approach."
[13] Ying Xin et al., "The Impact of Smoking and Quitting on Household Expenditure Patterns and Medical Care Costs in China," *Tobacco Control* 18, no. 2 (2009): 150–55.
[14] Wang, Sindelar, and Busch, "The Impact of Tobacco Expenditure on Household Consumption Patterns in Rural China."
[15] Jaya Jumrani and P S Birthal, "Does Consumption of Tobacco and Alcohol Affect Household Food Security? Evidence from Rural India," *Food Security* 9 (2017): 255–79.
[16] Abel Otwori Nyagwachi, Grieve Chelwa, and Corné van Walbeek, "The Effect of Tobacco-and Alcohol-Control Policies on Household Spending Patterns in Kenya: An Approach Using Matched Difference in Differences," *Social Science & Medicine* 256 (2020): 113029.
[17] Samuel A Donkoh, Hamdiyah Alhassan, and Paul K Nkegbe, "Food Expenditure and Household Welfare in Ghana," 2014.
[18] Sayin San and Frank J Chaloupka, "The Impact of Tobacco Expenditures on Spending within Turkish Households," *Tobacco Control* 25, no. 5 (2016): 558–63.
[19] Nyagwachi, Chelwa, and van Walbeek, "The Effect of Tobacco-and Alcohol-Control Policies on Household Spending Patterns in Kenya: An Approach Using Matched Difference in Differences."

commodity categories.[20] The authors used data from the Hellenic Statistical Authority's 2017 national representative household sample survey. They discovered that spending on tobacco has a detrimental impact on some commodity groups such as food, clothing, health, and durables while having a beneficial impact on communication, education, and spending on hotels and restaurants.

METHODOLOGY

The National Income Dynamic survey dataset (NIDs) from 2008 to 2017 was utilised to estimate the Methods of Moments Quantile Regression (MMQR) strategy to meet the study's objective, the impact of smoking on South African households' education expenditure. The authors's utilization of data from the National Income Dynamics Study (NIDS) up to 2017 is justified based on its distinctive characteristics and significance. NIDS is a longitudinal panel study that monitors the same households over time, documenting changes in poverty, well-being, labor markets, and socio-economic factors. The dataset, despite the latest wave that occurred in 2017, offers significant insights into long-term trends, establishing a solid basis for understanding societal changes with implications for policy. NIDS includes more than 28,000 individuals across 7,300 households, making it one of the most broad and reliable household surveys in South Africa. The nationally representative sample and thematic breadth of the data provide a valuable resource for socio-economic research, although more recent data may be preferable.

This research employed Machado and Silva's method of moments quantile regression (MMQR).[21] Quantile regression does not take into consideration the possibility of unobserved individual variability within the panel, despite its robustness against outliers. According to Van, this method necessitates evaluating the impact of covariance on the conditional heterogeneous household size indicators by inducing an individual effect that affects the overall distribution instead of merely modifying means.[22] This strategy is totally viable when individual effects surround the panel data model and the explanatory variables have endogenous features. It is particularly revealing due to the generation of regression quantiles in non-crossing estimations.

The conditional quantiles estimate Z r (β| Y) of the location-scale variant model is stated in the equation below:

$$Y_{it} = \hat{u}_i + X_{it}\beta + (\theta_i + Z_{it}W)\, K_{it} \quad (1)$$

Where the probability P $\{\theta_i + X_{it} > 0\} = 1.[\hat{u}, z, \theta, x]$ and variables must be evaluated. Each i fixed effects are denoted by $(\hat{u}_{i,}\theta_i), i$ =1.....m, and the q-vector of known elements of Z is denoted by Y, which are distinguishable conversion with components l as shown below:

$$X_i = X_i(Y), \beta = 1, \ldots., q \quad (2)$$

While other variables do not imply rigorous exogenous patterns, for every fixed X_{it}, it is distributed identically and independently across time K_{it} is likewise distributed in the same way through time (t) and among persons (i). It is also orthogonal to Y_{it} and generalized to meet momentary circumstances. The following equation is shown by equation (1):

$$Z_y(\hat{u}|Y_{it} = (\theta_i + \beta_i(\hat{u})) + Z_{it}w + Z_{it}rt(\hat{u}) \quad (3)$$

In Eq. (3), independent variables' vectors are defined by Z_{it}, i.e., income is used to describe monthly household income, smoking is used for monthly household expenditure on tobacco, the same with age (age of household heads in years), gender (male and female), and married household. The quantile distribution of the explained variable (education) is signified by, $Z_y(\hat{u}|Y_{it})$ and its natural log is symbolized by, Y_{it}, this is dependent on the position of explanatory variables, and the scalar coefficient, i.e., visual illustration of the individual i at quantile fixed effect, is displayed by $Y_{it} - \theta_i(\hat{u}) = \theta_i + \beta_i t(\hat{u})$. In contrast to standard fixed least-squares effects, the individual effect exhibits no variation in intercept. With heterogonous effects that diverge along the conditional distributional quantiles of the

[20] Ioannis Kostakis, "Does Tobacco Spending Crowd-out the Household Budget? Preliminary Results Using Nationwide Survey Data," 2020.
[21] José A F Machado and J M C Santos Silva, "Quantiles via Moments," *Journal of Econometrics* 213, no. 1 (2019): 145–73.
[22] Muhammed Hanifi Van, "The Role of Financial Development in the Relationship between Income Inequality and Economic Growth: Evidence from Method of Moments Quantile Regression," *İzmir İktisat Dergisi* 36, no. 3 (2021): 725–37.

endogenous variables, these parameters are time-invariant. The sample quintile is represented qrt (û), which is evaluated by solving the associated optimisation problem.

$$min_q \sum_i \sum_{tPT} (Q_{it} - (\beta_i + X_{it} R) t) \quad (4)$$

Where $J\hat{u}(B) = (P - 1) BN [B \leq 0) + PBN \{ B > 0\}$ implies the check function.

Justification of the selection of the variables

Income is measured in monthly household income. Individuals living in communities with low incomes have the least knowledge about the health risks of smoking, fewer financial and assistance from society, and frequently the least access to services that can assist them in quitting. People with lower yearly household incomes smoked more cigarettes than those who had greater annual incomes at home.

Age

Age is measured in the age of household heads (in years). Looking at household age, the age groups 25-44 years and 45-64 years had the largest rate of smokers. People aged 18 to 24 years had decreased current cigarette smoking rates.

Education

Most people who have higher levels of education have knowledge of the health hazards of smoking cigarettes; hence, they smoke less, which results in a negative effect of smoking by comparing households that have tertiary education and matriculation to people with a primary level of education and no education.

Marital status

Married household heads are measured, and research suggests that current cigarette smoking is higher among divorced, separated, or widowed people and lower among married or living with their partners. About 17.3% of all adults are divorced, separated, or widowed. 13% of all adults are unmarried, never married, or do not live with their partner. Almost 10.9% of every 100 married or alive adults have a partner.

Employed

Employed is measured with employed household heads. Most of the time, we find that employed households spend more money on smoking cigarettes than unemployed households.

Male

The male is measured in male household heads. Generally, men use all tobacco products at a higher rate than women, with 16.7 percent of adult males and 13.6 percent of adult females smoking cigarettes in 2015, a discrepancy that could be attributed to a mix of physiological and behavioural variables.

Empirical Analysis and Interpretation of the Result

Descriptive statistics

Descriptive statistics is a data analysis concept that assists econometricians in understanding the nature of the data utilised in a certain study. Descriptive statistics provide patterns that may exist in data to describe a data summary in a relevant way. As a result, descriptive data does not allow the author to draw inferences from any hypothesis. However, it seeks to characterise data in two ways: measures of spend (which is a standard deviation) and measures of central tendency (which include a variety of statistics such as mean, median, mode, maximum, and minimum).

Table 1. Descriptive Statistics

Empirical results

Variable	Mean	Std. Dev.	Min	Max
Education expenditure	121.861	1112.387	0	140000
Tobacco expenditure by head	152.8634	287.7233	0	5000
Urban	.5467039	.4978254	0	1
Married	.2772527	.4476464	0	1

Age	27.01307	21.20495	0	113
African	.7948787	.4037923	0	1
Coloured	.1351828	.3419205	0	1
Indian	.0190554	.1367204	0	1
White	.0508831	.2197602	0	1
No education	.2251346	.4176732	0	1
Primary	.3224834	.4674295	0	1
Matric	.0948356	.2929894	0	1
Tertiary	.0954139	.2937874	0	1
Household size	5.664004	3.310762	1	30
Employed	.4507259	.4975686	0	1

Table: 2 Quantile regression

VARIABLES	Quantile 0.25	Quantile 0.50	Quantile 0.75	Quantile 0.95
Regular smoker	-0.476** (0.210)	-0.327* (0.171)	-0.437** (0.180)	0.0646 (0.439)
Married	0.128	0.173*	0.187**	0.152
	(0.111)	(0.0900)	(0.0944)	(0.231)
Employed	0.0669	0.234**	0.238**	0.163
	(0.124)	(0.101)	(0.106)	(0.258)
Urban	0.180	0.0438	0.177*	0.269
	(0.122)	(0.0995)	(0.104)	(0.255)
Age	0.0886	-0.00615	0.0290	0.357
	(0.202)	(0.164)	(0.172)	(0.421)
African	-0.384*	-0.497***	-0.369**	0.0501
	(0.210)	(0.171)	(0.179)	(0.438)
Coloured	-0.623**	-0.871***	-0.937***	-0.640
	(0.257)	(0.209)	(0.219)	(0.536)
Indian	0.249	-0.0709	-0.0321	-0.218
	(0.430)	(0.350)	(0.367)	(0.896)
Primary	0.163	-0.0550	0.135	0.00543
	(0.238)	(0.194)	(0.203)	(0.497)
Secondary	0.534**	0.373*	0.429**	0.196
	(0.234)	(0.190)	(0.200)	(0.488)
Matric	0.724***	0.571**	0.856***	0.988*
	(0.275)	(0.224)	(0.235)	(0.574)
Tertiary	0.976***	0.789***	1.122***	0.991*
	(0.254)	(0.206)	(0.216)	(0.529)
Household size	-0.00490	-0.0109	0.00777	-0.0352
	(0.0233)	(0.0190)	(0.0199)	(0.0486)
Income	0.479***	0.495***	0.443***	0.530***
	(0.0664)	(0.0540)	(0.0567)	(0.138)
Constant	0.677	1.895**	2.431***	1.342
	(0.984)	(0.801)	(0.840)	(2.053)

RESULTS

The quantile regression coefficient states that for every one-unit decrease in smoking expenditure by the head of the household, the predicted value of education expenditure will decrease by 0.47 for the lower class (lower quantile (Q 0.25)), compared to the non-tobacco user's household head from the lower class. Results also indicate the negative association between tobacco spending by household heads from the

middle class (quantile (0.50 and 0.75) household as compared to the middle-class household heads who are non-tobacco users by 0.32 and 0.43, respectively. The middle-class households living in urban areas spent approximately 0.17 more on household education expenditure than the middle-class households living in rural areas. Married household heads from the middle class significantly spend more on education expenditure than unmarried household heads from the middle class. Employed household heads from the middle class spend more on household education expenditure than unemployed household heads from the middle class (middle quantile (Q 0.50)).

The lower-class African household heads spend less on household education expenditure compared to lower-class White household heads. Middle-class African household heads spend less on education expenditure in comparison to middle-class White household heads (Q 0.50 and Q 0.75). The lower-class Coloured household head spends less on household education expenditure compared to poor white household heads. Middle-class Coloured household heads spend less on education expenditure in comparison to middle-class white household heads (Q 0.50 and Q 0.75). Lower class (Q 0.25) and middle class (Q 0.50 and Q 0.75) household heads with secondary, matric, and tertiary levels of education spend more on household education than those with no form of education. Household heads with low income spend approximately 0.47 more on education compared to those without income, while the middle class and rich households heads spend 0.49 and 0.53, respectively, on household education compared to household heads with no income.

DISCUSSION

This study's findings highlight substantial correlations between household attributes and educational spending across various income quantiles. The results correspond with the existing literature in numerous aspects, while also offering distinct insights relevant to the study's context.

Expenditure on smoking and education

The inverse relationship between tobacco spending and spending on education, especially within lower and middle-income households, aligns with the findings of research conducted by Hu et al. and John et al.[23] These studies demonstrate that the use of tobacco diverts household resources away from productive expenditures, including schooling. The findings indicate that for each one-unit rise in smoking expenditure, household education expenditure diminishes by 0.47 in the lowest quantile and by 0.32 and 0.43 in the middle quantiles. This highlights the conflict for resources between tobacco smoking and educational investment, especially for households with constrained disposable income.

Expenditure on education in urban versus rural areas

The research indicates that middle-class households in urban regions allocate roughly 0.17 more for education compared to their rural counterparts. This outcome corresponds with Yang's research, which indicated that urban households frequently dedicate more resources to education owing to enhanced access to schools, improved educational services, and increased understanding of the advantages of education.[24] This urban advantage underlines the inequalities in resource distribution between urban and rural regions and emphasizes the necessity of resolving spatial imbalances in educational financing.

Marital and employment status

Marital and employment status correlate positively with increased educational spending. Married middle-class household heads allocate far more resources to education than their unmarried counterparts, complementing the findings of Behrman and Rosenzweig, which indicate that stable family structures promote investment in children's education.[25] Additionally, employed household heads in the middle quantile spend more on schooling than unemployed household heads. This aligns with Schultz's research,

[23] Teh-Wei Hu, Hai-Yen Sung, and Theodore E Keeler, "Reducing Cigarette Consumption in California: Tobacco Taxes vs an Anti-Smoking Media Campaign.," *American Journal of Public Health* 85, no. 9 (1995): 1218–22; Rijo M John et al., "Counting 15 Million More Poor in India, Thanks to Tobacco," *Tobacco Control* 20, no. 5 (2011): 349–52.

[24] Dennis Tao Yang, "Education and Allocative Efficiency: Household Income Growth during Rural Reforms in China," *Journal of Development Economics* 74, no. 1 (2004): 137–62.

[25] Jere R Behrman and Mark R Rosenzweig, "Does Increasing Women's Schooling Raise the Schooling of the next Generation?," *American Economic Review* 92, no. 1 (2002): 323–34.

which emphasizes the significance of secure sources of income in enhancing household investment in education.[26]

Racial disparities in educational funding

Racial differences are apparent in educational expenditure. African and Coloured household heads, in both lower and middle quantiles, allocate fewer resources to schooling than White household heads. This finding aligns with research by Seekings and Nattrass, which attribute racial discrepancies in educational investment to historical injustices and persistent socio-economic disparities.[27] These findings indicate the necessity for focused measures to mitigate racial disparities in educational funding.

Academic qualifications of household leaders

Household heads with secondary, matriculation, and university levels of education spend much more on education than those with no education, particularly in the lowest and middle quantiles. This is in keeping with the notion of human capital investment, which argues that better educated individuals value education more and are likely to invest more in their children's schooling.[28] The result highlights the intergenerational advantages of education and the influence of parental education on household expenditure decisions.

Household composition and income

Household size does not significantly affect education expenditure, however, income levels are substantially correlated with education spending across all quantiles. Household heads with low, moderate, and high incomes allocate far more resources to education than those with no income. This discovery corroborates Duflo's assertion that household income is a primary factor influencing schooling expenditure.[29] These findings highlight the essential function of economic resources in allowing households to prioritize expenditures on schooling.

RECOMMENDATIONS

Numerous demographic characteristics were substantially linked with quantiles of household tobacco expenditure. These factors include education, age, race, employment status, marital status, and smoking habits. Being well-educated, age, race group, employment, and marital status were all positively associated with quantiles of tobacco expenditure. There was no association between white households and tobacco consumption, implying that white households smoked tobacco regardless of their source of income.

This study's findings have revealed that education is positively associated with quantiles of tobacco expenditure. With the results, policymakers should focus on deterring well-educated people from smoking, which may be helpful. While people who smoke heavily should be given special attention, those who smoke less should not be disregarded. Second, population-based intervention methods aimed at reducing tobacco consumption among all income levels of young people rather than older individuals may provide encouraging results.

Policymakers should make an attempt to determine which age group of people consumes the most tobacco, as there is an inverted U-shape relationship between age and tobacco demand. Policymakers should also pay special attention to households headed by unemployed and unmarried individuals, with an emphasis on those who smoke heavily. This is due to the discovery that families led by unemployed and unmarried individuals are associated with increases in all quantiles of tobacco expenditure. Unmarried household heads spend more on tobacco than married household heads, since their households are larger. This means that policymakers should likewise focus on households with a large household

[26] T Paul Schultz, "School Subsidies for the Poor: Evaluating the Mexican Progresa Poverty Program," *Journal of Development Economics* 74, no. 1 (2004): 199–250.
[27] Jeremy Seekings and Nicoli Nattrass, *Class, Race, and Inequality in South Africa* (Yale University Press, 2008).
[28] G. S. Becker, *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education* (Columbia University Press, 1964).
[29] Esther Duflo, "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment," *American Economic Review* 91, no. 4 (2001): 795–813.

size. Finally, public interventions that increase knowledge of the disadvantages of household smokers may produce good results.

CONCLUSION

This study examined the influence of smoking expenditures on the educational expenditures of South African households, employing Methods of Moments Quantile Regression and data from the National Income Dynamics Survey (2008–2017). The results indicate that tobacco usage, especially within the most impoverished households, substantially diminishes spending on education. This is consistent with the literature, which regularly shows that tobacco expenditure diverts household resources from vital necessities such as education, food, health, and shelter.

The research establishes that the detrimental effect of tobacco spending on education endures throughout all income brackets, with the most impoverished households being disproportionately impacted. Smoking not only diverts critical financial resources but also reinforces socio-economic disparities, especially in education. Moreover, the findings highlight the impact of socio-economic characteristics, including urbanization, marital employment status, race, educational attainment, and income levels, on household expenditure for education.

The findings highlight the necessity for specific policy measures to mitigate the negative impacts of tobacco smoking on household resource distribution. Initiatives like anti-tobacco campaigns and assistance programs for heavy smokers can alleviate the financial strain on vulnerable households. Furthermore, initiatives to improve educational access in rural regions, address racial inequities, and foster equitable distribution of resources are imperative.

Subsequent studies ought to build upon these findings by investigating the health ramifications of tobacco use, especially among adolescents in rural regions, and its effects on household expenditures. By resolving these deficiencies, policymakers can gain a deeper insight into the wider ramifications of tobacco consumption on household welfare and formulate more effective strategies to enhance resource distribution and educational results in South Africa. In summary, diminishing tobacco expenditure and enhancing resource allocation within households are essential measures to enable all South African households, especially the most impoverished, to invest in education, thus promoting socio-economic growth and mitigating injustices.

Study Limitations

The study has some limitations; the data employed in the study is household data rather than individual data. As a result, individual tobacco usage decisions have not been properly identified. Secondly, the current study's cross-sectional data does not allow for causality tests. Also, the data gathered from the survey is self-reported, which may impair data dependability. Despite these limitations, the study is the first to employ quantile regressions to analyse factors influencing household expenditure on tobacco across different household expenditure levels. The current study's findings are based on a large national income dynamic survey dataset. As a result, significant discoveries are made. Future research could employ individual data to identify tobacco consumption decisions.

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