

Effects of Catastrophic Healthcare Expenditure on Household Labor Supply in Malawi

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Abstract

Background: The dynamics of labor supply and demand are examined via microeconomic theory at the individual firm and worker levels. A number of factors influence the amount and quality of the labor supply; one such determinant is health status. Research has viewed the connection between household labor supply and health as a two-way causal relationship, with health serving as the deciding factor that influences decisions made in the labor market. The labor supply of a particular household or individual is seen to be affected by a number of factors, with the health status of an individual or a family member being one of them. Households or individuals are forced to either increase or reduce the number of hours they offer to work with respect to the amount of income they spend in trying to cover health care expenses. A household is seen to fall into a health care spending catastrophe if its aggregate health expenditure exceeds a given threshold; thus, in this case, the study uses the 10% and 40% thresholds.

Objective: This study analyzed the effect of catastrophic health care expenditures on the household labor supply.

Methods: This study used the Fifth Integrated Household Survey, which consists of 11,434 respondents. An instrumental variable approach with a binary outcome variable was employed to estimate the causal effect of catastrophic health expenditures on the household labor supply in hours.

Results: The results from instrumental variable regression indicate that the probability of households supplying labor tends to decrease once they are subjected to catastrophic health care expenses at both thresholds.

Recommendation: The study recommends the implementation of policies that enhance financial protection for vulnerable groups. One such measure is the introduction of progressive taxation, which ensures that those with higher incomes contribute more to national revenue that can be in turn used to subsidize user fees.

1. Introduction

The dynamics of labor supply and demand are examined via microeconomic theory at the individual firm and worker levels [1]. A number of factors influence the amount and quality of the labor supply; one such determinant is health status. Health plays a role in influencing individuals' preferences between work and leisure activities following a health shock [2,3]. Deteriorating health may lead to a heightened demand for leisure, altering decisions connected to work supply, especially given the impact of health on life expectancy [4]. When the direct costs of healthcare services are considerable, generally referred to as out-of-pocket payments,

households may experience challenges in covering these charges using their available resources. Studies conducted in Africa and Asia, for example, highlight that user fees significantly impede healthcare access for the most vulnerable individuals, including elderly men and women, widows, and women headed households [5,6].

According to the World Bank, Malawi's labor force participation rate stood at 67.6% in December 2022. The CEIC data also show that the labor force participation rate in Malawi has fluctuated between 67.4% and 80.8% since December 1990. In terms of

financing mechanisms, most households in Malawi use out-of-pocket expenses to cover their health-related bills, such that these expenses often lead households to experience health care spending catastrophes [7,8].

As reported by the World Bank (2024), Malawi's labor force participation rate reached 67.6% in December 2022, with a steady increase over time [7,8]. Data from the CEIC also indicate that labor force participation in Malawi has fluctuated between 67.4% and 80.8% since 1990, with a noticeable increase in recent years.

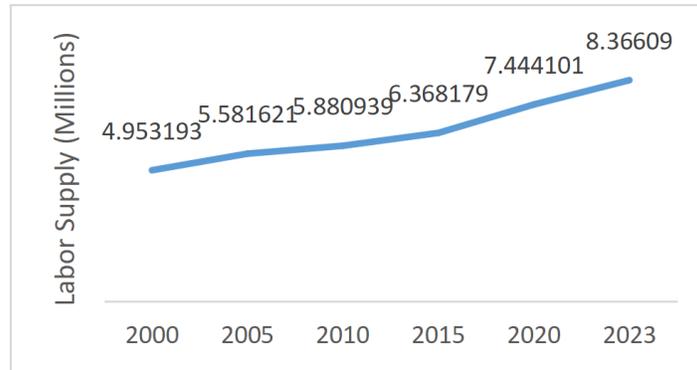
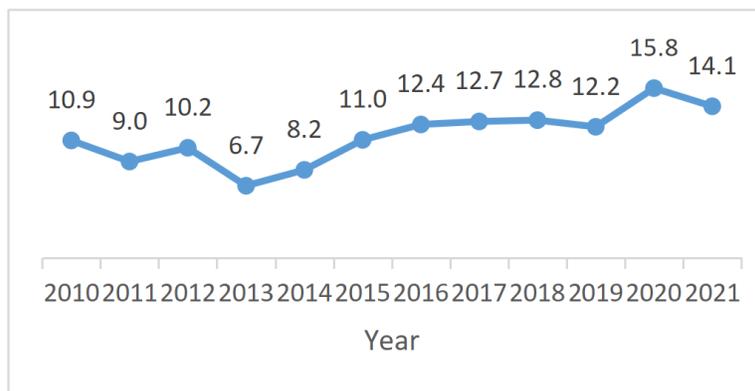


Figure 2: Below Shows How the Labor Supply Trend has Been in this Country Over the Years

Source: Plotted using data from the World Development Indicator Database, World Bank

Despite this increase, many households in Malawi continue to rely heavily on out-of-pocket expenses to meet their healthcare needs [7,8]. This reliance often results in households facing catastrophic

health expenditures. The Global Health Expenditure Database reports an increase in out-of-pocket spending in Malawi, from 12.2% in 2019 to 15.8% in 2020, as illustrated in Figure 3 below.



Source: Plotted using data from the Global Health Expenditure Database

As individuals struggle to cover these health costs, they tend to respond by increasing their labor supply, working more hours in an effort to increase earnings to cover medical expenses. However, this relationship is complex and bidirectional, as some households may reduce their hours of work following a health shock, such as caring for a sick family member requiring inpatient care.

illustrated in Figure 1, and the persistent increase in out-of-pocket health payments, depicted in Figure 2. The study therefore aims to determine whether these rising demands for labor are the result of households experiencing catastrophic health expenses depicted by the continued rise in out-of-pocket payments in the form of user fees and other health-related expenses [11].

While previous studies, including Choi et al. (2016) and Lee et al. (2020), have examined the connection between catastrophic health spending and household labor market behaviors, limited attention has been given to how these expenditures directly influence household labor supply decisions [9,10]. This study aims to address the gap in Malawi, where for example, Mchenga et al. (2017) focused only on the impoverishing effects of CHEs in general without specifically pinning them to a narrow sector, such as in this case, the labor supply, by analyzing the causal relationship between the rising labor force participation rates,

Catastrophic health care expenditure has been identified as a significant factor contributing to impoverishment, contrary to the objectives outlined in Sustainable Development Goal 3 (SDG 3), which seeks to promote good health and well-being. Through an examination of its effects on labor force participation, this study, in alignment with SDG 10, aims at providing insights that can guide the formulation of policies aimed at diminishing inequalities by analyzing how health care costs disproportionately impact distinct income groups, potentially exacerbating preexisting disparities, thus helping reinforce economic resilience at the household level.

2. Methods

2.1. Data

According to the WHO, household income and expenditure surveys are crucial for evaluating whether households face "catastrophic" health costs. Therefore, this study utilizes secondary data from Malawi's fifth round of the Integrated Household Survey (IHS5), which was conducted between April 2019 and March 2020. The survey sampled 11,434 households, which were statistically selected to ensure representativeness at the national, district, urban, and rural levels. The IHS5 employed a stratified sampling design, selecting 719 census enumeration areas (EAs) as primary sampling units (PSUs), with an average of 16 households per EA. Four types of questionnaires were administered during the survey: Household, Agricultural, Fisheries, and Community questionnaires. The key variables for this study—household labor supply, catastrophic health expenditure (CHE), household shocks and demographic characteristics—were derived primarily from the Household Questionnaire, which also includes broader information on household welfare in Malawi.

2.2. Dependent Variable

Our variable of interest was household labor supply, which was measured in hours. In the survey questionnaire, the respondents were asked specific questions about the number of hours they spent on different income-generating activities in the previous week, and the hours were aggregated. To improve consistency and precision in the model, the variables were normalized via the min-max method. This was necessary, as the raw aggregated labor hours produced disproportionately large values, reducing the precision of the parameter estimates. Proper normalization is critical in econometric models to ensure reliable and economically interpretable results [12]. The normalized variable ranges from 0 to 1, where values closer to 0 indicate lower-than-usual labor supply, and values closer to 1 indicate higher-than-usual labor supply.

2.3. Explanatory Variables

The choice of independent variables was based on previous studies that assessed the different health factors that affect the supply of labor for a given household. The variables included gender of the household head, age of the household head, location, education of the household head, catastrophic health expenditure (CHE) and marital status of the household head, among others, with CHE being the main explanatory variable of interest (see Table 1 for a full list of the variables we used). The choice of these explanatory variables is motivated by a number of studies like . This study employs both the 10% and 40% approaches to assess the economic implications of the catastrophic health care spending of given households toward their behavior in the labor market. The calculation for these thresholds is based on the guidelines proposed in several studies that look at estimation methods for the CHE thresholds [13,14]. The use of these different thresholds also helps to understand the extent to which poor households and rich households differ in the way they are affected when health care out of pocket spending exceeds the catastrophic thresholds with respect to their response in the labor market.

2.4. Instrument Choice

Endogeneity in this relationship arises from several factors. First, households experiencing significant out-of-pocket healthcare expenses may respond by increasing their labor hours to generate additional income to cover these costs. Conversely, an increase in labor hours supplied by a household may lead to higher income, enabling them to afford healthcare expenses and potentially influencing the extent of catastrophic health expenditures (CHEs) incurred.

Additionally, unobservable household characteristics, such as preferences for health or risk aversion, can simultaneously affect both the likelihood of incurring CHE and labor supply decisions.

This paper followed a number of studies that used shocks to instrument for the relationship between catastrophic health care expenditures and household welfare (Paxson, 1992; Wagstaff, 2007). The study, therefore, uses aggregated health shocks that may influence a household to incur catastrophic health payments as an instrument. The health shocks were computed by summing all the indicators that make up these health-related shocks, including but not limited to, death, birth, pandemics, etc.

Following equation i below, every shock is algebraically represented as:

$$shock = \sum S_i \dots\dots\dots (i)$$

These aggregated health shocks are assumed to affect the household labor supply (the dependent variable) solely through their influence on catastrophic health expenditures (CHE). These shocks are not expected to directly impact labor supply decisions in ways unrelated to CHE. We assume that aggregated health shocks do not directly affect labor supply decisions because they operate primarily through increased financial burden, captured by CHE. Any direct impact of health shocks (e.g., caregiving or reduced physical productivity) is assumed to be minimal and not systematically correlated with labor supply after accounting for CHE.

2.5. Data Analysis

The study used an instrumental variable approach with a binary dependent variable (IVPROBIT) to address endogeneity. Endogeneity occurs when a covariate is correlated with the unobserved error term of the regression. Our IV approach was motivated by concerns around the reverse causality between household aggregate expenditure and labor supply, which could cause endogeneity.

The basic simultaneous equations for estimating the model are represented as:

$$Labor_hrs = \beta_1 CHE_{10} + X'\beta + \varepsilon \dots\dots\dots (ii)$$

$$Labor_hrs = \beta_1 CHE_{40} + X'\beta + \varepsilon \dots\dots\dots (iii)$$

where CHE is an endogenous variable; hence, the first stage regresses the endogenous variable on an instrument Z and other exogenous variables to obtain the fitted values as follows:

$$\widehat{CHE}_{10} = \gamma_1 Z_1 + X'\gamma + \mu \dots\dots\dots (iv)$$

$$\widehat{CHE}_{40} = \gamma_1 Z_1 + X'\gamma + \mu \dots\dots\dots (v)$$

The second stage introduces the fitted values into equation i, giving:

$$P(Labor_hrs = 1) = \Phi(\beta_1 \widehat{CHE}_{10} + X'\beta + \mu) \dots\dots (vi)$$

$$P(Labor_hrs) = \Phi(\beta_1 \widehat{CHE}_{40} + X'\beta + \mu) \dots\dots\dots(vii)$$

where CHE₁ represents catastrophic health care expenditures for a household.

X' is a vector of relevant explanatory variables explaining the model Z₁ is an instrumental variable used to measure the indirect effect of the endogenous variable on the dependent variable, i.e., labor hours. β₁ and γ₁ are vectors of coefficients ε and μ are the error terms and are assumed to be highly correlated.

2.6. Instrument Relevance and Weak Instruments

To test for the presence of endogeneity in the dependent variable, the wald statistic is used. This statistic examines the null hypothesis that the dependent variable is zero. The Wald test yields a Chi2 statistic of 6.84, which is significant at the 1% level, with a p value of 0.0089. This, therefore, justifies the need to use instrumental variables to control for the endogeneity problem.

The study also performs a first-stage test to determine whether the instrument used is strong enough to capture the variations in the relationships being observed. The reported F statistics were greater than 10, with values of 16.7034 and 11.748 for both the 10% and 40% thresholds, respectively.

The model does not suffer from any overidentification issues, as only one instrument was used; thus, the model was identified exactly

3. Results

3.1. Descriptive Statistics

Variable	Obs	Mean/freq ¹	Std. Dev.	Min	Max
CONTINUOUS					
labor hrs	11434	32.553	32.213	0	865
age head	11434	43.129	16.085	15	100
BINARY/CATEGORICAL					
CHE10	11434	2.7%	.162	0	1
CHE40	11434	0.5%	.068	0	1
chronic condition	11434	27.5%	.446	0	1
Marital status of head					
Married	11434	70%	.458	0	1
Separated/Divorced	11434	14.5%	.352	0	1
Widowed	11434	12.2%	.327	0	1
Never	11434	3.3%	.179	0	1
location(Rural=1)	11434	81.7%	.387	0	1
gender(male=1)	11434	69.9%	.459	0	1
Region					
South	11434	46.4%	.499	0	1
Centre	11434	34.6%	.476	0	1
North	11434	19%	.393	0	1
Education Qualification					
none hh	11434	66.4%	.473	0	1
plsc hh	11434	11.2%	.315	0	1
jce hh	11434	8.9%	.285	0	1
msce hh	11434	9%	.286	0	1
postsec hh	11434	4.6%	.209	0	1

Table 1: Summary Statistics

As given in the *Table 1* above, 2.7% of the households incur catastrophic health care spending under the 10% threshold compared to the households that did not incur catastrophic health care spending using the same threshold. Using the 20% threshold, 3.5% of the households recorded catastrophic health care expenditures in comparison to those households that did not incur catastrophic health care expenditures given the same threshold. Thus, the threshold effect is observed as we increase it from 10% to 20%. On average, the number of hours worked per household, thus aggregating the number of hours per working household member, is 32 hours.

On average, most households were seen to be composed of 4 members. The average age of a household head was 43 years, with a minimum age of 15 years and a maximum of 100 years, thus indicating the presence of child-headed households. Male-headed households, on average, account for 70% of the total households in the sample, thus indicating homogeneity in the sample.

Most respondents are seen to reside in rural areas, thus accounting for 81.7% of those households residing in urban areas. With respect to the regional dispersion of household respondents, the southern region recorded the highest proportion of households, with a percentage of 46.4, followed by the central region, with 34.6%, and the northern region, with 19% of the total sample households.

Twenty-eight percent of the households were recorded to have at least one family member with a chronic condition or suffering from a chronic disease. On average, many household heads were recorded to have not attended any school level, representing 66.4% of the total population, compared with those who attended primary, secondary or tertiary levels. Seventy percent of the household heads were recorded to be monogamous or polygamous, indicating that a higher percentage, followed by divorced or separated household heads, recorded 14.5% of the total sample households.

3.1.1. T Tests

The study used t tests to determine if there was a significant difference between the means.

	Yes	no	p-value
Labor hours by(CHE10)	25.35323	32.75387	0.000
Labor hours by(CHE20)	22.54717	32.59982	0.023
Labor hrs by(chronic condition)	30.54045	33.31523	0.000
Labor hrs by(location) ²	27.82391	53.67232	0.000
Labor hours, by(gender of head) ³	36.07234	24.36514	0.000

Table 2: Two-way t Test with Equal Variances

Table 2 above shows that, households experiencing catastrophic health care expenditures in both the CHE10 and CHE20 categories are observed to supply significantly more hours of labor than households that do not incur such expenditures. The magnitude of the differences in mean labor hours is substantial and statistically significant for both categories. There is also a significant difference in the mean number of hours worked between households with at least one member with a chronic condition and those households

without a chronically ill member. Households that are headed by males are observed to supply a significantly greater number of work hours than households that are headed by females. With respect to location, households that reside in rural areas are observed to supply significantly fewer hours of work than households that reside in urban areas.

Econometric Results

Normalized Labor hours	Model 1 ⁴	Model 2 ⁵
CHE10	-4.664*** (0.917)	
CHE40		-12.081*** (2.001)
Age of head	-0.005*** (0.002)	-0.005*** (0.002)
marital status		
<i>Separated/Divorced</i>	-0.160*** (0.054)	-0.144*** (0.056)
<i>Widowed</i>	-0.192*** (0.067)	-0.118 (0.075)
<i>Never</i>	-0.259*** (0.088)	-0.196** (0.093)
Rural	0.090** (0.039)	0.044 (0.037)

Gender of head	0.151** (0.073)	0.168** (0.071)
Education of head		
<i>plsc_hh</i>	-0.025 (0.044)	-0.036 (0.042)
<i>jce_hh</i>	0.050 (0.059)	0.027 (0.058)
<i>msce_hh</i>	0.092 (0.070)	0.090 (0.067)
<i>postsec_hh</i>	0.061 (0.083)	0.059 (0.079)
<i>Economic shock</i>	0.094*** (0.028)	0.071** (0.028)
*** p<.01, ** p<.05, * p<.1 Standard errors in parentheses		

Table 4: Results of the Effect of Catastrophic Health Expenditures on the Household Labor Supply

Having presented the descriptive results, we present the results from the estimated IV model.

On the basis of the empirical findings from Table 6 above, both models are significant overall at the 1% level, with a p value of 0.000. Catastrophic health spending is seen to have a significant effect on the number of hours a household is likely to offer for both thresholds. On average, when the budget share approach (10%) is used, the probability of households that incurred catastrophic health expenditures to supply labor is reduced by 5 percentage points compared with households that did not experience CHE at the same threshold. On the other hand, incurring catastrophic health costs at 40% reduces the probability of supplying additional hours of labor by 12 percentage points compared with households not incurring CHE at the same threshold while holding all other factors constant. With respect to the reviewed literature, this study finding is in line with those of Cai & Kalb (2006) and Mchenga et al. (2017) [11,15].

Under both thresholds (10% and 40%), if a household is headed by a male, the probability of that particular household offering additional hours of work in the labor market increases by 15% and 17%, respectively, compared with those households that are headed by females.

The probability of a household being headed by a divorced or separated individual offering additional hours of labor is as follows: to decrease by 16 and 14 percentage points compared with households with heads that are married for both the 10% and 40% thresholds, respectively, holding all other factors constant. This is due to the ability of married households to help each other in labor activities, unlike widowed and divorced households, which are, in most cases, female-headed households. Additionally, the emotional and psychological impact of losing a spouse could influence their motivation and capacity to engage in labor activities.

Residing in rural areas is, on average, seen to decrease the probability of a household having additional hours of work for the

10% CHE threshold. Under the 40% CHE threshold, residing in a rural area does not have any significant effect on the probability of a household reducing or increasing hours of work. This can be a result of rural areas having fewer employment opportunities than urban centers do. Limited job prospects may compel individuals in rural households to accept lower-paying or part-time jobs, leading to fewer hours worked overall; thus, most rural households are seen to be engaged in informal labor (ganyu) that is short lived. Moreover, most households in the rural setting rely on on-farm activities, which they mostly perform on their own land, and in some cases, work on other people's farms for pay. Farm activities are seasonal, thus affecting their overall hours supplied compared with those of urban households.

The education qualifications of a household head under both thresholds are not found to have a significant effect on the probability of that particular household either supplying more or fewer hours of labor.

4. Discussion

The finding that CHEs reduce the probability of households supplying additional labor solidifies the fact that given exposure to health shocks, household members are constrained by health care giving activities in the case of sickness or injury of a household member making them reduce their hours of work. As CHEs become more severe (e.g., at the 40% threshold), the marginal utility of additional labor income diminishes. This is because the income earned might still not be sufficient to offset the rising healthcare costs, leading households to withdraw from labor markets entirely. This explains the higher reduction in labor supply probability (12 percentage points at 40%) compared to the lower threshold (5 percentage points at 10%).

Male headed households are seen to be more likely to offer additional hours of labor concretizes the idea that there could be disparities in access to employment opportunities or wage differentials on the basis of gender, leading to differential incentives for household heads to work longer hours. For example, if males have greater

access to higher-paying jobs or positions with more opportunities for overtime, they may be more inclined to work longer hours than females are. Women often face caregiving responsibilities, such as looking after children, elderly family members, or the sick, which can limit their ability to work more hours. Therefore, even when financial pressures on the household increase, women may be unable to significantly increase their working hours [16,17].

5. Conclusion and Recommendations

The overall findings indicate that catastrophic health payments affect the number of hours a household supplies in the labor market. The results indicate that the probability of households supplying labor tends to decrease once they are subjected to catastrophic health care expenses at both thresholds. This finding complements the findings of Cai & Kalb (2006) and Lindelow & Wagstaff (2005) [15,18].

At the 40% threshold, households facing CHE are likely to have incurred relatively higher health expenses than their overall financial resources, as most of the households are from rural areas and are not able to earn more with their reliance on ganyu and their on-farm activities, which are mostly seasonal. Consequently, these households may be compelled to offer a significantly larger number of additional hours of labor to cover expenses. On the other hand, under the budget share approach (10%), households facing CHE under this approach may incur health costs that represent a smaller fraction of their overall financial resources. As a result, the additional hours of labor offered by these households may be comparatively less substantial, reflecting the lower impact of health expenses on their budgetary allocations.

The results, and on the basis of the literature, indicate that Malawi's health care financing system is regressive, as low-income households have to pay more to access health care services, as shown by the introduction of user fees in most health care facilities. This means that, in terms of catastrophic health care expenditures, low-income households suffer a great deal in trying to cover their out-of-pocket health expenses; hence, they require much help and financial protection.

A general implication of these results is that household well-being is heavily influenced by the amount of labor that households can offer in the market, especially when faced with the financial burden of catastrophic health expenditure (CHE). This highlights the need for deliberate measures to protect low-income households from the negative effects of CHE. The study, therefore, recommends the implementation of policies that enhance financial protection for vulnerable groups. One such measure is the introduction of progressive taxation, which ensures that those with higher incomes contribute more to national revenue.

Limitations

The major limitation of this study is the homogenous nature of the data, since a large proportion of the sampled population was from a rural setting; thus, the study is more likely to be dictated by the characteristics of the rural households at the disadvantage

of those in urban areas. The researcher also acknowledges that the instrument used may not be sufficiently strong in capturing the effect of CHE on households' labor supply; therefore, the results of this paper need to be used with caution.

The data used in the study are publicly available at the World Bank website: Malawi - Fifth Integrated Household Survey 2019-2020 (worldbank.org)

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