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The effect of government expenditure and free maternal health care policy (FMHC) on household consumption in Ghana

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Abstract

Purpose – In Covid-19 pandemic era when most households' members have lost their jobs and incomes, the government assistance and programs in ensuring household consumption smoothing is very significant. The main objectives of this study are to analyze the impact of government expenditure and free maternal healthcare (FMHC) policy on household consumption expenditure in Ghana in both long run and short run.

Design/methodology/approach – They used the ARDL to estimate the impact of government expenditure on household consumption and Segmented Linear Regression to examine impact of FMHC policy household consumption using longitudinal data from 1967 to 2018.

Findings – The results revealed that government expenditure had a negative and statistically significant effect on household consumption expenditure suggesting that government expenditure crowed-out private consumption in Ghana. Also, it was observed that before the implementation of the FMHC policy, there was an increase household consumption expenditure, but after the introduction of the FMHC policy, the study household consumption expenditure decreases significantly suggesting that FMHC policy has strong association with household consumption in Ghana.

Research limitations/implications – Due to limited data availability, this study did not assess the impact of the FMHC policy at the household or district level. Also, Ghana has introduced a free senior high school education policy in 2017 so further research could analyze the implications of these policies for household consumption in Ghana at the micro-level using different estimation technique such as the difference in difference.

Practical implications – The study suggests the need to increase public spending on basic social amenities and also extend the free maternal healthcare policy to all pregnant women especially those in the rural areas of Ghana as these have a greater impact on household consumption in Ghana. The findings from this study have important implications for household savings and interest rate in Ghana. The findings from this study also have important implications for both fiscal policy and healthcare policy in Ghana and other developing countries.

Originality/value – To the best of my knowledge this is the first empirical study to examine the effect of government expenditure and free maternal healthcare policy on household consumption in Ghana.

Keywords Government expenditure, Free maternal HealthCare, Household consumption, ARDL, Segmented linear regression, Ghana

Paper type Research paper

JEL Classification — E21, H50, H51, I1

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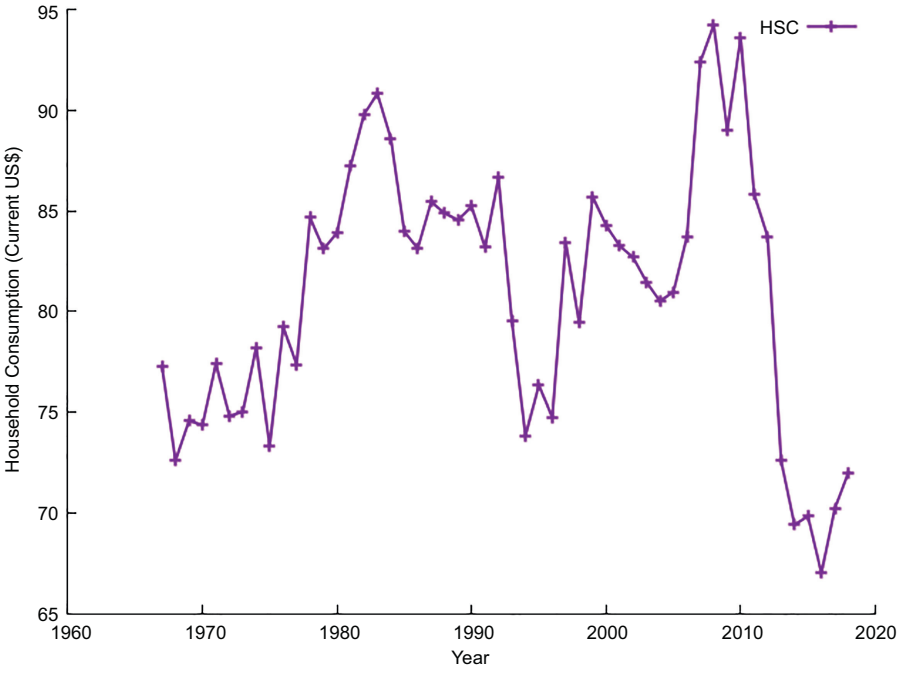
1. Introduction

The role of government expenditure and free maternal healthcare policy is critical not only in promoting economic growth but also very significant in ensuring household consumption smoothing especially when most households around the globe have lost their jobs and incomes due to coronavirus pandemic. In most developing countries and particularly Ghana, the government is responsible for the provision of basic social amenities such as toilet facilities, roads, water, electricity, national defense and law among others due to market failures that occurs when the private sector provides these facilities (Mahmud and Ahmed, 2012). Another reason is that most developing and low-income countries like Ghana are confronted with issues of low private savings and low investments and so it is incumbent on the government to providing basic infrastructure and social services for its citizens.

In 1967, household consumption expenditure in Ghana was US$ 1,209,980,674.0. In 2018, household consumption expenditure has increased to US$ 47,197,112,973.0 representing a change of 97.43% (World Bank, 2020; see Figure 1). At the household level, in 2008, the average annual household consumption expenditure in Ghana was around GH¢ 1,918.0 which approximate to about US$ 504.7 per capita (GSS, 2007; Bonsu and Muzindutsi, 2017). In 2018, the annual household consumption expenditure in Ghana per capita has increased to US$ 1,583.49 (World Bank, 2020). Although, according to Figure 2, the government expenditure as a percentage of GDP shows a declining trend in recent times, yet the country has implemented several social intervention programs such as the Livelihood Empowerment Against Poverty (LEAP), Capitation Grant, School Feeding Programme, free distribution of school uniforms, elimination of schools under trees, free senior high school education, the establishment of Community based Health Planning Services (CHPS) and national



Source(s): World Bank (2020). Software: SHAZAM

Figure 1.
Trends in household consumption expenditure in Ghana (Current US$)

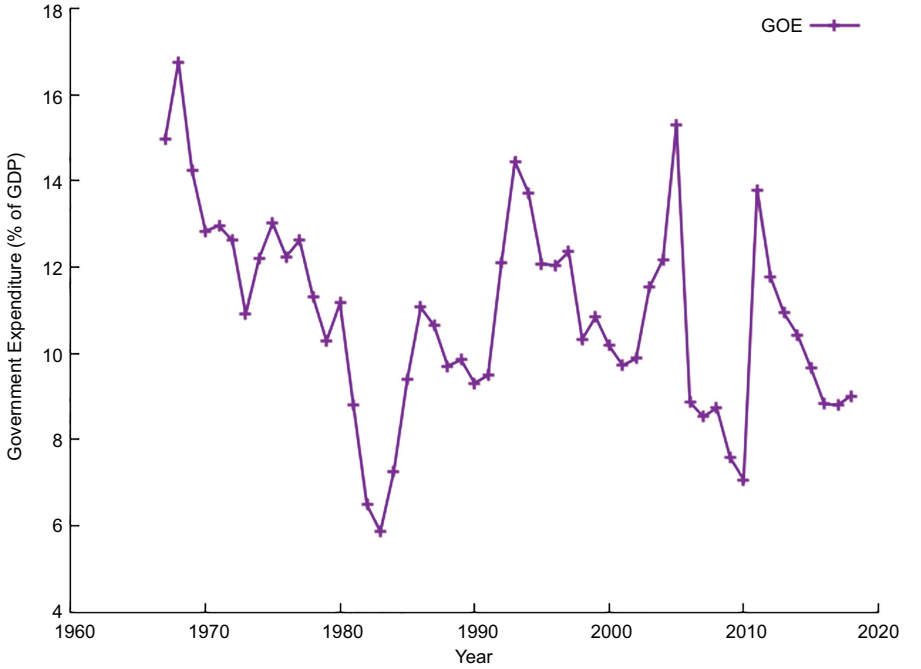


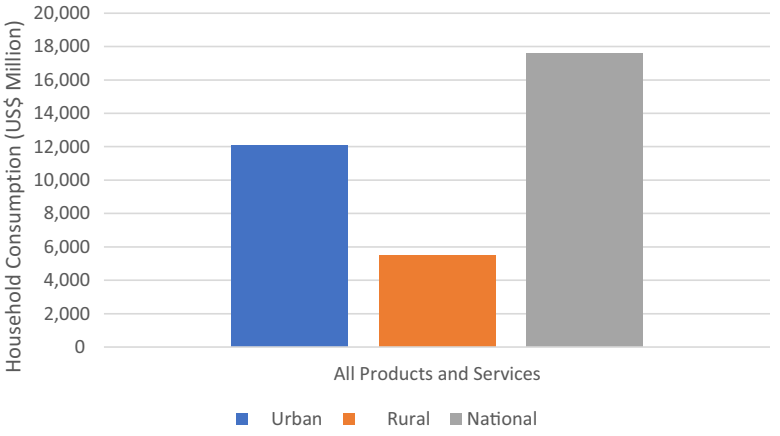
Figure 2.
Trends in government expenditure in Ghana (% of GDP)

Source(s): World Bank (2020). Software: SHAZAM

immunization against polio among others. All these programs were implemented to alleviate poverty among the vulnerable population, smooth household consumption and to raise the standard of living of the people (GSS, 2018).

Ghana has made significant progress with access to drinking water, toilet facilities, electricity, health care and school enrolment (GSS, 2007). For instance, between 2005 and 2017, access to electricity in Ghana has increased dramatically from 45.3% to 81.4% (GSS, 2018). Also, in 2018, access to electricity in Ghana has reached 82.4% of the entire population compared to Cote D'Ivoire (67%), Kenya (75%), Nigeria (56.5%), Tanzania(35.6%), Rwanda (34.7%) and Sub-Sahara Africa (47.7) (World Bank, 2020). Although in Ghana there has been increase in access to these social services and programs, the gaps between urban and rural households and across regions in terms of household consumption of these services and products remain significant issue (see Figure 3). Also, the proportion of households with access to electricity still varies by quintile and urban/rural areas, with the lowest wealth quintile in rural areas having the least access 46.1% and the highest quintile in urban area having the highest access 96.8% (GSS, 2018).

Maternal mortality is one of the greatest challenges confronting most developing countries including Ghana. According to the World Health Organization (WHO) (2016), about 800 women die every year due to complications associated to pregnancy and childbirth (WHO, 2016). In Ghana, maternal mortality ratio increased from 173 per 100,000 live births in 2014 to 319 per 100,000 live births in 2015 (GHS, 2011 and WHO, 2016). To achieve the Sustainable Development Goal (SDG 3) targeted at reducing global maternal mortality ratio to less than 70 per 100,000 live births, in 2008, the government of Ghana introduced several intervention policies in order to improve utilization of maternal healthcare services including



Source(s): World Bank (2020), GSS (2007). Software: Excel

Figure 3.
Household consumption in Ghana by product/service and area in US$ (Million) (2005–2006)

ANC and skilled attendance at childbirth (GHS, 2015; Lagarde and Palmera, 2008 and Dickson *et al.*, 2017). These programs include the implementation of FMHC policy, repositioning family planning, repositioning reproductive and child health staff (GHS, 2015). The FMHC policy allows pregnant women to immediately receive free health services for their pregnancy, during labor and birth and up to three months postpartum (Dalinjong *et al.*, 2018). Empirical studies have indicated a strong positive relationship between free maternal healthcare and ANC utilization (Dzakpasu *et al.*, 2014 and Hatt *et al.*, 2013). For instance, in Malawi, fee exemption in mission health facilities increases ANC visits by about 15% (Manthalu, 2016).

Recently, in Ghana, there has been a steady decline in antenatal care (ANC) visits (4+) from 98.6% in 2011 to 90.8% in 2013 and down to 86.7% in 2014 (Ghana Health Service (GHS), 2015). In addition, from 2017 to 2018, antenatal care in Ghana declined to 85% although the country recorded the highest ANC visits in Africa (UNICEF, 2019). This downward trend in ANC visits in Ghana has been linked to inadequate funds for outreach programs in the communities as well as poor data (GHS, 2015 and Dalinjong *et al.*, 2018). Arthur (2012) and Dixon *et al.* (2014) have shown that pregnant women who are uneducated, poor and live in rural communities tend to have fewer access to ANC compared to their counterparts who are educated, rich and are urban dwellers. The basic question is what is the implication of these government programs on household consumption in Ghana?

Generally, there is no consensus on the qualitative response of government expenditure shock on household consumption both theoretically and empirically (Ercolani, 2007). In their study, Blejer and Cheasty (1989) recognized the complementarities between public and private investment in case of developing countries. That is, their work explained that public investment in infrastructure and provision of public goods can increase private sector investment and productivity. Also, Fosu (2016) found that public investment in economic and social infrastructure had a positive effect on private investment in Ghana. From both neoclassical and New-Keynesian perspective, Baxter and King (1993) showed that private consumption decreases following positive shock on government expenditure because negative wealth tend to reduce the household permanent income. Furthermore, Ramey and Shapiro (1998) employed the so-called narrative approach within the framework of vector-autoregressive approach and found that government consumption crowds-out private

consumption. Lopez-Salido and Rabanal (2006) also did a similar study and found that the form of complementarity between household consumption and hours worked enables consumption to increase after a government shock.

Previous studies have analyzed how government programs and policies affect household consumption in several countries (Mahmud and Ahmed, 2012; Linnemann, 2006; Thamae and Macheli, 2013; Kumara and Samaratunge, 2017 and Sheu and Lu, 2014). However, given the significant role of government expenditure and FMHC policy in household consumption smoothing, to my knowledge, no empirical study has analyzed the impact of government spending and FMHC policy on household consumption in Ghana. The broad objectives of this study are two-fold. The first objective is to examine the impact of government expenditure on household consumption in Ghana in both short run and long run. The second objective is to analyze the impact of FMHC policy on household consumption in Ghana. The current study contributes to empirical literature because it is the first empirical study to examine the effect of government expenditure and FMHC policy on household consumption in Ghana. In addition, the outcome of this study has important implications for fiscal policy and health policy in Ghana and the entire Africa. The rest of the paper is organized as follows. The first section presents a review of relevant literature, followed by the methodology. The next section presents the results and discussions and the last section presents the conclusion and recommendations.

2. Literature review

This section of the study presents the review of literature. Using cointegration analysis and error correction model, Mahmud and Ahmed (2012) analyzed the effect of government spending on private consumption in Bangladesh. The cointegration analysis found a positive relationship between public and private consumption while the error correction model found an inverse relationship between public and private consumption in the long run. In addition, the Granger causality test found evidence of no causal relationship between government consumption and household consumption. Their study also supported Barro–Ricardian equivalence hypothesis.

In addition, Linnemann (2006) used nonadditive separable utility function and a small intertemporal consumption elasticity and found that a higher fiscal spending raise consumption and lower investment. In a similar study, Coenen and Straub (2005) used the dynamic stochastic general equilibrium (DSGE) to determine whether government spending crowd in private consumption for the euro area. The study showed that the inclusion of non-Ricardian households, which simply consume their current disposal income, is in general favorable to raising the level of consumption in response to government spending shocks. Their study concluded that government spending shocks crowd in private consumption.

Also, Bouakez and Rebei (2007) used US data and explained the puzzling crowding-in effect of government spending on private consumption. The findings revealed a strong complementarity between public and private spending. In addition, Horvath (2009) presented the normative analysis within the New Keynesian framework to examine the effects of government spending shocks on consumption under optimal stabilization. The results of their study provide little support for a crowding-in effect under optimal stabilization policy. Furthermore, using panel analysis, Argimon *et al.* (1997) examined the relationship between government spending and private investment using panel of 14 OECD countries. Their study revealed existence of a significant crowding-in effect of private investment due to increase in public spending.

In Lesotho, Thamae and Macheli (2013) examined the effects of public spending on private consumption using the multivariate cointegration techniques covering the period 1980–2010. The study finds a positive and stable long-term relationship between government spending and private consumption in Lesotho. Their study suggests that public consumption crowd in

private consumption. In a similar study, Khalid (1996) found that public spending is a poor substitute for private consumption in developing countries and thus suggesting that temporary increases in public spending may have some expansionary effect on aggregate demand.

Furthermore, Kumara and Samaratunge (2017) used Sri Lanka Household Income and Expenditure Survey 2012/2013 data and examined the association of non-communicable diseases (NCD)-prevalence and healthcare utilization with household consumption. Their study found that financial constraints induced by NCD-prevalence and hospitalization compel households primarily to sacrifice food consumption. In addition, private hospitalization was found to be adversely associated with a wider range of consumption.

Using a disaggregated analysis and data from 1970 to 1997, Ramajo *et al.* (2007) examined the effects of public expenditure on private consumption in Spain. The results from the study showed significant links between public and private consumption. That is, the results provide evidence that some components of public and private consumption act as substitute, whereas others act as complements.

More so, Baldacci *et al.* (2010) examined the impact of public expenditures on social programs on household consumption using Chinese household income survey. The study found that 1% increase in public expenditures, distributed equally across education, health and pensions result in a permanent increase in household consumption ratio of 1.25%.

Sheu and Lu (2014) used a difference-in-difference (DID) estimation analysis and sample of 17,899 households from the 1993 to 2000 Taiwan Survey of Family Income and Expenditure to assess the impact of national health insurance (NHI) on household consumption patterns. The effect of NHI was assessed by the changes in the proportion of the consumption expenditure devoted to medical items and non-medical items in the post-NHI period (1996–2000) compared to the pre-NHI period (1993–1994). The results revealed that spending related to the improvement of housing conditions had the most significant increase.

The study by Rajaram *et al.* (2014) employed the difference-in-differences method to control for background trends in patient outcomes. Rajaram *et al.* (2014) used a large clinical registry for surgical patients (American College of Surgeons National Surgical Quality Improvement Program) and evaluated several clinical outcomes (mortality, serious morbidity and readmission) and American Board of Surgery pass rates for before and after the 2011 Accreditation Council for Graduate Medical Education (ACGME) duty hour reforms. Similarly, Patel *et al.* (2014) used Medicare claims data and evaluated mortality and readmissions for before and after the ACGME duty hour reforms, also using a comparison group of nonteaching hospitals. Both studies found no association of the 2011 ACGME duty hour reform with clinical outcomes.

Ionescu-Ittu *et al.* (2015) used the Canadian Community Health Survey (2001–2009) to conduct a DID regression analysis for the effect of the Universal Child Care Benefit (UCCB) on self-reported food insecurity overall and in vulnerable subgroups. The respondents were ages ≥12 in families with at least one child aged less than 6 years (UCCB-eligible, $n = 22{,}737$) or a child aged 6–11 but no child less than 6 years (control group, $n = 17{,}664$). The findings of the study showed that about 16.3% of respondent experienced some level of food insecurity. Also, UCCB reduced food insecurity by 2.4%. There was a significant impact on food insecurity for respondents from low-income household and from single parent families.

Using National Survey of America's Families data from 1997 to 1999, Garret and Zuckerman (2005) established what Medicaid beneficiaries' access and use would have been in the absence of Medicaid managed care (MMC) and to control for unobserved county differences. The study estimated DID models using a comparison group of privately insured individuals who we would not expect to be affected by MMC. The study found a weaker effect of MMC programs for children than adults. It was also observed that mandatory health maintenance organizations (HMO) programs reduce the probability of Medicaid adults using

emergency rooms, when implemented alone or together with Primary Care case Management (PCCM).

Zhao *et al.* (2020) used segmented linear regression analysis and a national longitudinal data to analyze the trend change and level change of neonatal health services (2000–2017) and neonatal mortality rates (NMR) (1991–2017) before and after the introduction of the Basic Public Health Service (BPHS) project in 2. The study found that trend change coefficient of national NMR and the gap of NMR between urban and rural areas were −0.57 and −0.49 after the introduction of the BPHS project while annual trend coefficient of the NMR and the neonatal visit rate were 1.21 and 0.85 respectively. Their study concluded that the introduction of BPHS project is associated with increased in volume of neonatal health services and reduced NMR in China.

Lagarde (2012) also used segmented regression model and assessed the impact of health policy change on the number of monthly outpatient consultations with routine longitudinal data. The study found no significant month-to-to change in the number of consultations, either before or after the intervention, however, immediately after the intervention, the number of consultations increased by about 1,603 consultations per month.

Similarly, Yilma *et al.* (2015) used three rounds of household survey data collected before and after the introduction of the Ethiopia's Community-Based Health Insurance Scheme (CBHI) to assess the impact of the scheme on household consumption, income, indebtedness and livestock holdings. The study provides no evidence that CBHI affects household consumption, as the coefficients lack statistical significance and the magnitudes are small.

It can be observed that previous studies on how government expenditure and government healthcare policy affect household consumption have been done in several countries, however, this kind of study is limited for Ghana. The current study seeks to fill this gap in the literature by examining the impact of government expenditure and free maternal healthcare policy on household consumption in Ghana.

3. Methodology

3.1 Theoretical model

To analyze the impact of government expenditure on household consumption, the study employed the representative agent model. The model assumed that the representative agent has infinite planning horizon, to face perfect capital markets and to have perfect foresight (Turnovsky, 2000). The agent's aim is to maximize his consumption by choosing his private rate of consumption (c), supply of labor (l), capital stock (k) and holdings of government bonds (b).

The agent tries to maximize his utility in Eqn (1):

$$\max \int_0^{\infty} U(c, l, g)e^{-\beta t}dt \tag{1}$$

$$U_c > 0,\ \ U_{cc} < 0,\ U_l < 0,\ U_{ll} < 0,\ U_g > 0,\ U_{gg} < 0$$

Subject to the budget constraint

$$c + \dot{k} + \dot{b} = F(k, l) + rb - T \tag{2}$$

and the initial conditions

$$b(0) = b_0, \quad k(0) = k_0 \tag{3}$$

where g is real government consumption expenditure, T is lump-sum taxes, β is rate of consumer time preference and r is real interest rate. Also, T, β and r are assumed to be

constant. The output in this economy is shown by the neoclassical production specified by Eqn (4).

$$y = F(k, l); \quad F_k > 0, F_{KK} < 0, F_l > 0, F_{ll} < 0 \tag{4}$$

For simplicity, the study assumed no depreciation of capital. It is also assumed that F is linearly homogeneous in capital and labor. This implies that $F_{KK}F_{ll} - F_{kl}^2 = 0$ and $F_{kl} > 0$.

To solve this optimization problem, the study specifies the Lagrangian expression:

$$\mathrm{H} = \ U(c,l,g)e^{-\beta t} + \lambda e^{-\beta t}(F(k,l) + rb - T - c - \dot{k} - \dot{b})) \tag{5}$$

where $\lambda(t)$ measures the marginal utility of wealth. The optimality conditions from the Hamiltonian function are specified below:

$\frac{\partial H}{\partial c} = 0, \ \frac{\partial H}{\partial l} = 0, \frac{\partial H}{\partial k} + \frac{\partial}{\partial t}(\lambda e^{-\beta t}) = 0, \frac{\partial H}{\partial b} + \frac{\partial}{\partial t}(\lambda e^{-\beta t}) = 0$ gives Eqn (6) –(9) respectively.

$$U_c(c, l, g) = \ \lambda \tag{6}$$

$$U_l(c, l, g) = \ -\lambda F_l(k, l) \tag{7}$$

$$\lambda F_k(k, l) = -\dot{\lambda} + \lambda\beta \tag{8}$$

$$\lambda r = -\dot{\lambda} + \lambda\beta \tag{9}$$

Thus, Eqn (6) states that at equilibrium, the agent's marginal utility of consumption must equal his marginal utility of wealth. Eqn (7) shows that marginal utility of an extra unit of leisure must equal the marginal utility of consumption priced at the real wage rate. Eqns 6 and (7) are static efficiency conditions while Eqns (8) and (9) are dynamic efficiency conditions. More so, the transversality conditions below must hold to eliminate explosive equilibria.

$$\lim_{t\to\infty} \lambda k^{-\beta t} = 0 \tag{10}$$

$$\lim_{t\to\infty} \lambda b^{-\beta t} = 0 \tag{11}$$

In this model, the other agent is the government. The government makes expenditure decisions, taxations decisions and financing decisions subject to its flow constraint in Eqn (12).

$$\dot{b} = g + rb - T \tag{12}$$

Eqn (12) shows that government deficit is government expenditures plus interest payments on its outstanding debts less tax revenues must be financed by issuing additional debt.

By substituting Eqn (12) into Eqn (2) yields Eqn (13).

$$F(k,l) = c + \dot{k} + g \tag{13}$$

Eqn (13) is the market clearing which shows that current output must be either consumed by household, consumed by the government or accumulated as additional capital stock.

From Eqns (6) and (7), c and l can be solved in the form:

$$c = c(\lambda, k, g) \tag{14}$$

$$l = l(\lambda, k, g) \tag{15}$$

From these equations we can also determine:

$$\frac{\partial c}{\partial \lambda}, \frac{\partial c}{\partial k}, \frac{\partial c}{\partial g}, \frac{\partial l}{\partial \lambda}, \frac{\partial l}{\partial k}, \frac{\partial l}{\partial g}$$

Eqn (14) is the Ricardian Equivalence which emerges from the dynamic competitive macroeconomic model with government having discretion to issue bonds or impose tax to finance its spending.

3.2 Econometric model (first objective)

The objectives of this study are two-fold. The first is to examine the impact government expenditure on household consumption in Ghana and secondly, to examine the impact of the free maternal healthcare policy on household consumption in Ghana. The econometric model for the first objective is shown by Eqn (16).

$$\ln \mathrm{HSC}_t = \delta + \eta \ln \mathrm{GOE}_t + \vartheta \ln \mathrm{GDP}_t + \epsilon_t \tag{16}$$

where HSC is household consumption expenditure or private consumption measured as household final consumption expenditure (% of GDP), GOE is government expenditure measured as general government final consumption expenditure (% of GDP). GDP is GDP per capita growth (annual %). t is time, ln is natural log. δ is an intercept parameter, η and ϑ are slope coefficients or the elasticity. Government expenditure can act as a substitute or a complement to household consumption, so the study expects this variable to be negatively or positively related to household consumption (i.e. $\eta > 0$ or < 0). Also, an increase in income ceteris paribus will lead to increase in household consumption for a normal good (i.e. $\vartheta > 0$). For inferior good, an increase in income will lead to a fall in household consumption (i.e. $\vartheta < 0$). In addition, the study used secondary data covering the period of 1967–2018. Data on household consumption, government consumption expenditure and real GDP were gleaned from the World Bank website: https://databank.worldbank.org/reports.aspx?source=world-development-indicators#.

To examine the long-run relationship and short-run dynamics of public consumption on private consumption, the study used the ARDL cointegration technique developed by Pesaran *et al.* (1999) and Pesaran *et al.* (2001) was employed. This estimation technique has several advantages than other estimation techniques. It allows a mixture of both I(0) and I(1) variables to be used. In addition, the method is relatively efficient especially when working with small and finite sample data. The mathematical representation of the ARDL model in this study is shown below:

$$\begin{aligned} D(\ln(\mathrm{HSC}_t)) = {} & \alpha_{01} + \beta_{11} \ln(\mathrm{HSC}_{t-1}) + \beta_{21} \ln(\mathrm{GOE}_{t-1}) + \beta_{31} \ln(\mathrm{GDP}_{t-1}) \\ & + \sum_{i=1}^{P} \alpha_{1i} D \ln(\mathrm{HSC}_{t-i}) + \sum_{i=1}^{P} \alpha_{2i} D \ln(\mathrm{GOE}_{t-i}) \\ & + \sum_{i=1}^{P} \alpha_{3i} D \ln(\mathrm{GDP}_{t-i}) + \epsilon_{1t} \end{aligned} \tag{17}$$

$$\begin{aligned} D(\ln(\mathrm{GOE}_t)) = {} & \alpha_{02} + \beta_{12} \ln(\mathrm{HSC}_{t-1}) + \beta_{22} \ln(\mathrm{GOE}_{t-1}) + \beta_{32} \ln(\mathrm{GDP}_{t-1}) \\ & + \sum_{i=1}^{P} \alpha_{1i} D \ln(\mathrm{GOE}_{t-i}) + \sum_{i=1}^{P} \alpha_{2i} D \ln(\mathrm{HSC}_{t-i}) + \sum_{i=1}^{P} \alpha_{3i} D \ln(\mathrm{GDP}_{t-i}) \\ & + \epsilon_{2t} \end{aligned} \tag{18}$$

$$D(\ln(\mathrm{GDP}_t)) = \alpha_{04} + \beta_{13}\ln(\mathrm{HSC}_{t-1}) + \beta_{23}\ln(\mathrm{GOE}_{t-1}) + \beta_{33}\ln(\mathrm{GDP}_{t-1}) + \sum_{i=1}^{P}\alpha_{1i}D\ln(\mathrm{GDP}_{t-i}) + \sum_{i=1}^{P}\alpha_{2i}D\ln(\mathrm{GOE}_{t-i}) + \sum_{i=1}^{P}\alpha_{3i}D\ln(\mathrm{HSC}_{t-i}) + \epsilon_{4t} \quad (19)$$

where ln is the logarithm operator, α and β are unknown parameters to be estimated, D is the first difference and ϵ is the error term. Eqns (17)-(19) indicate that household consumption, government expenditure and income tend to be influenced and explained by their past values. The optimal lag length is determined by using the either the minimum of AIC or SIC. The first step in the ARDL estimation is to estimate Eqns (17)-(19) by OLS.

The OLS estimation of these equations essentially test for the presence of long relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of variables (Belloumi, 2014; Fosu, 2017). The null hypothesis of no cointegration given by H_0: $\beta_{1i} = \beta_{2i} = \beta_{3i} = 0$ against the alternative one given by H_A: $\beta_{1i} \neq \beta_{2i} \neq \beta_{3i} \neq 0$ for all $i = 1, \ldots, 3$. The calculated F-Statistic value will be compared to the critical values determined by Pesaran *et al.* (2001). According to Pesaran *et al.* (2001), the lower bound critical values assumed that all variables included in the ARDL are integrated of order zero, while the upper bound critical values assumed that variables are integrated of order. If the F-statistic exceeds the upper critical bounds value the null hypothesis of no cointegration is rejected, while it is accepted if F-statistic is lower than the lower bounds value. The test is inconclusive if the F-statistic lies between them.

Following the empirical work of Belloumi (2014) and Odhiambo (2009), the study specified the short-run dynamic coefficients by estimating the error correction model associated with the long-run estimates. This is specified as follows:

$$D(\ln(\mathrm{HSC}_t)) = \alpha_0 + \sum_{i=1}^{P}\alpha_{1i}D\ln(\mathrm{HSC}_{t-i}) + \sum_{i=1}^{P}\alpha_{2i}D\ln(\mathrm{GOE}_{t-i}) + \sum_{i=1}^{P}\alpha_{3i}D\ln(\mathrm{GDP}_{t-i}) + \tau\mathrm{ECT}_{t-1} + \epsilon_{1t} \quad (20)$$

$$D(\ln(\mathrm{GOE}_t)) = \alpha_0 + \sum_{i=1}^{P}\alpha_{1i}D\ln(\mathrm{GOE}_{t-i}) + \sum_{i=1}^{P}\alpha_{2i}D\ln(\mathrm{HSC}_{t-i}) + \sum_{i=1}^{P}\alpha_{3i}D\ln(\mathrm{GDP}_{t-i}) + \tau\mathrm{ECT}_{t-1} + \epsilon_{2t} \quad (21)$$

$$D(\ln(\mathrm{GDP}_t)) = \alpha_0 + \sum_{i=1}^{P}\alpha_{1i}D\ln(\mathrm{GDP}_{t-i}) + \sum_{i=1}^{P}\alpha_{2i}D\ln(\mathrm{GOE}_{t-i}) + \sum_{i=1}^{P}\alpha_{3i}D\ln(\mathrm{HSC}_{t-i}) + \tau\mathrm{ECT}_{t-1} + \epsilon_{3t} \quad (22)$$

where α_{1i}, α_{2i}, α_{3i}, α_{4i} and α_{5i} are the short-run dynamic coefficients, τ indicate the speed of adjustments and ECT_{t-1} is the error correction term.

3.3 Econometric model (second objective)

The study used a segmented linear regression model and a longitudinal data to assess the level change and trend change of household consumption before and after the introduction of free maternal healthcare policy. This is shown by Eqn (23). The segmented regression analysis helps to control for secular trends and also adjust for potential serial correlation of the data (Lagarde, 2012; Ramsey *et al.*, 2001; Wagner *et al.*, 2002; Zhao *et al.*, 2020). Zhao *et al.* (2020) used this method and analyzed the trend change and level change of neonatal health services (2000–2017) and neonatal mortality rates (1991–2017) before and after the introduction of the Basic Public Health Service (BPHS) project in China. In addition, Lagarde (2012) used a segmented regression model and assessed the impact of health policy change on the number of monthly outpatient consultations for before and after the policy.

$$Y_t = \Phi_0 + \Phi_1 \text{time} + \Phi_2 \text{intervention} + \Phi_3 \text{postslope} + \vartheta_t \tag{23}$$

where Y_t is the outcome variable, time is a continuous variable indicating time from the start of the study up to the end of the period of observation, intervention is coded 0 for before-intervention period and 1 for after-intervention time period and postslope is coded 0 up to the last point before the intervention phase and coded sequentially from 1 thereafter. In this model, Φ_0 captures the baseline level of the outcome at time 0 (beginning of the study period), Φ_1 captures the structural trend or growth rate in consumption, independently from the intervention, Φ_2 measures the immediate impact of the intervention or the change in level in the outcome of interest after the intervention and Φ_3 measures the change in trend or growth rate in outcome after the intervention. The intervention in this study is the free maternal healthcare policy and the outcome is household consumption.

An alternative coding that specify the trends before and after the intervention is given by Eqn (24)

$$Y_t = \psi_0 + \psi_1 \text{preslope} + \psi_2 \text{intervention} + \psi_3 \text{postslope} + \vartheta_t \tag{24}$$

where preslope is a continuous variable is a continuous variable indicating time from the start of the study up to the beginning of the intervention. The other variables have been defined already. To capture the change in trend, equivalent to the coefficient Φ_3 in Eqn (23), we subtract $\psi_3 - \psi_1$. To test for serial correlation in the data series, the study first performs Durbin–Watson (DW) to test for the presence of autocorrelation in the model. If the DW statistic is close to 2 is an indication of no serial correlation. Assuming there is serial correlation in the model, a generalized least squares estimator will be performed using the Prais–Winsten method (Judge *et al.*, 1988; Lagarde, 2012). In this case, the STATA command "prais" will be used instead of "reg" to perform the regression analysis.

4. Results and discussions

This section of the study presents the empirical results of the study. This study has two key objectives. The first objective is to examine the effect of government expenditure on household consumption expenditure in Ghana in the short run and long run and the second is to examine the effect-free maternal healthcare policy on household consumption expenditure in Ghana. Table 1 presents the summary statistics of the data. Table 1 shows that the outcome variable (i.e. household consumption expenditure) on average is around 80.93% with the minimum and maximum consumption around 66.99% and 94.23% of GDP. Average government spending is 10.89% of GDP with minimum government spending around 5.86% of GDP and maximum government spending around 16.76% of GDP. Average GDP growth per capita within the study period is 1.27% with the minimum and maximum GDP growth per capita equal −14.50% % and 11.31% respectively. In addition, skewness and kurtosis

test showed that household consumption and government expenditure are normally distributed except GDP and free maternal healthcare.

4.1 Test of unit root

The study conducted the ADF and PP unit root test for intercept only and intercept and trend. This is shown in Tables 2 and 3 respectively. The results show that all variables are stationary at their levels except household consumption, which is nonstationary. Variables that are stationary at levels have their order of integration to be I(0) while the nonstationary variable has its order of integration to be I(1). The choice of the ARDL estimation is suitable for this study because it allows for a mix of both I(0) and I(1) variables to be used for the estimation.

4.2 Test of long-run relationship

The Wald and *F*-Statistic test of cointegration indicates the presence of a long-run relationship among the variables. This is shown in Table 3. Since the test statistic lies above the upper bound, the null hypothesis of no level effect is rejected (Table 3).

4.3 Long-run estimates

Table 4 presents the long-run results of the study. The results revealed a negative and 1% significant effect of governments spending on household consumption. Empirically,

Variable	Observation	Mean	Std. dev	Min	Max
Outcome	52	80.938	6.576	66.992	94.231
Time	52	26.500	15.155	1	52
Intervention	52	0.212	0.412	0	1
Postslope	52	1.269	2.877	0	11
GOE	52	10.897	2.307	5.861	16.764
GDP	52	1.272	4.359	−14.509	11.315

Source(s): World Bank (2020), Author's Construct. Software: Stata. 11

Table 1. Summary statistics

	ADF (level)		PP (level)	
Variable	Intercept Only *t*-statistic	Intercept &Trend only *t*-statistic	Intercept only *t*-statistic	Intercept &Trend only *t*-statistic
GOE	−3.338**	−3.437	−3.304**	−3.471
GDP	−4.614***	−5.374	−4.639***	−5.167

Note(s): ***, **, * indicate 1%, 5% and 10% significance level, OI indicates order of integration

Source(s): World Bank (2020), Author's Construct. Software: EViews SV. 11

Table 2. Unit root test-ADF and PP (intercept only)

	Lower bound (95%)	Upper bound (95%)
F-Statistic	9.272	9.272
11.792		
W-Statistic 11.792	9.272	9.272

Source(s): World Bank (2020), Author's Construct. Software: Microfit 5.5

Table 3. Test of long-run relationship

1% increase in government expenditure decreases household consumption by 1.669% in the long run. This result suggests that government expenditure crowed-out private consumption in Ghana. This is not surprising because in Ghana, the government finance its expenses and programs mainly through taxation. So as government expenditure increase, it must also increase tax to finance spending. An increase in tax leads to a fall in income which produces a negative income effect on private consumption. The findings from this study are consistent with the findings by Ramey and Shapiro (1998), Smets and Wouters (2003) and Baxter and King (1993) who also found that government spending crowds-out private consumption. However, the findings from this study contradict the work of Blanchard and Perotti (2002), Linnemann and Schabert (2004), Mountford and Uhlig (2005), Baldacci *et al.* (2010) who found out that shocks to government spending increases household consumption.

Furthermore, the coefficient of real GDP indicates that marginal propensity to consume (MPC) is 0.198; implying that 1% increase in real GDP (i.e. income) leads to about 0.198% increase in household consumption expenditure in Ghana in the long run. This finding supports the results of Bonsu and Muzindutsi (2017) who also found MPC of 0.797 in Ghana. Differences in MPC between the current study and Bonsu and Muzindutsi (2017) might be due to the fact that increase in government spending decreases households' disposable income thereby leading to lower private consumption. More so, this result is consistent with Chioma (2009) and Mallik and Pradhan (2012) who found a positive and significant relationship between household consumption and income.

4.4 The error correction model

Table 5 presents the short-run results of the study. The error correction term (ECM (−1)) indicates the speed of adjustment. It is negative and statistically significant as expected. The speed of adjustment value of −0.326 indicates that approximately about 32.6% of the short-run disequilibrium is corrected in the long-run. Also, the short-run estimates are similar to the long-run estimates in terms of signs of coefficients. The short run results indicate that 1% increase in government expenditure leads to 0.544% decreases in household consumption expenditure in Ghana. This results also suggest that both government consumption expenditure crowd-out household consumption expenditure in Ghana in the short run. In addition, the MPC is 0.064 indicating that 1% increase in income leads to about 0.064% increase in household consumption expenditure in the short run.

4.5 Diagnostic tests

Various diagnostic tests were performed to check for the robustness of the ARDL results. The diagnostic tests results are shown in Table 6. The diagnostic tests results indicate that the model passed all diagnostic tests (i.e. serial correlation, functional form, normality and heteroscedasticity test) suggesting the model in general is robust, consistent and reliable.

Variables	Coef	Std. error	*T*-stat	*p*-value
Dep var: HSC				
GOE	−1.669	0.846	−1.972	0.001***
GDP	0.198	0.363	0.545	0.588
CONSTANT	98.943	9.091	10.883	0.000***

Note(s): ***, **, * indicate 1%, 5%, and 10% significance level
Source(s): World Bank (2020), Author's Construct. Software: Microfit 5.5

Table 4.
The long-run estimates

Variables	Coef	Std. error	*T*-stat	*p*-value
Dep var: dHSC				
dHSC(1)	0.067	0.143	0.469	0.644
dHSC(2)	0.391	0.140	2.792	0.008***
DGOE	−0.544	0.267	−2.037	0.048**
dGDP	0.064	0.121	0.529	0.596
ECM(−1)	−0.326	0.095	3.432	0.001***
R-Squared	0.307	Akaike info Criterion		−134.894
F-Statistic	3.804	Schwarz criterion		−140.570
DW-Statistic	2.077			

Note(s): ***, **, * indicate 1%, 5%, and 10% significance level, *D* is first differenced
Source(s): World Bank (2020), Author's Construct. Software: Microfit 5.5

Table 5.
The error correction model (short-run estimates)

Test statistics	LM version	*p*-value
Serial correlation	0.455	0.500
Functional form	2.395	0.122
Normality	0.251	0.882
Heteroscedasticity	0.036	0.952

Source(s): World Bank (2020), Author's Construct. Software: Microfit 5.5

Table 6.
Diagnostic tests

4.6 The segmented linear regression

To analyze the impact of the free maternal healthcare policy on household consumption in Ghana for before and after the launch of the policy, the study used a segmented linear regression and longitudinal data from 1967 to 2018. Model 1 did not adjust for first-order autocorrelation despite a Durbin–Watson statistic of 0.749 which suggest its presence in the model. Model 2 is the same model using Prais–Winsten estimator that corrects for autocorrelation. Table 7 presents the results from a segmented linear regression model.

The results show a significant annual change in household consumption before the introduction of the FMHC policy. Immediately the FMHC policy was introduced, household consumption insignificantly increased by about 5.472. Also, the trend change in household consumption after the FMHC policy was negative and statistically significant suggesting that the FMHC policy lead to a reduction in household consumption expenditure. This result is consistent with Lagarde (2012) and Zhao *et al.* (2020) who also found annual trend change coefficient to be negative.

5. Conclusion and recommendation

The first objective of the study is to analyze the impact of government expenditure on household consumption using the ARDL estimation technique in Ghana while the second objective was to assess the level changes and trend changes of the household consumption before and after the introduction of free maternal healthcare (FMHC) policy from 1967 to 2018 using a segmented linear regression model. The results revealed that government expenditure had a negative and statistically significant effect of on household consumption expenditure suggesting that government expenditure crowed-out private consumption in Ghana. The intuition behind this result is that as government expenditure increases it must increase tax to finance spending. An increase in tax results in a fall in income which produces a negative income effect on private consumption. It was also observed that

Dep. Var outcome/	Coefficient	Standard error	*T*-statistic	*p*-value
Indep. variable: FMHC				
Model 1 (no correction for autocorrelation)				
Constant Φ_0	77.808	1.509	51.560	0.000***
Secular trend Φ_1	0.176	0.063	2.810	0.007***
Level Change Φ_2	10.889	3.395	3.210	0.002***
Trend Change Φ_3	−2.841	0.452	−6.280	0.000***
R-Squared	0.510			
F-Statistic	16.680			0.000***
DW-statistic	0.749			
Model 2 (correction for first order autocorrelation)				
Constant Φ_0	77.191	3.109	24.830	0.000***
Secular trend Φ_1	0.215	0.125	1.730	0.091*
Level Change Φ_2	5.472	3.983	1.370	0.176
Trend Change Φ_3	−2.126	0.622	−3.420	0.001***
R-Squared	0.628			
F-Statistic	27.020			0.000***
Pho	0.667			
DW-Statistic	2.112			

Note(s): ***, **, * indicate 1%, 5%, and 10% significance level
Source(s): World Bank (2020), Author's Construct. Software: Stata 14.2

Table 7. Estimated level and trend changes of FMHC policy before and after the interventions on outcome variable

before the implementation of the FMHC policy, there was an increase household consumption expenditure, but after the introduction of the FMHC policy, household consumption expenditure decreases significantly suggesting that FMHC policy has strong association with household consumption in Ghana. The findings from the study have important implications not only for the Ghanaian economy but also for other developing countries. In addition, the results from this study have implications for household savings and interest rate. The study suggests the need to increase public spending on basic social amenities and also extend the free maternal healthcare policy to all pregnant women especially those in the rural areas of Ghana as these have a greater impact on household consumption in Ghana. The current study contributes to empirical literature because it is the first empirical study to examine the impact of government expenditure and free maternal healthcare policy on household consumption expenditure in Ghana using the ARDL and segmented linear regression model respectively. Due to limited data availability, this study did not assess the impact of the FMHC policy at the household or district level. Also, Ghana has introduced a free senior high school education policy in 2017 so further research could analyze the implications of these policies for household consumption in Ghana at the micro-level using different estimation technique such as the DID. Also, future research can decompose government expenditure into capital and recurrent expenditure and examine their effect on private consumption.

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