

From subsistence to formality: how government spending shapes self-employment across the distribution in sub-Saharan Africa

Abstract: This study investigates the impact of government spending on subsistence self-employment in sub-Saharan Africa (SSA), a region where informal and precarious employment remains widespread despite efforts to promote decent work under Sustainable Development Goal 8. Employing Simultaneous Quantile Regression (SQR) and Instrumental Variable Quantile Regression (IVQR) on panel data from 41 SSA countries (1991–2021), we assess both the aggregate and gender-specific effects of government expenditure on self-employment across the employment distribution. Results show a consistent and statistically significant negative effect of government spending on self-employment, with the impact strongest in countries exhibiting lower initial levels of self-employment. Furthermore, the gender-disaggregated analysis reveals that female self-employment is more responsive to fiscal policy in low self-employment contexts. These findings offer critical insights for designing differentiated, quantile-sensitive public policy responses aimed at addressing persistent informality in SSA labour markets.

Keywords: Government spending, self-employment, Simultaneous Quantile Regression, Instrumental Variable Quantile Regression, sub-Saharan Africa.

JEL classification:

1. Introduction

Since the adoption of the Sustainable Development Goals (SDGs) in 2015, 193 member states of the United Nations have prioritised the promotion of inclusive and sustainable economic growth through decent work for all, encapsulated in SDG 8 (UN, 2018; UN DGC, 2023). Yet, SSA economies remain characterised by persistently high levels of informal employment. As of 2022, nearly 78% of the workforce in the region remained self-employed (World Bank, 2022), with women disproportionately represented (ILO, 2016). As much as Goal 8 emphasises the importance of productive employment and decent work for all, many countries are still far from achieving these goals (Dasgupta, 2019, ILO, 2018, Narita, 2020, Herreño and Ocampo, 2023). Fields (2019) found that in developing countries, for example, 76.5% of the poor are engaged in subsistence self-employment, which is precarious and undervalued in terms of wages and conditions of employment.

Against this backdrop, governments in SSA face growing pressure to adopt policies that shift employment patterns towards more formal and productive forms. Government expenditure can influence employment outcomes via multiple channels: by enhancing infrastructure (Foster et al., 2022), expanding educational and vocational training (Shen et al., 2018; Kumar, 2023), and strengthening social protection systems (Anderson et al., 2018). These interventions may reduce reliance on subsistence self-employment, particularly among vulnerable groups such as women. The literature identifies several factors driving informality—such as education, access to finance, and macroeconomic conditions (Fields, 2019, Yerrabati, 2023, Herreño and Ocampo, 2023, Narita, 2020, Boeri et al., 2020, Poschke, 2019). Nonetheless, these debates and discussions did not shed light on the role of government spending. By creating opportunities for productive employment, promoting skill development, and enhancing social safety, government spending can play a pivotal role in reducing self-employment. Unfortunately, the empirical evidence supporting this view is not always readily available. Addressing this research gap is important for two reasons. First, it aids in designing targeted interventions to alleviate the dependence of the poor on subsistence self-employment. Second,

it informs strategies to promote sustainable economic development by reducing the reliance on such employment and fostering productive employment opportunities.

This paper addresses two research questions: (1) How does government spending affect self-employment in SSA? and (2) Are these effects gender-differentiated? To this end, we analyse longitudinal data from 41 SSA countries over three decades using Simultaneous Quantile Regression (SQR) and Instrumental Variable Quantile Regression (IVQR). These techniques allow us to investigate heterogeneity in government spending effects across the distribution of self-employment. Additionally, the approach provides robust estimates by accounting for nonlinearity and heteroskedasticity in the data, which is a common characteristic of self-employment data in SSA contexts, thus providing a more reliable analysis. To validate the findings obtained using SQR, several robustness and sensitivity checks, including the most recent Instrumental Variable Quantile Regression (IVQR) approach, were employed.

Our results reveal that increased government spending significantly reduces self-employment, particularly in lower quantiles—indicating stronger effects in countries with less pervasive self-employment. Furthermore, the effects are gender-specific: female self-employment shows greater responsiveness to fiscal policy interventions in low self-employment contexts. Compared to countries with high levels of self-employment, the effect of government spending on female self-employment is more substantial in countries with low levels of self-employment. These findings make a dual contribution to the literature on informal labour markets and the design of public employment policy in developing economies.

The paper proceeds as follows: Section 2 outlines the theoretical framework and empirical strategy. Section 3 presents the results and robustness checks. Section 4 concludes with a discussion of policy implications and avenues for future research.

1.1 Theoretical considerations

It is important to recognise that the primary reason why many workers resort to self-employment is because of a lack of sufficient productive employment opportunities (Fields, 2019, Yerrabati, 2021, Yerrabati, 2023). Government expenditures influence the movement of workers between employment types through three interconnected mechanisms. First, investment in public infrastructure—such as roads, ports, and communication networks—lowers transaction costs and nurtures the expansion of the formal sector, thereby creating new opportunities for salaried work (Foster et al., 2022).

Second, channelling resources into education and vocational training enhances individuals' skills and productivity, making formal employment more accessible and diminishing reliance on informal self-employment (Kumar (2023), Shen et al. (2018), Onabote et al. (2023), and Woldu and Szakálné Kanó (2023)). Finally, well-designed social protection schemes and safety nets cushion vulnerable populations against income shocks, offering viable alternatives to unstable self-employment—an effect that is particularly pronounced among women (Anderson et al., 2018). Together, these fiscal measures reshape the employment landscape by simultaneously lowering barriers to formal jobs, boosting workforce capabilities, and safeguarding workers against precarious livelihoods. These mechanisms may exert heterogeneous effects across the distribution of self-employment intensity—an insight best captured using a distributional approach.

To capture this heterogeneity, we employ SQR, which estimates effects at multiple points (quantiles) of the conditional distribution. SQR allows us to go beyond the average treatment effect to identify where policy interventions may have the greatest or least impact. For robustness, we also use IVQR to account for potential endogeneity in government spending,

using legal origin as an instrument—a common approach in comparative political economy (La Porta et al., 1999; Chernozhukov & Hansen, 2008).

This study is grounded in the dual labour market and segmentation theories (Piore, 1971; Fields, 2005), which posit that individuals enter informal or subsistence self-employment primarily due to exclusion from the formal labour market rather than entrepreneurial preference. In this context, public expenditure plays a pivotal role in reducing barriers to formal employment by creating enabling environments through investment in infrastructure, human capital, and welfare systems.

The dataset comprises macroeconomic indicators from 41 SSA countries over the period 1991–2021. Variables include self-employment rates (total, male, female), general government consumption expenditure (% of GDP), real GDP, FDI inflows, urbanisation rates, and inflation. Quantile regression is particularly suited for our context, given the non-normal distribution and heteroskedasticity observed in employment data across the region (Koenker & Bassett, 1978; Cameron & Trivedi, 2009).

This strategy enables us to estimate differentiated effects of fiscal policy across employment contexts while ensuring empirical robustness through alternative specifications and instrumental variable techniques.

2. Methodology

This research is twofold, firstly, we investigate the impact of government spending on total self-employment, secondly, we examine whether this effect is gender specific. The study utilizes data spanning from 1991 to 2021, sourced from 41 Sub-Saharan African (SSA) Countries. The methodological framework of this study is grounded in Simultaneous Quantile Regression (SQR), an empirical approach that allows for the estimation of multiple quantiles of a target variable concurrently (Gould, 1998). This study specifically examines the effects across five distinct quantiles: the 10th, 25th, 50th, 75th, and 90th. The simultaneous quantile regression (SQR) approach has gained significant traction among researchers in recent years due to its ability to estimate the relationship of different conditional quantiles of a response variable given a set of predictor variables at various quantiles, as opposed to merely measuring the mean effect. Cameron and Trivedi (2009) advocate for the use of the quantile regression approach over traditional least square regression methods, citing its robustness to outliers as a key advantage.

Furthermore, the Quantile Regression (QR) estimation approach employed in this study does not rely on assumptions of future government spending distributions. Instead, it empirically determines the relationship between government spending and self-employment based on the conditional distribution of the existing data. In this study, the dependent variable (y) represents self-employment, which includes total self-employment, male self-employment, and female self-employment. The independent variable (x) is a vector of continuous variables, including general government final consumption expenditure as a percentage of the gross domestic product ($govt$), the natural logarithm of the gross domestic product measured in constant 2015 US dollars (GDP), net foreign direct investment inflows as a percentage of the gross domestic product (fdi), the urban population as a percentage of the total population (pop), and inflation, measured as an annual percentage of the consumer price index ($infla$).

As argued by Koenker & Bassett (1978), Koenker & Hallock (2001), and Cameron & Trivedi (2009), quantile regression coefficients are estimated by minimizing the sum of absolute values of errors. Given that the mean effect of government spending, the main independent variable,

might not capture all the treatment effects of the outcome distribution on self-employment, we estimate the τ^{th} conditional quantile of $Q_{y_i|x_i}(\tau|x_i)$

$$Q_{y_i|x_i}(\tau|x_i) = x_i^n \beta_\tau \quad (1)$$

Here, $Q_{y_i|x_i}(\tau|x_i)$ is the conditional τ^{th} quantile outcome given the x_i , $\tau \in (0, 1)$ is the τ^{th} quantile of the outcome variable. $x_i = (x_{i1}, x_{i2}, \dots, x_{ip})^n$ is the vector of covariates for each individual i , and $\beta_\tau = (\beta_{\tau 0}, \beta_{\tau 1}, \dots, \beta_{\tau p})^n$ is the vector of $(p + 1)$ regression coefficients at a known τ . This formulation allows us to model two or more quantiles simultaneously while adjusting for the observed covariates. To achieve this objective, we use the multiple variable simultaneous quantile regression command available in Stata “sqreg”¹.

For robustness testing, we adopt the instrumental variable quantile regression (IVQR) approach as specified by (Asafo-Adjei et al., 2023). We utilise this approach as some covariates of interest are often endogenous for reasons such as self-selection, omission of some relevant variable, and measurement error and are often influenced by other factors. For example, government spending decisions are often impacted by other economic factors such as tax revenues, consumer spending and investment returns etc. Therefore, the effect of government spending could be spurious in our SQR estimation and as such we control for this endogenous effect in the IVQR regression where we use as instruments for government spending country’s legal origin. For more details on IVQR, see (Chernozhukov and Hansen, 2006, 2008).

The IVQR objective function is presented as follows:

$$R(\tau, \alpha, \beta, \gamma) = \sum_{t=1}^T \sum_{i=1}^N \rho_\tau(y_{it} - e'_{it}\alpha - x'_{it}\beta - z'_{it}\gamma) V_{it} \quad (2)$$

Here, n , y , e , x , and z represent the observation number, dependent variable outcome, vector of endogenous variable, a vector of exogenous covariates, and the vector of the instrumental variable, respectively. In addition, $\rho_\tau = u(\tau - I(u \leq 0))$ is the quantile regression loss function, I represent each of the SSA countries ($i = 1, 2, \dots, 41$), and t refers to the time from ($t = 1, 2, \dots, 31$). $V_i = V(x_{it}, Z_{it}) > 0$ is a scalar weight and τ is the quantile index. We use Stata to execute the “ivqregress iqr” command available in Stata18.

3. Findings

This section presents the empirical results of the SQR and IVQR models. We begin with a descriptive overview before turning to the main regression results, robustness checks, and sensitivity analyses.

3.1: Descriptive statistics and correlation analysis

Tables 3 and 4 in the Appendix provide descriptive statistics and correlation analysis. According to Table 3, the average levels of total, male and female self-employment are 68.11, 62.56 and 75, respectively, indicating that more than half of the employed in SSA are self-employed. Government spending is averaged at 14.83 with a standard deviation of 6.25. An analysis of the correlation in Table 4 indicates that government spending has a negative relationship with all three types of self-employment with a statistical significance of 1 per cent. All three forms of self-employment are highly correlated, which is why they do not enter the same estimation. The Variance Inflation Factor (VIF) (see Table 5) suggests no significant issues with multicollinearity. We ran unit root tests to check if the regressions' variables and

¹ As documented in Stata manual “sqreg command estimates simultaneous-quantile regression. It produces the same coefficients as qreg for each quantile. Reported standard errors will be similar, but sqreg obtains an estimate of the VCE via bootstrapping, and the VCE includes between-quantile blocks. Thus, by adopting this approach, we can test and construct confidence intervals comparing coefficients describing different quantiles”.

residuals were stationary. Table 6 shows these results. Most variables, except for population, are stationary at the first difference, whereas all variables are stationary at the second difference, eliminating the possibility of obtaining spurious relationships.

3.2: *Quantile regression analysis*

Table 7 presents results from the SQR model across five quantiles (q10, q25, q50, q75, q90) for total, male, and female self-employment.

Consistent with the quantile-regression literature, we began by evaluating whether ordinary least squares or quantile regression would serve as the more appropriate analytical approach. We graphically represented the impact of government spending on three types of self-employments across various conditional quantiles, complete with 95% confidence intervals (refer to Figure 1 for coefficient plots). Visual inspection of the conditional quantile plots (Figure 1) supports our choice of quantile regression over Ordinary Least Squares (OLS), as the marginal effects of government spending clearly vary across quantiles. OLS estimates mask these distributional differences. The graphs indicate a varying distributional effect of government spending on all self-employment measures across different conditional quantiles. This implies that the influence of government spending on self-employment is not uniformly distributed, hence it is heterogeneous.

Conversely, the marginal effects of OLS with 95% confidence intervals suggest a constant effect. This observation leads us to infer that employing OLS to investigate the correlation between government spending and self-employment could result in misleading outcomes. Considering this, Table 7 provides the SQR estimates for government spending, enabling a comprehensive interpretation of the graphical analysis. We examined five quantiles (0.10, 0.25, 0.50, 0.75, and 0.90) to comprehend potential coefficient alterations across the conditional distribution. In Table 7, columns 1-5 display the results for total self-employment at each of these five quantiles, while columns 6-10 and 11-15 present the results for male and female self-employment, respectively. We performed homogeneity tests to examine the uniformity of coefficients across quantiles along the self-employment conditional distribution. In all instances, we rejected the null hypothesis, thereby validating the selection of quantile regression.

Two novel findings emerge from our study. First, the findings of our study reveal an impactful relationship between government spending and self-employment. As expected, government spending has a negative and statistically significant impact on self-employment. In other words, as governments spend more, the number of individuals who rely on self-employment as subsistence falls. These findings reinforce the argument that government spending reduces dependency on subsistence self-employment, but that the effectiveness is conditional on the structure and depth of the informal economy—and is more pronounced for women in contexts of emerging formality. They align with the broader literature, which provides evidence of the role of government spending in reducing precarious employment (Kumar, 2023, Shen et al., 2018, Onabote et al., 2023, Woldu and Szakálné Kanó, 2023).

It should be noted, however, that there is considerable heterogeneity across quantiles. With coefficients of -2.51 and -1.96, the effect of government spending on reducing self-employment is particularly pronounced in the lower quantiles (10th and 25th). However, as indicated by the decreasing coefficients of -1.32, -0.64 and -0.31, respectively, the negative effect diminishes as we move towards the median and upper quantiles (50th, 75th and 90th). Put differently, although government spending reduces subsistence self-employment, its effect weakens in economies with high reliance on such employment. These findings highlight the complex

interplay between government spending and subsistence self-employment, suggesting that factors other than government spending may be more influential in contexts where this form of employment is more prevalent, justifying the need for a deeper understanding of this relationship.

Government spending may have an amplified impact on reducing self-employment in countries with lower levels of self-employment as a result of targeted approaches. In other words, fiscal measures could be deployed more effectively in sub-Saharan African economies with a lower reliance on self-employment, directly addressing the problem. Having fewer people dependent on self-employment for survival makes interventions more effective, resulting in greater reductions. The diminishing impact at higher quantiles suggests that the relative effectiveness of government spending may be dampened in countries with high self-employment levels. Often, countries with high self-employment rates are confronted with entrenched structural barriers, such as insufficient social safety nets and rigid regulations governing the labour market. Complexities such as these limit the effectiveness of targeted fiscal interventions, which have a lessened effect on relieving the burden of self-employment. When such challenges exist, it becomes imperative to address the root causes, as they can prevent fiscal intervention's amplified effect on self-employment. These findings highlight the nuanced nature of the policy impact and add further weight to the need for tailor-made strategies based on the levels of self-employment.

Second, the nuanced impacts of government spending on self-employment are gender-specific and reveal an intriguing interplay. In lower quantiles, where government spending has a pronounced impact on reducing self-employment, the effect is substantial on females. In contrast, at higher quantiles, the impact on females is lower. These findings suggest that, in SSA countries with lower levels of self-employment, increased government spending benefits females more by relieving them of the burdens of such employment. One possible reason for this could be that targeted fiscal interventions in these contexts address the needs of female workers by recognising and mitigating the economic disparities that increase their vulnerability. In contrast, in contexts with high levels of self-employment, policy priorities could be focused on reducing the poor's reliance on such employment rather than addressing gender-specific issues, which may inadvertently benefit more males than females.

Control variables behave largely as expected, growth and population have statistically significant and negative effects on all three forms of self-employment across all five quantiles. While the negative effect of growth was expected and is in line with the extant literature, the effect of population is counterintuitive. One possible reason for this counterintuitive finding is that as the population grows, a greater demand for skilled workers encourages the transition from self-employment to a more stable employment situation. Additionally, there is the possibility that an increase in population may be driving economic development, allowing individuals to find more productive employment. Notably, growth and population have gender-specific effects on self-employment across all quantiles. While the effects on female self-employment are more pronounced than male self-employment at lower quantiles, they are less pronounced at higher quantiles. Put differently, these findings demonstrate the importance of economic and demographic factors in shaping labour markets in SSA economies. While FDI has a significant positive effect on self-employment, the effects are inconsistent across all quantiles. Inflation has no impact on self-employment.

3.3 Robustness checks

Two robustness checks have been carried out to validate the results obtained in Table 7. The first one involved re-estimating equation 2 using IVQR (Table 8a). The second robustness check involved re-estimating the equation using two alternative government spending measures (Tables 8b, 8c). The first measure involved using general government final consumption expenditure measured in constant 2015 US dollars as the percentage of gross domestic measured in constant 2015 US dollars; the second measure involved general government final consumption expenditure measured in constant 2015 US dollars as the percentage of gross domestic product, purchasing power parity in constant 2017 international dollars. The key findings of the study obtained in Table 7 are robust to these two checks.

3.4 Sensitivity checks

To further validate the key findings of the study and test the stability of our results, two sensitivity checks were carried out by including education and democracy as additional variables in separate estimations. The inclusion of either of these additional variables did not alter the key findings. As expected, and in line with the extant literature, education is associated with a fall in dependency on subsistence self-employment. The impact of democracy on total and male self-employment remains insignificant. However, sporadic negative associations are noted across certain quantiles for female self-employment. The findings suggest that democracy does not play a significant role in shaping the poor's dependence on subsistence self-employment.

Taken together, the findings remain consistent across a variety of models and specifications, indicating that the negative relationship between government spending and subsistence self-employment—especially for women and in countries with lower self-employment rates—is both statistically robust and economically meaningful.

4. Conclusions and policy recommendation

This study examined the effects of government spending on subsistence self-employment in 41 sub-Saharan African countries between 1991 and 2021, using Simultaneous Quantile Regression and Instrumental Variable Quantile Regression methods. To understand the potential effects across the conditional distribution, we analysed the data using SQR across five quantiles – 0.10, 0.25, 0.50, 0.75 and 0.90. Understanding the role of government spending on subsistence self-employment is important for two reasons – firstly, it aids in designing targeted interventions to alleviate the dependence of the poor on subsistence self-employment; secondly, it informs strategies to promote sustainable economic development by reducing the reliance on such employment and fostering SDG8.

The analysis produced two core findings. First, government spending significantly reduces self-employment, but the magnitude of this effect varies across the employment distribution and is most pronounced in countries with initially lower levels of self-employment. Second, the effects are gender-differentiated: fiscal policy exerts a stronger impact on female self-employment, especially in contexts where informal employment is less entrenched. In countries with high levels of self-employment, the effects are more pronounced on male self-employment. These findings yield three key policy implications:

Policymakers should recognise that government spending is most effective in countries where self-employment is less pervasive to contribute to the achievement of SDG 8. These contexts represent policy windows where fiscal interventions—such as infrastructure investment or training schemes—can meaningfully shift employment patterns. In contrast, in countries with entrenched informality, complementary reforms addressing labour market rigidities and informality traps will be necessary to enhance fiscal impact.

The heightened responsiveness of female self-employment to public spending suggests that gender-targeted interventions—such as subsidised childcare, maternal health services, and women-focused vocational training—can deliver disproportionately positive returns in terms of labour market formalisation. Mainstreaming gender analysis into public finance decisions is thus critical.

National development strategies should adopt differentiated approaches informed by the distributional profile of self-employment. For example, low-quantile countries may prioritise scaling up social investments and productivity-enhancing services, while high-quantile countries may focus on regulatory reform, access to capital, and broader structural transformation. Any attempt to reduce the dependence of the poor on self-employment will not be successful unless the underlying structural barriers that are responsible for forcing the poor to resort to self-employment are addressed. Besides addressing these barriers, formalising self-employment by removing legal and administrative barriers, including providing legal protection, reducing bureaucracy, and simplifying the registration process, is a crucial step in ensuring sustained and inclusive growth that benefits these workers.

Future research could explore subnational data to better understand within-country heterogeneity, examine sector-specific spending effects, or assess the interplay between fiscal policy and institutional quality. These efforts would further enrich our understanding of how government spending can be deployed to support inclusive and sustainable employment transitions across the Global South.

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Appendix

Table 1: Variables and definitions

<i>Variable</i>	<i>Definition</i>	<i>Source</i>
<i>self_tot</i>	Total self-employment as the percentage of total employment (modelled ILO estimate)	World Development Indicators
<i>self_male</i>	Male self-employment as the percentage of male employment (modelled ILO estimate)	World Development Indicators
<i>self_fem</i>	Female self-employment as the percentage of female employment (modelled ILO estimate)	World Development Indicators
<i>govt</i>	General government final consumption expenditure as the percentage of the gross domestic product	World Development Indicators
<i>lngrow</i>	Natural logarithm of gross domestic product measured in constant 2015 US dollars	World Development Indicators
<i>fdi</i>	Net foreign direct investment inflows as the percentage of the gross domestic product	World Development Indicators
<i>pop</i>	Urban population as percentage of total population	United Nations Conference on Trade and Development
<i>infla</i>	Inflation, consumer prices measured as annual percentage	World Development Indicators

Table 2: List of countries included in the study

Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Dem. Rep., Congo, Rep., Cote d'Ivoire, Equatorial Guinea, Eswatini, Ethiopia, Gabon, Gambia, The, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Table 3: Summary statistics

<i>Variables</i>	<i>No of No of observations</i>	<i>mean</i>	<i>sd</i>	<i>min</i>	<i>max</i>
<i>self_tot</i>	1032	71.30	22.72	14.1	95.4
<i>self_male</i>	1032	65.92	22.26	15.1	93.7
<i>self_fem</i>	1032	77.93	23.59	11.8	99.2
<i>lag govt</i>	1032	14.22	6.27	0.9	43.5
<i>lngrowth</i>	1032	23.03	1.40	20.3	27.0
<i>fdi</i>	1032	2.95	4.97	-18.9	46.3
<i>pop</i>	1032	38.02	16.55	5.4	90.1
<i>infla</i>	1032	34.92	740.69	-11.7	23773.1

Source: Own estimates using data from sources listed in Table 1.

Table 4: Correlation analysis

<i>Variables</i>	<i>self_tot</i>	<i>self_male</i>	<i>self_fem</i>	<i>govt</i>	<i>lngrowth</i>	<i>fdi</i>	<i>pop</i>	<i>infla</i>
<i>self_tot</i>	1							
<i>self_male</i>	0.989***	1						
<i>self_fem</i>	0.984***	0.951***	1					
<i>govt</i>	-0.359***	-0.363***	-0.360***	1				
<i>growth</i>	-0.269***	-0.272***	-0.260***	-0.170***	1			
<i>fdi</i>	0.0391	0.0110	0.0655	0.0366	0.0116	1		

<i>pop</i>	-0.416***	-0.434***	-0.371***	-0.0341	0.224***	0.126***	1	
<i>infla</i>	0.0351	0.0335	0.0338	-0.0689	0.0243	-0.0251	-0.0162	1

Source: Own estimates using data from sources listed in Table 1.

Table 5: Multicollinearity test

<i>Variable</i>	<i>Total self-employment</i>		<i>Male self-employment</i>		<i>Female self-employment</i>	
	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
<i>lngrow</i>	1.09	0.917078	1.09	0.917078	1.09	0.917078
<i>pop</i>	1.07	0.938619	1.07	0.938619	1.07	0.938619
<i>govt</i>	1.05	0.954272	1.05	0.954272	1.05	0.954272
<i>fdi</i>	1.01	0.985904	1.01	0.985904	1.01	0.985904
<i>infla</i>	1	0.996149	1	0.996149	1	0.996149

Source: Own estimates using data from sources listed in Table 1.

Table 6: Results of unit root tests

<i>Variable</i>	<i>Levels</i>	<i>Difference (1)</i>	<i>Difference (2)</i>
<i>self tot</i>	0.143	-4.679***	-12.609***
<i>self male</i>	1.073	-4.084***	-12.067***
<i>self fem</i>	0.331	-6.502***	-14.719***
<i>govt</i>	3.785	-5.222***	-12.968***
<i>lngrow</i>	0.432	-4.601***	-15.633***
<i>fdi</i>	-1.615*	-13.882***	-21.784***
<i>pop</i>	3.260	3.130	-4.513***
<i>infla</i>	0.815	-10.231***	-19.178***

Source: Own estimates using data from sources listed in Table 1.

Table 7: Estimation results government spending and self-employment using simultaneous quantile regression approach

	<i>Total self-employment</i>					<i>Male self-employment</i>					<i>Female self-employment</i>				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
<i>Variables</i>	q10	q25	q50	q75	q90	q10	q25	q50	q75	q90	q10	q25	q50	q75	q90
<i>lag govt</i>	-2.51*** (0.26)	-1.96*** (0.18)	-1.32*** (0.12)	-0.64*** (0.09)	-0.31*** (0.09)	-2.51*** (0.24)	-1.77*** (0.16)	-1.28*** (0.08)	-0.75*** (0.12)	-0.38** (0.19)	-2.76*** (0.25)	-2.08*** (0.18)	-1.13*** (0.14)	-0.49*** (0.08)	-0.18*** (0.05)
<i>lag lngrowth</i>	-3.36*** (0.77)	-5.04*** (0.68)	-2.27*** (0.46)	-2.26*** (0.33)	-2.39*** (0.13)	-2.18*** (0.76)	-4.69*** (0.57)	-1.83*** (0.48)	-2.05*** (0.49)	-2.69*** (0.27)	-4.83*** (0.77)	-5.06*** (0.65)	-2.62*** (0.43)	-1.99*** (0.20)	-1.97*** (0.14)
<i>lag fdi</i>	0.50* (0.30)	0.08 (0.24)	0.47** (0.20)	0.12* (0.06)	-0.06 (0.04)	0.60** (0.24)	0.15 (0.25)	0.32** (0.15)	0.04 (0.06)	-0.11** (0.05)	0.52 (0.35)	0.13 (0.26)	0.41** (0.17)	0.19*** (0.05)	0.06* (0.03)
<i>lag pop</i>	-0.48*** (0.06)	-0.66*** (0.04)	-0.65*** (0.06)	-0.36*** (0.03)	-0.27*** (0.03)	-0.41*** (0.05)	-0.62*** (0.05)	-0.70*** (0.04)	-0.58*** (0.03)	-0.34*** (0.09)	-0.51*** (0.09)	-0.64*** (0.05)	-0.45*** (0.05)	-0.15*** (0.03)	-0.10*** (0.01)
<i>lag infla</i>	0.01 (0.03)	0.01 (0.03)	0.01 (0.01)	-0.01 (0.00)	-0.01 (0.00)	0.01 (0.03)	0.01 (0.03)	-0.01 (0.02)	-0.01 (0.01)	-0.01 (0.00)	0.01 (0.02)	0.01 (0.02)	0.01 (0.01)	-0.01 (0.01)	0.01 (0.00)
<i>No of observations</i>	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Constant included but not reported. Government spending is measured as general government final consumption expenditure as the percentage of the gross domestic product. q10, q25, q50, q75 and q90 stand for quantiles 10, 25, 50, 75 and 90, respectively.

Source: Own estimates using data from sources listed in Table 1.

Table 8a: Estimation results government spending and self-employment using instrumental variables quantile regression approach

	<i>Total self-employment</i>					<i>Male self-employment</i>					<i>Female self-employment</i>				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
<i>Variables</i>	q10	q25	q50	q75	q90	q10	q25	q50	q75	q90	q10	q25	q50	q75	q90
<i>lag govt</i>	-2.67*** (0.36)	-2.12*** (0.22)	-1.40*** (0.10)	-0.69*** (0.14)	-0.41*** (0.11)	-2.61*** (0.33)	-2.07*** (0.21)	-1.30*** (0.08)	-0.87*** (0.16)	-0.55*** (0.17)	-2.91*** (0.45)	-2.13*** (0.18)	-1.21*** (0.14)	-0.52*** (0.10)	-0.22*** (0.07)
<i>lag lngrowth</i>	-3.19*** (0.77)	-4.93*** (0.68)	-2.37*** (0.46)	-2.27*** (0.33)	-2.53*** (0.13)	-2.10*** (0.76)	-4.25*** (0.57)	-1.91*** (0.48)	-2.44*** (0.49)	-2.93*** (0.27)	-4.70*** (0.77)	-4.98*** (0.65)	-2.76*** (0.43)	-2.03*** (0.20)	-2.19*** (0.14)

	(0.75)	(0.53)	(0.47)	(0.46)	(0.35)	(0.72)	(0.50)	(0.45)	(0.56)	(0.43)	(0.77)	(0.63)	(0.43)	(0.32)	(0.26)
<i>lag fdi</i>	0.45*	0.10	0.44***	0.13**	-0.02	0.58***	0.11	0.33***	0.04	-0.14**	0.46	0.13	0.43***	0.21***	0.08**
	(0.27)	(0.20)	(0.14)	(0.06)	(0.05)	(0.23)	(0.19)	(0.11)	(0.06)	(0.06)	(0.91)	(0.24)	(0.15)	(0.06)	(0.04)
<i>lag pop</i>	-0.49***	-0.65***	-0.66***	-0.36***	-0.28***	-0.41***	-0.60***	-0.70***	-0.59***	-0.39***	-0.53***	-0.62***	-0.45***	-0.15***	-0.11***
	(0.08)	(0.04)	(0.04)	(0.04)	(0.03)	(0.06)	(0.04)	(0.04)	(0.05)	(0.07)	(0.12)	(0.05)	(0.05)	(0.03)	(0.02)
<i>lag infla</i>	-0.01	-0.04	0.01	0.01	-0.01	-0.01	-0.05	-0.01	-0.01	-0.01	-0.01	-0.03	-0.01	0.01	0.01
	(0.02)	(0.07)	(0.01)	(0.01)	(0.01)	(0.02)	(0.05)	(0.01)	(0.01)	(0.01)	(0.02)	(0.03)	(0.01)	(0.01)	(0.00)
<i>No of observations</i>	998	998	998	998	998	998	998	998	998	998	998	998	998	998	998

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Constant included but not reported. Government spending is measured as general government final consumption expenditure as the percentage of the gross domestic product. q10, q25, q50, q75 and q90 stand for quantiles 10, 25, 50, 75 and 90, respectively.

Source: Own estimates using data from sources listed in Table 1.

Table 8b: Estimation results government spending and self-employment using simultaneous quantile regression approach

	<i>Total self-employment</i>					<i>Male self-employment</i>					<i>Female self-employment</i>				
<i>Variable</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
<i>s</i>	q10	q25	q50	q75	q90	q10	q25	q50	q75	q90	q10	q25	q50	q75	q90
<i>lag govt</i>	-6.34***	-3.95***	-3.29***	-1.79***	-0.69***	-5.14***	-3.88***	-3.13***	-2.03***	-0.89***	-7.81***	-4.63***	-2.86***	-1.49***	-0.57***
	(0.55)	(0.41)	(0.22)	(0.22)	(0.24)	(0.46)	(0.42)	(0.16)	(0.29)	(0.33)	(0.59)	(0.30)	(0.49)	(0.18)	(0.17)
<i>lag lngrowth</i>	-3.06***	-3.65***	-1.21**	-1.74***	-2.02***	-2.03***	-3.89***	-0.59*	-1.51**	-2.03***	-3.43***	-3.77***	-1.51**	-1.64***	-1.97***
	(0.68)	(0.75)	(0.47)	(0.44)	(0.21)	(0.51)	(0.75)	(0.52)	(0.65)	(0.32)	(0.64)	(0.81)	(0.63)	(0.30)	(0.15)
<i>lag fdi</i>	0.04	-0.04	0.53**	0.30***	-0.03	0.04	-0.08	0.42**	0.21***	-0.12	0.36	0.43	0.47**	0.32***	0.12**
	(0.43)	(0.42)	(0.23)	(0.07)	(0.08)	(0.32)	(0.38)	(0.19)	(0.08)	(0.09)	(0.39)	(0.29)	(0.23)	(0.07)	(0.05)
<i>lag pop</i>	-0.19**	-0.52***	-0.68***	-0.38***	-0.26***	-0.20***	-0.45***	-0.70***	-0.62***	-0.37***	-0.36***	-0.49***	-0.52***	-0.17***	-0.10***
	(0.08)	(0.04)	(0.04)	(0.03)	(0.03)	(0.05)	(0.06)	(0.03)	(0.04)	(0.06)	(0.07)	(0.05)	(0.05)	(0.04)	(0.01)
<i>lag infla</i>	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-0.01	-0.01	0.01	0.01	0.01	0.01	0.01
	(0.04)	(0.02)	(0.01)	(0.00)	(0.00)	(0.04)	(0.02)	(0.01)	(0.00)	(0.00)	(0.03)	(0.03)	(0.02)	(0.01)	(0.01)

<i>No of observat ions</i>	953	953	953	953	953	953	953	953	953	953	953	953	953	953
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Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Constant included but not reported. Government spending is measured as general government final consumption expenditure in constant 2015 US dollars as a percentage of gross domestic product measured in purchasing power parity in constant 2017 international dollars. q10, q25, q50, q75 and q90 stand for quantiles 10, 25, 50, 75 and 90, respectively.

Source: Own estimates using data from sources listed in Table 1.

Table 8c: Estimation results government spending and self-employment using simultaneous quantile regression approach

	<i>Total self-employment</i>					<i>Male self-employment</i>					<i>Female self-employment</i>				
<i>Variable</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
<i>s</i>	q10	q25	q50	q75	q90	q10	q25	q50	q75	q90	q10	q25	q50	q75	q90
<i>lag govt</i>	-2.08*** (0.29)	-1.68*** (0.16)	-1.39*** (0.13)	-0.59*** (0.09)	-0.26*** (0.09)	-1.93*** (0.22)	-1.45*** (0.19)	-1.26*** (0.09)	-0.62*** (0.12)	-0.28* (0.15)	-2.47*** (0.30)	-1.90*** (0.17)	-1.19*** (0.18)	-0.57*** (0.06)	-0.26*** (0.08)
<i>lag lngrowth</i>	-3.19*** (0.79)	-4.44*** (0.80)	-1.65*** (0.49)	-1.71*** (0.40)	-2.17*** (0.20)	-2.14*** (0.67)	-5.07*** (0.82)	-1.20** (0.54)	-1.61*** (0.48)	-2.13*** (0.23)	-4.14*** (0.80)	-4.71*** (0.76)	-1.96*** (0.64)	-1.99*** (0.27)	-2.05*** (0.15)
<i>lag fdi</i>	0.70 (0.45)	0.01 (0.36)	0.48*** (0.15)	0.19*** (0.07)	-0.08 (0.06)	0.65** (0.30)	-0.06 (0.30)	0.38*** (0.12)	0.09 (0.06)	-0.14* (0.08)	0.99** (0.42)	0.48* (0.26)	0.52*** (0.17)	0.23*** (0.05)	0.10** (0.04)
<i>lag pop</i>	-0.34*** (0.08)	-0.58*** (0.04)	-0.71*** (0.06)	-0.37*** (0.04)	-0.26*** (0.04)	-0.29*** (0.06)	-0.54*** (0.05)	-0.71*** (0.04)	-0.61*** (0.03)	-0.35*** (0.07)	-0.48*** (0.09)	-0.58*** (0.04)	-0.52*** (0.07)	-0.17*** (0.03)	-0.11*** (0.01)
<i>lag infla</i>	0.01 (0.04)	0.01 (0.02)	0.01 (0.01)	0.01 (0.00)	0.01 (0.00)	0.01 (0.04)	0.01 (0.02)	0.01 (0.01)	-0.01 (0.01)	-0.01 (0.00)	0.01 (0.03)	0.01 (0.02)	0.01 (0.01)	0.01 (0.01)	0.01 (0.00)
<i>No of observati ons</i>	953	953	953	953	953	953	953	953	953	953	953	953	953	953	953

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Constant included but not reported. Government spending is measured as general government final consumption expenditure in constant 2015 US dollars as a percentage of gross domestic product in constant 2015 US dollars. q10, q25, q50, q75 and q90 stand for quantiles 10, 25, 50, 75 and 90, respectively.

Source: Own estimates using data from sources listed in Table 1.

Table 9a: Estimation results government spending and self-employment using simultaneous quantile regression approach

	<i>Total self-employment</i>					<i>Male self-employment</i>					<i>Female self-employment</i>				
<i>Variable</i>	(1) q10	(2) q25	(3) q50	(4) q75	(5) q90	(6) q10	(7) q25	(8) q50	(9) q75	(10) q90	(11) q10	(12) q25	(13) q50	(14) q75	(15) q90
<i>s</i>															
<i>lag govt</i>	-0.61*** (0.16)	-1.14*** (0.13)	-1.28*** (0.14)	-0.59*** (0.12)	-0.28*** (0.09)	-0.75*** (0.21)	-1.06*** (0.15)	-1.11*** (0.09)	-0.81*** (0.12)	-0.37*** (0.11)	-0.79*** (0.15)	-1.30*** (0.12)	-0.99*** (0.18)	-0.43*** (0.09)	-0.23*** (0.05)
<i>lag lngrowth</i>	-3.08*** (0.64)	-1.16* (0.60)	-1.29*** (0.46)	-1.91*** (0.35)	-2.09*** (0.21)	-2.22*** (0.67)	-0.62 (0.54)	-1.05** (0.45)	-1.85*** (0.38)	-2.08*** (0.23)	-3.59*** (0.53)	-1.67** (0.83)	-1.24*** (0.35)	-1.98*** (0.29)	-1.53*** (0.18)
<i>lag fdi</i>	-0.64** (0.28)	-0.22 (0.19)	0.09 (0.24)	0.13 (0.08)	0.06 (0.06)	-0.59* (0.31)	-0.28 (0.25)	0.13 (0.19)	0.12 (0.09)	-0.06 (0.06)	-0.13 (0.22)	0.04 (0.13)	0.22 (0.18)	0.22*** (0.06)	0.14*** (0.04)
<i>lag pop</i>	-0.05 (0.05)	-0.23*** (0.04)	-0.30*** (0.06)	-0.25*** (0.04)	-0.13*** (0.04)	-0.05 (0.06)	-0.19*** (0.04)	-0.26*** (0.07)	-0.32*** (0.05)	-0.20*** (0.06)	0.05 (0.06)	-0.22*** (0.07)	-0.23*** (0.05)	-0.10*** (0.03)	-0.03** (0.02)
<i>lag infla</i>	0.01 (0.05)	0.01 (0.03)	0.01 (0.01)	-0.01 (0.01)	-0.01 (0.00)	0.01 (0.08)	0.01 (0.04)	0.01 (0.01)	-0.01 (0.00)	-0.01 (0.00)	0.01 (0.03)	0.01 (0.03)	0.01 (0.01)	0.01 (0.01)	0.01 (0.00)
<i>lag edu</i>	-7.22*** (0.27)	-6.10*** (0.40)	-4.45*** (0.50)	-2.29*** (0.34)	-1.48*** (0.20)	-5.97*** (0.36)	-6.62*** (0.31)	-5.09*** (0.45)	-3.40*** (0.40)	-2.44*** (0.20)	-8.72*** (0.40)	-5.92*** (0.61)	-3.19*** (0.52)	-1.33*** (0.29)	-0.84*** (0.16)
<i>No of observations</i>	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032	1,032

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Constant included but not reported. Government spending is measured as general government final consumption expenditure as the percentage of the gross domestic product. q10, q25, q50, q75 and q90 stand for quantiles 10, 25, 50, 75 and 90, respectively. Education measured as expected years of schooling from United Nations Development Programme Human Development Report is included as an additional control variable.

Source: Own estimates using data from sources listed in Table 1.

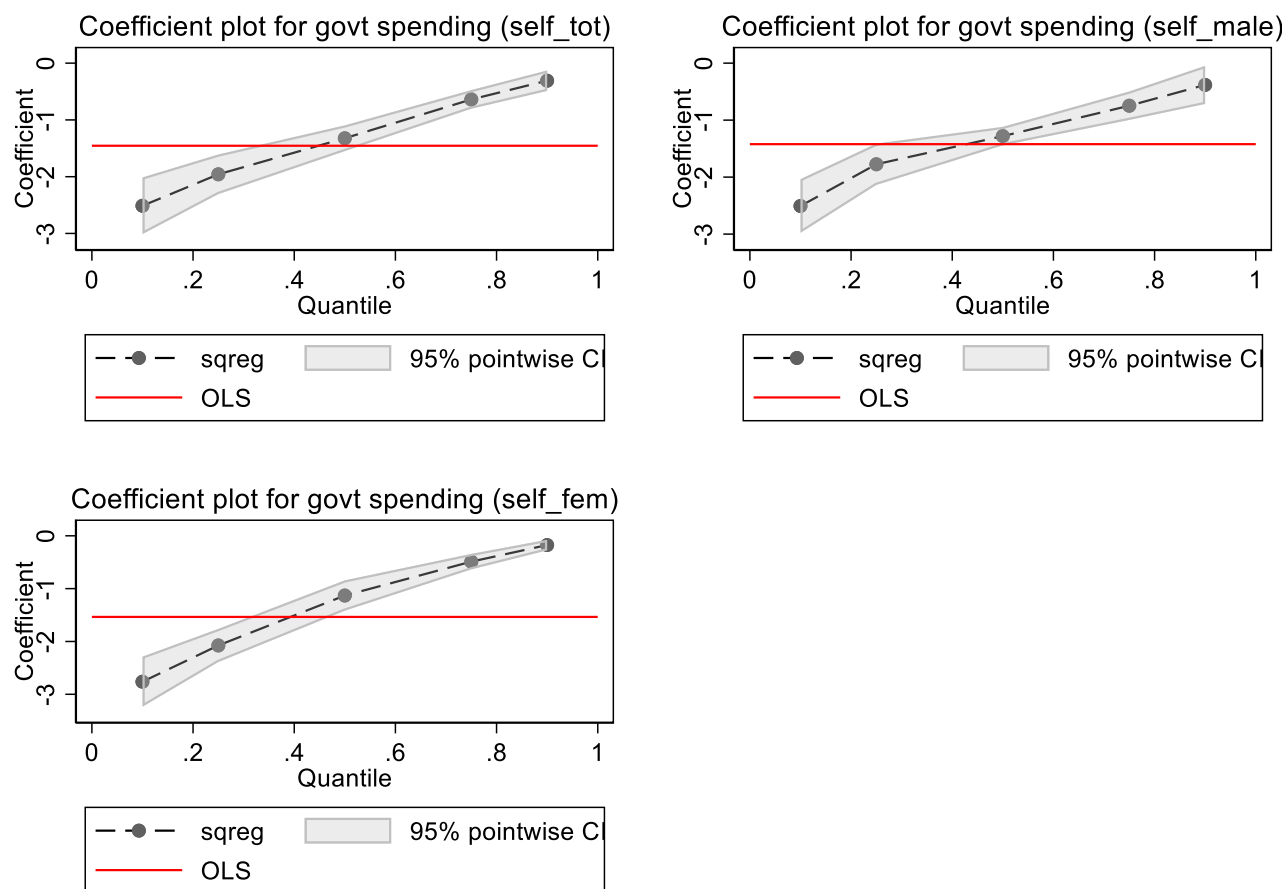
Table 9b: Estimation results government spending and self-employment using simultaneous quantile regression approach

	<i>Total self-employment</i>					<i>Male self-employment</i>					<i>Female self-employment</i>				
<i>Variable</i>	(1) q10	(2) q25	(3) q50	(4) q75	(5) q90	(6) q10	(7) q25	(8) q50	(9) q75	(10) q90	(11) q10	(12) q25	(13) q50	(14) q75	(15) q90
<i>s</i>															
<i>lag govt</i>	-2.88*** (0.34)	-1.77*** (0.22)	-1.38*** (0.13)	-0.73*** (0.11)	-0.32*** (0.12)	-2.92*** (0.32)	-1.90*** (0.25)	-1.34*** (0.10)	-0.86*** (0.17)	-0.42** (0.20)	-3.04*** (0.36)	-1.94*** (0.18)	-1.23*** (0.14)	-0.59*** (0.08)	-0.29*** (0.08)
<i>lag lngrowth</i>	-2.09*** (0.66)	-4.42*** (0.59)	-2.17*** (0.62)	-1.92*** (0.41)	-2.42*** (0.21)	-0.89 (0.64)	-4.07*** (0.56)	-1.80*** (0.46)	-1.90*** (0.48)	-2.76*** (0.30)	-3.96*** (0.78)	-5.24*** (0.67)	-2.67*** (0.49)	-1.63*** (0.28)	-1.98*** (0.20)
<i>lag fdi</i>	0.54* (0.30)	0.11 (0.24)	0.46** (0.19)	0.19** (0.07)	-0.06 (0.06)	0.59** (0.28)	0.10 (0.24)	0.30** (0.13)	0.07 (0.08)	-0.15*** (0.05)	0.39 (0.32)	0.18 (0.21)	0.49*** (0.17)	0.27*** (0.06)	0.09* (0.05)
<i>lag pop</i>	-0.45*** (0.06)	-0.68*** (0.04)	-0.68*** (0.05)	-0.43*** (0.05)	-0.27*** (0.05)	-0.40*** (0.05)	-0.64*** (0.05)	-0.75*** (0.03)	-0.62*** (0.05)	-0.35*** (0.08)	-0.45*** (0.06)	-0.66*** (0.04)	-0.49*** (0.06)	-0.24*** (0.04)	-0.13*** (0.02)
<i>lag infla</i>	0.01 (0.03)	0.01 (0.02)	0.01 (0.01)	-0.01 (0.01)	-0.01 (0.00)	0.01 (0.03)	0.01 (0.02)	0.01 (0.00)	-0.01 (0.00)	-0.01 (0.00)	0.01 (0.04)	0.01 (0.03)	0.01 (0.01)	0.01 (0.01)	0.01 (0.00)
<i>lag dem</i>	-0.40 (0.33)	-0.56* (0.31)	-0.02 (0.17)	-0.05 (0.11)	0.01 (0.09)	-0.28 (0.28)	-0.35 (0.30)	0.13 (0.18)	0.08 (0.13)	-0.12 (0.15)	-0.62* (0.38)	-0.68** (0.31)	-0.08 (0.14)	-0.23*** (0.07)	-0.01 (0.07)
<i>No of observations</i>	936	936	936	936	936	936	936	936	936	936	936	936	936	936	936

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Constant included but not reported. Government spending is measured as general government final consumption expenditure as the percentage of the gross domestic product. q10, q25, q50, q75 and q90 stand for quantiles 10, 25, 50, 75 and 90, respectively. Democracy index from Polity IV is included as an additional control variable. Democracy variable is read as follows: A score of -10 represents the least democratic country, a score of +10 represents a country with the highest level of democracy.

Source: Own estimates using data from sources listed in Table 1.

Figure 1: Quantile regression coefficient plots for government spending



Notes: In each of the above graphs, vertical axis shows the coefficient of the government spending, and the horizontal axis shows the quantiles of respective self-employment (i.e., total, male and female). The constant horizontal line is the OLS estimate. The dotted line (block colour) in the shaded region (confidence interval) are the quantile regression estimates.

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