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Research article

Inflation, unemployment and subjective wellbeing: nonlinear and asymmetric influences of economic growth

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Abstract: Plausible economic growth would undoubtedly offset the unemployment-output tradeoff to subjective wellbeing and relieving labor market discrepancies. This study expands on the tradeoff exploration considering the impact of unemployment-inflation on SWB and, output growth on unemployment using output gap as the tradeoff regulator and using a quadratic specification and the Nonlinear Autoregressive Distributed Lag, respectively. Authors explored this effects and specifically the nonlinear response of subjective wellbeing (SWB) to inflation, unemployment and output, and the asymmetric responses by unemployment to business cycle output for Kenya. The main results report that first, output per capita gap is important in regulating the inflation-unemployment tradeoff and negativities to SWB with costlier effects by unemployment than inflation. Secondly, unemployment trades off with long run shocks in cyclical output although they exhibit symmetric nature of Okun law. Thirdly, unemployment negatively relates to fiscal policy in the long run as the tradeoff is supported. Therefore, to alleviate SWB, feasible unemployment alleviation policies are required while to incarcerate the persisting unemployment and minimizing labor market discrepancies, feasible labor supply and fiscal side policies should be implemented since short run and including policy specific reforms. This, would therefore supplement the usually time-lagging effects by implemented structural reforms.

Keywords: tradeoff; subjective wellbeing; cyclical unemployment; asymmetries

JEL Codes: E32, C33, C22, D10

1. Introduction

Economic growth, sustainable inflation and low unemployment have been in literature linked to positively determine the prevailing levels of subjective wellbeing (SWB- henceforth) while plausible economic growth reduces cyclical unemployment. Plethora of studies, among them (Clark, 2003; Blanchflower et al., 2014; Lucas et al., 2004; Luhmann et al., 2012; Ouardighi and Munier, 2019; Helliwell and Huang, 2014) points out that unemployment and inflation negatively influences SWB, plausible growth reduces unemployment (Ouardighi and Munier, 2019; Hongo et al., 2019; Tang and Bethencourt, 2017; Anderson et al., 2014; Blanchflower et al., 2014; Welsch and Kühling, 2016) as a handful demonstrates the implausible economic growth and/or high inflation increases unemployment (Tang and Bethencourt, 2017; Lim et al., 2019). If unemployment is increased, it implies worsening SWB levels. Since SWB is a reflection of individual's identity of the general economic stance and individual owns life using the affective and cognitive demystifications sights, a point to note from the above studies is that unemployment implicates massive psychological and depressing defects than losing a job since the former is attached to both job loss and monetary agony. Unemployment lastingly destroys an individuals' wellbeing, incriminates depression with a lost touch over own life (Ouardighi and Munier, 2019) and renders a feeling of unhealthiness and unhappiness to the individual (Helliwell and Huang, 2014). This affects the satisfaction level of an individual/society and generally changing the stance of economic prosperity.

On the other hand, with GDP growth on SWB, has impact pegged on the theoretical facts of the Easterlin (1974) paradox: In the short run, the minority rich are the most happier but as richness spreads to the rest of the populace and to everyone over time, happiness is trivially determining income (Easterlin, 2013). Thus, there are happier people in the static than dynamic economy and with their happiness level gauged by social comparisons (plus income variation) not forgetting the adaptive capability of the individual. Regarding the social square, some studies report that income is only effectual to SWB for short run and is uncorrelated in the long run while its relative variability induces different income levels (Wolbring et al., 2011). Concerning GDP growth to an individual's income, there is reduced enjoyment and satisfaction in the current than previous income due to already built up higher expectations than could have been created because the individuals have adapted and superseded on the previous SWB levels. The new desires created by the adaptive income demonstrates the perilous policy making and managements processes. However, the advantageous implications to general welfare are that the populace who initially were in dire need of the upward shifting income currently boosts consumption of goods that later renders obsolete due to newly built consumption preference that only demands new goods and services. This, updates the aspiration-consumption circle in the goods market as GDP/capita influences SWB in the short run.

Talking of economic growth, its therefore important to put that, GDP does not only influence SWB via the paradox effect but also via its growth level (Clark, 2003; Ouardighi and Munier, 2019) i.e., the per capita growth level (Welsch and Kühling, 2011) or via the nonlinear growth of GDP (Welsch and Kühling, 2016). In this case, GDP/capita and/growth offsets the negativities by the unemployment/inflation influence on happiness/SWB. In this faith, the level of per capita growth is perceived in many studies to emanate a downward pressure on inflation via improving the productivity and other positive structures in offsetting its negativities thereby alleviating unemployment or downsizing the inflation-unemployment or unemployment-output trade-off.

However, in Kenya the GDP growth and development since independence depicts to many and over time increasing dynamics and inconsistencies which seems to resonate with the increasing high inflation, and surging and persistent unemployment rates. Economic growth and inflation have respectively averaged at 1.5%, and 10.2% and unemployment 9.3% between 1991–2018. This, of course, depicts to how thrilling unstable inflation and high unemployment are to growth.

Figure 1 demonstrates the dynamics in growth–inflation development pointing to many discrepancies. Generally, its implied, low inflation boosts GDP growth as in initial decade while increasing inflation down pressurize economic growth and this has persisted to high unemployment rates. The broken-shaded rectangle implying to tight monetary policies that maintained inflation below the 4% central bank's target, plausibly caused a 2.8% GDP growth which according to Government reports, implemented reforms lowly trended unemployment. Contrary, the post 1970s inflation has continually trended at/over 7.5% and high above GDP growth which has on average grown at 1.2%. Since the temporal period designates to the Great inflation (before 1984/5) and Great moderation coupled with financial crisis (the post 1990) periods, and in response, the many structural reforms (Subbo, 2007; Nyaranga et al., 2019; Ssali et al., 2019) had little to offer in trending inflation close to target but they consequentially critically declined the inflation-growth trade-off as depicted by the shades. Figure 2[1] also demonstrates unemployment-output trade-off. The shades reflect to tight fiscal policies which can be seen to slightly offset unemployment and for the other parts, higher unemployment due to weak labor markets, rapidly down pressed economic growth.

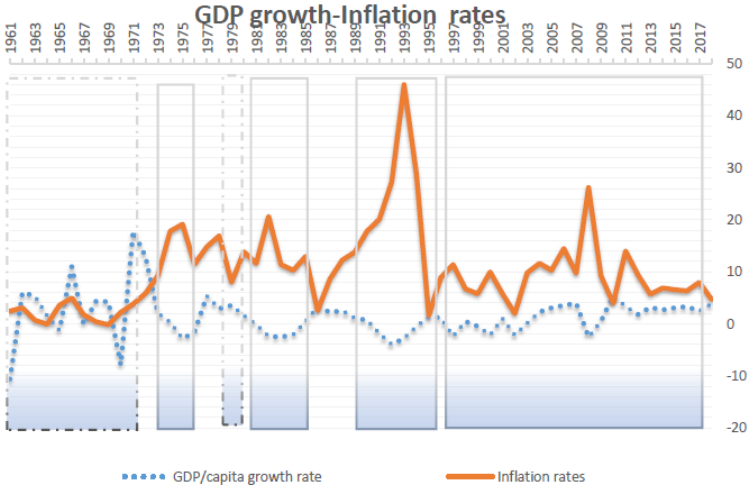

Figure 1. GDP-growth and Inflation rates. Reminder: The dotted/continuous line-shaded area designates the periods of tight/weak monetary policies. Further, the dotted shade reflects the below 5% inflation target by monetary authorities while the continuous line-shaded reflects the regions when observed inflation are greater than the upper 5% ± 2.5% bound by the monetary expectations.

[1] Since 1991, inflation has averaged 9.3% YOY and which is even higher than the 5% target and with expectation geared to close over 8% and also higher from the target bound. Unemployment has on the contrary averaged 10.8% since 1991 peaking 12.3% (2009) and downing 8.9% (2006). This shows to the greater risks attached with the two macroeconomic variables to growth.

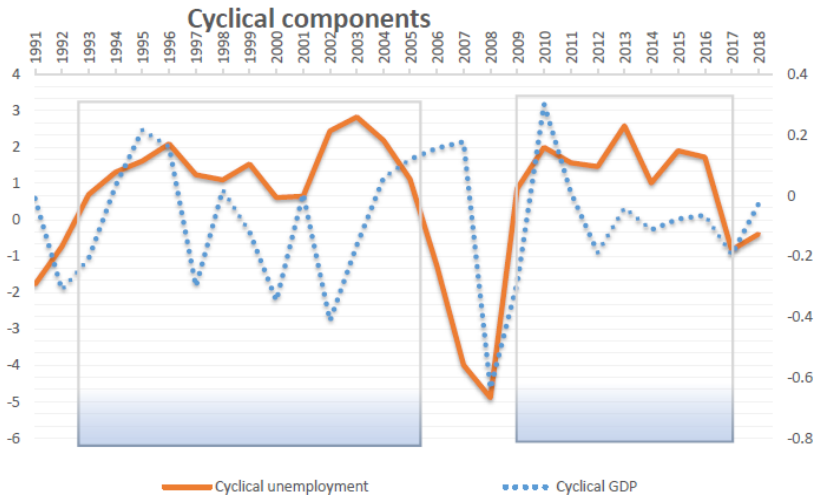

Figure 2. Cyclical GDP growth and Cyclical unemployment rates. Reminder: The continuous line-shaded area designates to the periods of tight fiscal policies and positive economic growth. The left scale reflects to cyclical GDP.

Similarly, Figure 1 demonstrates to relatively greater economic defects by recession than inflation supported by the persistence response of unemployment that after a long run recession, the defects still spills over into the booming period. This is despite the many structural policies by the government to date but still unemployment domineers output (Subbo, 2007; Hongo et al., 2019) and on average, the country has concurrently experienced both high inflation and unemployment rate partially explained by the behavior in profit maximization against increasing input and wage costs for firms and industries.

The behavior demonstrates that unemployment and inflation which detriments SWB are not fully structural problems and that there might be asymmetric behaviors in unemployment and inflation which distorts their risk targeting polices. Offsetting this would demand appropriate fiscal and labor market systems (Anderson et al., 2014; Fernández-Villaverde et al., 2014; Cosar and Yavuz, 2019) aside from the goods market reforms. Also, if unemployment nonlinearly responds to changes in the goods and fiscal market and, nonlinearly deters SWB, then, reforms instituted has to concur the nature/specificity of exhibited behavior. Suggestively, the trade-off link by unemployment-output might be nonlinear (Tang and Bethencourt, 2017; Shin et al., 2014; Cosar and Yavuz, 2019). Therefore, confounding impacts/relationships are inevitable in case there exist nonlinearities by the three macroeconomic variables: A wrong or insignificant at expense of significant impression could be created in the runs when the nonlinearities are ignored as model might be incorrectly identified (Villaverde and Maza, 2009). This, constructed the necessity for exploiting the in-born characteristic for appropriate decision implications.

Over the economic cycle, the unemployment-output tradeoff has extraordinarily been in previous studies implored grounded from Okun (1962) law which, in the goods-labor market, points out that GDP negatively correlates with unemployment. Studies have done the exercise pegged on a linear framework assuming that both SWB on the three macro-economic variables and unemployment on labor markets linearly responds. Perman and Tavera (2005) demystifies this and links the instabilities occurring in the trade-off to asymmetric responses by unemployment to labor market. This is supported by the many studies which narrows the unemployment output tradeoff (Tang and Bethencourt, 2017; Silvapulle et al., 2004; Beyaert and García-Solanes, 2014; Lim et al., 2019) and the nonlinear responses of SWB to macroeconomic variables (Ouardighi and Munier, 2019; Lucas et al., 2004).

Many regional studies have recently investigated such nonlinearities of SWB to either part/all of the three macroeconomic variables such as in the Euro area (Ouardighi and Munier, 2019; Blanchflower et al., 2014; Helliwell and Huang, 2014), U.S., (Helliwell and Huang, 2014) and OECD (Welsch and Kühling, 2016). Regarding the unemployment-growth tradeoff, we have studies like; Euro area (Tang and Bethencourt, 2017; Anderson et al., 2014; Saraceno, 2016), U.S., (Lim et al., 2019), Turkey (Cosar and Yavuz, 2019), South Africa (Marinkov and Geldenhuys, 2007). However, many of this studies have been regional based with others exploiting the nonlinearities on linear models and incorrectly capturing the specific responses as country specific SWB studies such as Kenya (Junior et al., 2016) and Sierra Leone (Levine, 2019) not capturing the nonlinearities and therefore captured partially the specific behaviors. In addition, nonlinear studies of unemployment and/or SWB in Kenya are yet scarce while none of the studies have explored the significant contributions of the level of GDP in regulating the effects of unemployment and inflation on SWB and also, the asymmetric response of unemployment on cyclical output and labor market. This is despite the increasing demand for the nonlinear knowledge in socio-economic policy planning.

This paper therefore addresses this gap by investigating two main objectives. First, it explores how SWB nonlinearly responds to unemployment and inflation tradeoff controlled by the growth in output gap, and second, the asymmetric response of unemployment on output while accounting its tradeoff to (thirdly) appropriately account their determining factors for appropriate labor reforms that would offset unemployment and hence its highly regarded detrimental effects to SWB. This is motivated by the increasing need for happiness knowledge in socio-economic development and asymmetric information of the Kenya's labor market.

This paper adds to literature in a number of ways; on theoretical contribution, the study improves on the tradeoff analysis using output gap to control their weakening effects on SWB and worsening unemployment levels while reporting consistent results. It also innovatively contributes to methodology by employing various techniques to exploit the different variations such as (non)linear specifications in SWB analysis, the asymmetric behaviors in business cycle components regression and the robust least squares in modelling the labor market determinants. The aim is to appropriately inform robustness and consistency by the dynamics of growth gap in stabilizing the tradeoff negativities to both SWB and unemployment. Still, the exploration of the dynamic multiplier to trace the asymmetric changes by unemployment from previous unsteady disequilibrium to newly established long run equilibrium and stabilizing with shocks in the goods/labor market supports novelty on extant literature and to the ways the error correcting term could be investigated.

The research design embraced goes; the paper first demonstrates the linear responses of SWB to unemployment, output growth and inflation then explores the nonlinearities of GDP/capita growth gap in interactively altering the response by the three macroeconomic variables to offset/alleviate SWB-importantly to trace the stability of the economy to sustain wellbeing. Second, authors expedite the asymmetric response of cyclical unemployment to business cycle changes in GDP growth to determine how unemployment responds to the positive/negative shocks in economic growth for specific structural reforms to the seemingly persistent unemployment. Third, the study innovatively explores a quadratic structural model of SWB while invoking the impact and tradeoff by unemployment, output and inflation on SWB. For unemployment asymmetries, authors incarcerate the NARDL to investigate how unemployment positively/negatively changes from its long run equilibrium then, using the cumulative long run aggregate shocks in finding the determining factors

of labor market. Also, authors incorporate the dynamic multiplier to observe the dynamic behavior by unemployment in a backdrop characterized by economic shocks and previous instabilities.

The main results report that first, output per capita gap is important in regulating the inflation-unemployment tradeoff and negativities to SWB with costlier effects by unemployment than inflation. Secondly, unemployment trades off with long run shocks in cyclical output although they exhibit symmetric nature of Okun law. Thirdly, unemployment negatively relates to fiscal policy in the long run as the tradeoff is supported and, therefore the need for such policy to be feasibly used in effectual policy adjustments.

The rest of the paper is partitioned as follows: Next section briefly describes the recent literature on SWB-the three macroeconomic variables and, unemployment asymmetries, section 3 presents the data and methodology, 4 results, analysis and discussion. Section 5 concludes and provide some policy guidelines based on these results.

2. Literature review

Initial works on SWB dates to Easterlin (1974) using correlational exploration which has in literature formed the basis for successive studies on happiness where, together with Easterlin (2013), they reported that income influences happiness in the short run when few people are rich but as everyone become rich in the end, happiness and income are uncorrelated however with an implied significance of continuously renewed activities in the goods market due to changing adaptive expectations. Successive studies have reported mixed findings on SWB and concentrated on either the macroeconomic aspect or social determinants of SWB.

Regarding the macroeconomic side, Di Tella, MacCulloch, and Oswald (2001) with survey data reported that unemployment greatly demeans SWB but with almost double weight than inflation and this is supported by Blanchflower et al. (2014). This is also supported with Di et al. (2003) study's whom, upon developing on this work and incorporating both growth and its level, they in addition reported the growth level to control the rate by which unemployment/inflation affect SWB. In the same line, Welsch and Kühling (2016) reported on one hand that inflation and unemployment reduces SWB unlike economic growth but when SWB depth indicator is used (i.e., the national macroeconomic performance indicator), they find a significance linkage between the indicator and institutional change via improved trade openness, corruption control and democratic institution. In Kenya, a positive relationship is reported by Junior et al. (2016) amid income (via unconditional cash transfer) and SWB.

The Other strand of studies concerned the social norm impact where the unemployed is less disturbed in an environment with more unemployed individuals. Among such and consistent with the hypothesis includes; Clark (2003) on a rich British dataset with findings that collective unemployment implies greater negative influence on the employed than the unemployed. In support of this, Clark et al., (2010) does not only suggest consistent empirical findings with a panel of German socio-economic data but also reports consistent findings suggesting that the best analysis could be presented if contrast made regards the low-versus high-labor market. Chadi (2014) with similar data set interactively correlates individuals and cumulative unemployment to SWB and concludes that higher stress is tied to the employed operating in a backdrop of unemployed. Still in this line, Helliwell and Huang (2014) on a U.S survey dataset finds unemployment to impose greater nonpecuniary impact on the unemployed than on both the lower income group and the remaining populace.

Regarding the unemployment-output asymmetries, many studies have pegged their analysis on the conventional Okun law (Anderson et al., 2014; Shin et al., 2014; Beyaert and Garc á-Solanes, 2014; Fern ández-Villaverde et al., 2014; Lim et al., 2019; Ouardighi and Munier, 2019; Cosar and Yavuz, 2019). Although they have mostly reported significant asymmetric response of unemployment to recession/boom and or to labor market they have mostly based on regional analysis despite the rising needs for asymmetric information for country specific labor and goods market policy formulation.

In summary, most of the studies have underscored the unemployment effect on SWB or asymmetric response by unemployment to output but failed to succinctly incorporate the interactive impact by output level important in controlling the unemployment-inflation negativities. Also they have mostly anchored on regional studies whose findings may not sufficiently be applied on country specific situations without generalization. Similar observation is tied to those concerned with unemployment factor. However, in Kenya, studies on SWB are yet scarce while none has expedited the nonlinear relationship or response of SWB and unemployment to macroeconomic variables. This paper fills the gap and analyses how SWB nonlinearly responds to unemployment-inflation tradeoff and unemployment to GDP growth under a regulated response.

3. Data and methodology

3.1. Data

A number of studies reports SWB may be regarded as either ordinal in which greater weight reflects to higher life satisfaction or cardinal with little effect on the final outcome since various measures of LS auto correlates and/or relates to way an individual externally perceives LS (Diener et al., 1993). Some opine the determinants of SWB slightly vary and are dependent on the events in life so that SWB is ended up as latent variable demonstrating to happiness (Frey and Stutzer, 2002).

SWB is how an individual uses the affective and cognitive demystifications to insight owns life and is therefore a function of both life satisfaction and affect part of the individual. However, literature does not suggest a consensual provision on the specific proxies of SWB. Hence, due to lack of SWB and/or LS data, we adopted Frey and Stutzer (2002) proposition and the argument that SWB is interconnected and sensitive to life happenings, and developed a latent depth indicator of SWB using known indicators to SWB pegged in literature and appraising the society's role in consequential policy formulation. The LS part is proxied by Economic Freedom Index (EFI henceforth) and employment volatility while the unstable happiness index and suicidal rates demonstrates the emotional (affective) part[2]. EFI supports

[2] Suicide rate is from Business Daily at https://www.businessdailyafrica.com/datahub/Kenya published on 20182406 and accessed on 20141309, EFI from https://www.heritage.org/, happiness index from Kenya World Happiness Index and Employment from World bank database at https://countryeconomy.com/demography/world-happiness-index/kenya. BD relates the increasing suicidal rates to depression amongst other risk related factors and using this rates, the country is ranked 114/175 best in suicidal rates by a World Population report 2019. EFI is averagely representing the four broad categories of an economy; government size, open markets, rule of law and regulatory efficiency. Employment volatility is the persistence of unpleasant employment conditions such as continually low wage rates like job insecurity that despite being employed, a worker still operates below the poverty line due to the many risks involved and this changes the degree of happiness. Premeditated employment termination by the employer has disparaging effects on the employee with many psychological distress. The volatile part of employment from the Baxter-King filter is adopted to designate employment volatility.

propensity of the system in providing basic to luxury goods and service to the people and, together with employment related uncertainties, the populace gains access to (in)secure employment or stay out of stable job participation while changing happiness. The resulting depressing effects psychologically distorts the individual to loosing esteem over own life as suicide remains the food for thought. Table 1 demonstrates the SWB-latent variable extraction using the principle component analysis (PCA) and as indicated in footnotes of the table, underlying variables show significant correlation. Also, the rejection of the null by the KMO test statistics in measuring the adequacy of factor analysis demonstrates that the statistic (0.87) is commendable and adequate to apply the PCA component in aggregation of SWB. Further, the table implies, the four SWB determinants effectively aggregates into one component supported by the highest explanatory power of the 1st component and supported by the scree plot. Proceeding table will describe its statistic to demystify the stance of the macroeconomic variables with respect to SWB and unemployment. The GDP/capita is the Purchasing Power Parity in 2011 constant U.S dollar and the GDP growth rate, unemployment and inflation are extracted from the world bank website over the period 1991–2018 and determined by the longest period by unemployment. However, potential GDP is extracted by the following process keeping in mind of multicollinearity among various GDP calibrations.

If y_t is the GDP growth, y_t^{pot} the potential (long run GDP average), un_t^{gap} the labor market slack and e_t an iid component, we extract potential GDP (presented in Table 2) using Okun law designated as;

$$y_t = y_t^{pot} + un_t^{gap} + e_t \tag{1}$$

where $y_t^{pot} = [e^n / e^a]y^a$ with e as employment and, superscripts n and a the natural and actual respectively.

Table 1. SWB- PCA analysis.

		Eigen Value		
component	total	% variance	Proxies	Coefficient
1	1.936	48.39	Suicidal rate	−0.449
2	1.264	31.60	Economic freedom	0.372
3	0.87	14.68	Employment uncertainties	−0.132
4	0.213	5.32	Happiness	0.398
Diagnostic				
KMO test statistic	0.872**			

Reminder: The correlation matrix demonstrates significant positive and negative correlations between the variables. The scree plot also points to 1st component combination to account for the highest variation. The KMO is the Kaiser-Meyer-Olkin test. Both the matrix and scree plot are not provided due to space limit however available upon request.

3.2. Methodology

Authors describe the specifications used to determine largely the influence of unemployment on SWB and later, how economic growth influences unemployment taking into account nonlinearities.

Section initiates by SWB specification to explore the impact of unemployment, economic growth and inflation on subjective wellbeing described as;

$$SWB_t = c + X_z^{'}\beta_{zt} + e_t \tag{2}$$

where X is a vector of z exogenous variables. $e_t = e_{t-1} + u_t$ where u_t is an iid. $\beta_t = \bar{\beta} + \mu_t$ with $\bar{\beta}$ the long run average and μ_t an iid innovation capturing the exogenous shocks in X. Specification Equation (2) is an extension of Ouardighi and Munier (2019) model from panel to country specific. Equation (2) is then used to explore the comparative importance of economic growth (y_t), unemployment(un_t) and inflation(π_t) on SWB.

Importantly to note, β_t depends on the level of economic growth in which, following literature, growth in GDP and/or per capita interactively offsets the negativities of inflation, output gap and unemployment on SWB or heightens the positive effects of income to happiness. This prompts delving its marginal effects as;

$$\beta_{zt} = \sum_{r=0}^{l} \vartheta_{zn} y_{gap}^{n} \tag{3}$$

where $y_{gap} = y_t - y_t^{pot}$ and n the level of the gap in the polynomial of order l. If $l = 0$, $\beta_{zt} = \vartheta_{0z}$ implying it's the direct influence of the exogenous X_z captured on SWB. In this line, the impact should be positive for per capita y_t and negative for un_t and π_t. Table 3 demonstrates these results.

The SWB nonlinearities are captured if $l \geq 1$, and therefore for $\vartheta_{1z} > 0$, implies that the negative influences of inflation and unemployment are offset by the growth in GDP gap. Regarding GDP/capita growth, $\vartheta_{1z} > 0$ implies growth to offset the gap and gap heightened if $\vartheta_{1z} < 0$. Heightening the gap means worsening SWB levels and vice versa.

Regarding marginal effects, they are zero if $\beta_{zt} = 0$ with GDP growth gap of $-\vartheta_{0z} / \vartheta_{1z}$. Threshold growth is attained using the quadratic polynomial i.e., $l = 2$ and thus the minimum/maximum growth gap is $-\vartheta_{1z} / 2\vartheta_{2z}$. The marginal effects rising to threshold are minimum for a $-\vartheta_{1z}$ and $+\vartheta_{2z}$ opening upward and, maximum threshold if $+\vartheta_{1z}$ and $-\vartheta_{2z}$ meaning it opens downward. These knowledge of nonlinearities is important in pointing out the importance of the scales of economic growth in offsetting/ boosting the effects by the three macroeconomic variables. We consider up to the quadratic polynomial of SWB due to inability to approximate higher order. This results are estimated by the weighted LS and confirmed by the robust LS as in Tables 3&4.

However, estimation Equation (2) & (3) are done paying attention to the nonlinear responses with greatest devotion to way unemployment damages SWB and its combative cost in comparison to inflation. Alarm created suggest to queer behavior in unemployment. A glimpse of the temporal behavior and descriptive table also suggests to unemployment as seemingly diverging with suspicions of asymmetries. Such persistent behaviors have also been linked to asymmetric response of unemployment to macroeconomic variables (Silvapulle et al., 2004; Levine, 2019; Shin et al., 2014). Also, the nonconforming estimates/effects by GDP gap, the unprecedented response in unemployment and some missing thresholds as in by specification Equation (3) apparently suspects to asymmetries.

In this regard, authors considered their asymmetric behaviors specifically, the asymmetric response of unemployment to GDP growth to determine how unemployment responds to the positive/negative changes in cyclical growth. This is based on the classical Okun law using cyclical

components; unemployment (un_t) and real GDP (y_t). We demonstrate the tradeoff and long run relationship for Equation 3 and Equation 4 denoted using the static models;

$$\Delta un_t = \beta \Delta y_t + e_t \tag{4}$$

And,

$$un_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 t + e_t \tag{5}$$

where β is the Okun coefficient expected to be negative and significant for tradeoff, β_0 constant , t trend and, β_1 and β_2 the long run coefficients. Equation (5) is modified and expressed in a standard cointegrating framework to measure the long run linkage amid the cyclical components and, is cointegrated if e_t is level stationary and the two components first difference stationary. Equation (5) is an extension of Tang and Bethencourt (2017) however slightly differs when we implore on country specific and implicating inflation as the control variable.

Thus, using linear ARDL, we estimated results of Equation (4) and Equation (5) and presented in L.H.S of Table 4. However, the static nature of 3&4 is mostly non-robust in estimating β as both sufficiency and consistency is hard to achieve if the cyclical components asymmetrically responds (Anderson et al., 2014). This is the case as demonstrated in previous sections and therefore we adopt the Shin et al. (2014) model to take care of such shortcomings and demonstrate the NARDL procedure that robustly explores the asymmetries. In the long run, Equation (5) modifies into the linear asymmetric model as;

$$un_t = \beta_0 + \beta_1^+ y_t^+ + \beta_2^- y_t^- + e_t \tag{6}$$

y_t is decomposed into $m \times 1$ vector of regressors reflecting $y_t = c + y_t^+ + y_t^-$. y_t^+ and y_t^- as the positive/negative partial sum process in y_t are disintegrated by the processes;

$$y_t^+ = \sum_{i=1}^{t} \Delta y_k^+ = \sum_{i=1}^{t} max(\Delta y_i, 0) \text{ and } y_t^- = \sum_{i=1}^{t} \Delta y_k^- = \sum_{i=1}^{t} \min(\Delta y_i, 0) \tag{7}$$

And, asymmetric long run coefficient are designated by β_1^+ and β_2^- . The linear stationary combination(z_t) of long run partial sum of processes is;

$$z_t = c + \phi_1^+ un_t^+ + \phi_2^- un_t^- + \beta_1^+ y_t^+ + \beta_2^- y_t^- + e_t \tag{8}$$

Equation (8) is stationary for a z_t =I(0) and with linear symmetric cointegration achieved when the null hypothesis $\phi_1^+ = \phi_2^- = \beta_1^+ = \beta_2^-$ are rejected. Equation (6) and Equation (8) are then estimated using the classical Least Squares regression that however results to plethora of short comings in the estimates. For instance, the inability to address endogeneity and autocorrelation which have no space in cointegration analysis and hence, difficulty to sufficiently remove them.

The dynamic nonlinear frameworks are therefore appropriate and rewrites Equation (6) and Equation (8) into $ARDL_{(pq)}$ as, respectively;

$$un_t = \sum_{i=1}^{p} \lambda un_{t-i} + \sum_{i=0}^{q} (\beta^+ y_{t-i}^+ + \beta^- y_{t-i}^-) + e_t \tag{9}$$

And,

$$\Delta un_t = \rho un_{t-i} + \varphi^+ y_{t-i}^+ + \varphi^- y_{t-i}^- + \sum_{i=1}^{p} \delta_i \Delta un_{t-i} + \sum_{i=0}^{q} (\Delta \eta_i^+ y_{t-i}^+ + \Delta \eta_i^- y_{t-i}^-) + e_t \tag{10}$$

Equation (9) is the asymmetric AR-dynamic framework with λ the AR parameter and, β^+ and β^- the distributive lags. Equation (10) is the long run cointegration form of Equation (9) and is the nonlinear ARDL. However, $\rho, \varphi^+, \varphi^-$ are the long run parameters, $\delta_i, \eta_i^+ \eta_i^-$ the short run dynamics. The long run asymmetric coefficients are given by $\beta_1^+ = -\varphi^+ / \rho$ and $\beta_2^- = -\varphi^- / \rho$. Specification Equation (10) is cointegrated for a rejected F-Wald's statistic of the null hypothesis $\rho = \varphi^+ = \varphi^- = 0$. Bound testing is done by comparing this statistic on the respective Pesaran et al. (2001) table. The symmetries in the short- and long- run are investigated based on the null: $\eta_i^- = \eta_i^+ = 0$ and $\varphi^+ = \varphi^- = 0$ respectively and is present for rejected nulls. Finally, we regressed Equation (9) and presented this results in Table 4.

In the results section as will be seen shortly, there exist significant asymmetric long run relationship hence the motive to investigate how cyclical unemployment changes from a backdrop of short run and previous disequilibrium to newly found balance and response of long run unemployment to business cycle. This is done by observing the effects of y_t^- and y_t^+ subjected to 1% standard shock on un_t. This is the dynamic multipliers generated from Equation (10) using the processes;

$$mh^+ = \sum_{i=0}^{h} \frac{\partial un_{t+i}}{\partial y_i^+} = \sum_{i=0}^{h} \lambda_i^+ \text{ and } mh^- = \sum_{i=0}^{h} \frac{\partial un_{t+i}}{\partial y_t^-} = \sum_{i=0}^{h} \lambda_i^- \quad \text{h=0,1,2,…,t} \tag{11}$$

whereas $m \to \infty$ $mh^+(mh^-) \to \beta^+(\beta^-)$ while mh^+ is the long run asymmetric coefficients.

Literature offers the need for appropriate structural reforms in labor market with greatest attention on aggregate supply and bettering the fiscal systems (Anderson et al., 2014; Tang and Bethencourt, 2017). Proceeding, we use the aggregate long run unemployment asymmetries(L_i^{asy}) to find out how its influenced by labor(l), goods(g) and fiscal(f) markets. L_i^{asy} is arrived at by;

$$L_i^{asy} = \hat{\beta}_t^+ - \hat{\beta}_t^- \text{ and } L_i^{asy} = f(l, g, f) \tag{12}$$

The function incorporates some of the aggregate supply variables widely used in literature like; minimum wage rate, tax burden/rate, imports and exports.

4. Results and analysis

Section initiates from the descriptive statistics of variables presented in Table 2. In the first column, SWB has a mean value of 0.54 and is even far less than half of that by unemployment and inflation. Unemployment mean is on the contrary overweighting that of inflation. We read, although the unemployment-inflation cumulative effect is greater to SWB, that by unemployment is costly to mitigate on both SWB and economic growth. The lower GDP growth mean than potential GDP is indicative of an economic growth growing below its average at deficit of 0.44%. The per capita growth is also lowly growing than long run economic growth. Unemployment is still harmful to economic growth with close to double rate by GDP. Its unfortunate SWB is growing far lower than economic growth and implying that happiness is 0.82 times deficiently growing to economic growth. Other statistics indicates that although the rest of the variables are normally distributed, inflation is abnormal and volatile while unemployment is persistent. We demystify this in analyzing their nonlinearity responses. Therefore, the proceeding section initiates from the analysis of SWB.

Table 2. Descriptive statistics.

	SWB	Unemployment	Inflation	GDP growth	GDP/capita growth	Potential GDP
Mean	0.538	9.693	8.703	4.300	4.166	4.751
Median	0.507	9.753	8.434	4.712	3.982	4.554
Std. Dev.	0.967	0.304	4.984	2.229	0.538	1.362
Skewness	0.079	−0.958	1.730	−0.465	0.867	−0.057
Kurtosis	3.187	3.353	7.521	2.390	2.463	1.452
Jarque-Bera	0.060	3.800	32.41***	1.236	3.300	2.408
Observations	24	24	24	24	24	24

Note: *** designates 1% significance and SWB the subjective wellbeing.

4.1. Subjective wellbeing analysis

Presented in this section are the results due to specification Equation (2) and (3). Specifically, Table 3 presents results of Equation (3) on assumption that SWB linearly responds to GDP growth, unemployment and inflation on weighted LS (in 1st column) and robust LS (in 2nd column) frameworks importantly to guide in determining the direction of impact and identifying the findings with related literature. Impacts reflected is that all are significant and negative except for GDP growth which is positively impacting SWB and inflation in 4th column. This imply both inflation, unemployment and GDP/capita growth reduces SWB. Impact is consistent even in specifications where GDP growth is incarcerated/dropped from the specification and, an indication of the significance of the regulatory influence by per capita GDP growth. In contrast, unemployment has greater weights to extent greater than 1 and inflation lesser weight close to but greater than zero and, a suggestion of the costlier influence by unemployment than inflation. On average, inflation and unemployment have reducing coefficients of −0.027 and −1.127 to SWB respectively. GDP growth is alleviating than GDP/capita and on average with a 0.101 coefficient.

These findings are similar with recent studies. Ouardighi and Munier (2019) and Blanchflower et al. (2014) for Eurozone supports unemployment as costlier than inflation while we differ that, our case,

GDP/capita still diminishes SWB than theirs with increasing impact but supported by Welsch and Kühling (2016). In contrast, Di Tella et al. (2001) in EU reported greater weights for both unemployment and inflation. The positive effects by GDP growth are supported by (Levine, 2019; Ouardighi and Munier, 2019; Welsch and Kühling, 2011, 2016). Results also supports Junior et al. (2016) in Kenya and Levine (2019) in Sierra Leone with the report that income boost SWB. The most plausible tradeoff is by specification Equation (5) suggesting an unemployment-GDP growth of 6.1%(−1.111/.183) that downsizing unemployment by 1% is equally significant as growing GDP by 6.1%. This is equally 4 times greater than by Ouardighi and Munier (2019) in Europe and Welsch and Kühling (2016) in OECD. With inflation-unemployment, no significant tradeoff is identified. Findings also concur the claims in Table 2 where aggregate effects by unemployment and inflation supersede the ability by which economic growth can better SWB and also, unemployment is superficially harmful to SWB. The diagnostic test does not purport any inconsistencies and insufficiencies. However, the linear responsive assumptions are contravened by the significant F_{WALD} statistic that rejects the null hypothesis $\vartheta_{zn} = \vartheta_{0z} = \vartheta$.

Table 3. Linear responses in SWB.

D.V: SWB	WLS		RLS	
	(1)	(2)	(3)	(4)
Constant	0.818***	0.843***	0.832***	0.884***
	[0.007]	[0.034]	[0.125]	[0.061]
Inflation	−0.023***	−0.024***	−0.034*	0.009
	[0.001]	[0.002]	[0.019]	[0.009]
Unemployment	−1.149***	−1.224***	−1.385**	−1.111***
	[0.069]	[0.152]	[0.578]	[0.273]
GDP/capita growth	−4.253***	−4.302***	−3.019**	−7.027***
	[0.170]	[0.189]	[1.173]	[0.639]
GDP growth		0.019**		0.183***
		[0.024]		[0.025]
F_{WALD} statistic	(7.634e^3)***	(6.986e^3)***	8.854***	(1.21e^2)***
R^2	0.986	0.986	0.194	0.367
P(F-stats)	0.004	0.000	0.031	0.000
$\chi^{s/correlation}$	5.953(0.114)	12.98(0.000)	0.279^Q(0.597)	0.947^Q(0.333)
$\chi^{normality}$	1.706 (0.426)	0.796(0.671)	0.084(0.958)	0.651(0.722)
χ^{arch}	0.005(0.946)	0.001(0.981)	--	--
χ^{RESET}	0.564(0.452)	1.598(0.206)	--	--

Note: ***, **, * designates the 1,5 and 10% significance respectively. Round (square) brackets represents the standard errors(p-values). Superscript Q is the Q-statistics of the squared residuals in the correlogram plot at lag 1 and not forgetting that, since lag 1, they all have insignificant statistics at 10% C.V. WLS and RLS designates to weighted- and robust least squares respectively. The WLS is weighted by the standard deviation of residuals and using HAC covariance and, RLS chosen based on the S-estimation. The F_{WALD} statistic designates the null that for all n: $\vartheta_{zn} = \vartheta_{0z} = \vartheta$ that SWB linearly responds to levels of GDP gap.

Thus, Table 4 presents significant results accounting that SWB nonlinearly responds to inflation, unemployment and economic growth, and implying how the GDP via the interactive gap and hence the marginal effects determines the scale of impact with which the three variables influence SWB. This is supported by the rejected F_{WALD} statistics at 1% significance. Therefore, models (1)–(4) stands significant impacts to SWB. Columns 1&3 (2&4) represents to specifications by weighted (robust) least squares, respectively. Column 1&2 denotes to linear responses of the gap while 3&4

denotes the quadratic responses. First, the impacts by inflation, unemployment and GDP/capita to SWB seconds that from Table 3 as linear GDP gap specification depicts to some confounding estimates. In column 3&4, addition of the quadratic terms of gap renders the coefficients in 3rd specifications insignificant compared to 4. Therefore, the rest of analysis base on column 4.

Regarding the interactive backdrop, the linear effects demonstrate that GDP gap regulates the influence of inflation and unemployment on SWB. First, the gap heightens(offsets) the negativities of inflation(unemployment) to SWB. That by GDP/capita are also heightened resulting to per capita in negatively impacting SWB. The linear marginal effects by inflation $\hat{\beta}_{z\pi}$ is $\hat{\beta}_{z\pi} = -0.028 - 0.037 y_{gap}$ with marginal linear impacts of 0.76% (−.028/−.037) required to offset to nil the impact of inflation on SWB. The linear marginal effects by unemployment demonstrates it linearly grows to the GDP gap with $\hat{\beta}_{zUne} = -1.034 + 0.130 y_{gap}$ implying, to offset completely the negativities of unemployment on SWB, 7.95% GDP growth is required. This coefficient (7.95%) is twice as larger than 3.1% by Ouardighi and Munier (2019) in Europe and suggesting that a larger economic growth is needed to suffice the large aggregate demand from inputs. This demonstrates how wide the gap and costlier it encompasses to offset the unemployment. The marginal quadratic effects are implausible in threshold calculations (i.e., wrongly signed) hence we do not delve the side. However, their significant impacts demonstrate how the gap level changes the impacts to well-being: The coefficient of inflation and unemployment in the quadratic than linear parts have reduced in size.

Comparing these results, Table 2 depicts an effective GDP growth of 0.451(4.751–4.166) and implying, a 7.5% (7.95–0.451) GDP growth should be implored to completely offset the negativities by unemployment which are consequentially larger than combating the effects of inflation. These combative efforts by economic growth are perhaps twice as great than for developed countries. Like, Ouardighi and Munier (2019) reports a 2.5% growth rate is wanted to offset unemployment for Eurozone.

To implore the trade-off, authors implicated the impacts of marginal effects to insight how the gap has altered the relation. Columns (1–3) do not suggest to any trade-off even with/out inclusion of control variable- the per capita growth and therefore base our argument on column 4. The inflation-unemployment tradeoff is −0.285(−.037/.13) that reducing unemployment by 1% implores similar effects as increasing inflation by 0.3% in order to nil the cumulated unemployment-inflation effects on SWB. With GDP/capita, it's −0.751(.13/−.173) for unemployment-per capita GDP implying, increase unemployment by 0.8% or reduce growth by 1% to zero the unemployment-growth effects on SWB. Clearly, the unemployment-inflation effects have greater weight than unemployment-growth. Similarly, the weight in increasing unemployment has costlier implicative socio-economic effects than reducing growth. This supports how harmful and costlier unemployment is to SWB. The less than 1% weights by unemployment and inflation fortunately evident the ability by GDP gap to offset their negative effects thereby alleviating SWB. This is in line with many previous findings supporting the greater thrilling effects that despite unemployment, GDP/capita growth and inflation reducing SWB, that by unemployment supersedes that by inflation and by inflation exceed that by growth (Blanchflower et al., 2014; Welsch and Kühling, 2016; Di Tella et al., 2001).

Table 4. Nonlinear responses of SWB.

D.V: SWB	(1) WLS	(2) RLS	(3) WLS	(4) RLS
Constant	1.915***	1.056***	2.299**	1.143***
	[0.118]	[0.043]	[0.269]	[0.055]
Inflation	–0.267***	–0.010*	–0.194**	–0.028***
	[0.035]	[0.005]	[0.038]	[0.006]
Unemployment	–4.161**	–0.320**	–5.491**	–1.034***
	[1.256]	[0.137]	[1.100]	[0.171]
GDP/capita growth	–6.870***	–7.544***	–7.346**	–7.359***
	(0.211]	[0.414]	[1.215]	[0.501]
Inflation*GDP growth gap	0.106**	0.002	–0.061	–0.037***
	[0.021]	[0.003]	[0.050]	[0.005]
Unemployment*GDP	–0.265**	0.032**	–0.229	0.130***
growth gap	[0.079]	[0.016]	[0.317]	[0.029]
GDP/capita growth*GDP	0.425*	–0.027	0.649	–0.173**
growth gap	[0.186]	[0.038]	[0.678]	[0.065]
Inflation*GDP growth gap^2			–0.004	–0.005***
			[0.015]	[0.001]
Unemployment*GDP			0.014	0.073***
growth gap^2			[0.174]	[0.016]
GDP/capita growth*GDP			–0.094	–0.171***
growth gap^2			[0.426]	[0.040]
F_{WALD} statistic	(4.138e^3)***	(4.56e^3) ***	(1.76e^2) ***	(3.09e^2) ***
P(F-stats)	0.001	0.000	0.065	0.000
R^2	0.941	0.310	0.951	0.339
$\chi^{s/correlation}$	10.42(.005)	0.957^Q(.328)	7.23(.613)	0.505^Q(.477)
$\chi^{normality}$	1.569 (.456)	1.86(.394)	1.626(.443)	--
χ^{arch}	0.062(.802)	--	0.069(.719)	0.712(.700)

Note: ***, **, * designates the 1,5 and 10% significance respectively. Round (square) brackets represents the standard errors(p-values). Superscript Q is the statistics of squared residual in the correlogram at lag 1; although since lag 1, they all bear insignificant statistics at 10% C.V. Specification 1 and 3 are weighted using inverse of standard deviation and HAC covariance while 3 and 4 by M-robust estimation. The F_{WALD} statistic designates the null that for all $n: \vartheta_{zn} = \vartheta_{1z} = \vartheta_{2z}$ implying SWB linearly responds to levels of GDP gap.

The diagnostic tests in rear part of the table do not suggest to miss-specified and inconsistent model. The residuals are all significant with respect to calibrations of a classical least square (LS) model. However, the weighty contribution of unemployment to SWB and its general behavior, plus the F_{WALD} statistic confirms the asymmetries. Therefore, exploiting its response to the positive and negative changes in the business cycle, Table 5 demonstrates this results with both dynamic symmetric and asymmetric coefficients in L.H.S and R.H.S, respectively. The former draws reference point of the impact and in existing literature and the latter, the nature of Okun law, and determinants of cyclical unemployment in labor market.

4.2. Unemployment analysis

In this section, results due to specifications (9&10) and thereabout are presented- that is both a\symmetric specifications and the dynamic multiplier effects. Therefore, the ARDL (L.H.S) results depicts to significant Ect(-1) term demonstrating the cyclical components and inflation entrenched in the exercise are stationary and exhibits long run relationship. Further, in the short run, observed economic growth decreases unemployment but its increased as from 1st lag onward. The most stressed dynamic influence is the positive and this dismisses the tradeoff and contrasting Hongo et al. (2019) that short term growth in GDP reduces unemployment in Kenya. In the end, unemployment is decreased by economic growth suggesting to significance of Okun law and supporting Tang and Bethencourt (2017) for among them, Ireland, Greece and Malta while the positive impact by inflation to unemployment is insignificant. Disregarding significance, it means, increasing inflation to sustainable levels boost growth via increased economic activities.

The significance of the diagnostic tests does not also demonstrate to any weakness in the model. However, the significant F_{LRS} statistics rejects the assumption modelling these results that the unemployment-output is symmetric. The absence of tradeoff by inflation, its insignificance and its missing dynamics also suggest to wrong coefficients and magnitude pointing to what may be wrong specification (Silvapulle et al., 2004). Therefore, the R.H.S displays results based on NARDL which address these asymmetric dynamics. First and foremost, the test diagnostics all suggest to a correctly specified model and in line with the classical LS calibrations.

The asymmetric estimates depicted in the short run demonstrate that, over half of both positive and negative sum of squares processes (y_t^+ and y_t^-) increases unemployment. The rejection of F_{PSS} statistic is an implication that unemployment and output correlate in the long run (i.e., perpetrates long run relationship) and therefore, in the long run, increasing output (LR_{y^+}) decrease cyclical unemployment while its increased when cyclical output(LR_{y^-}) is decreased and supporting a tradeoff.

The acceptance of both short- and long- run (F_{SRS} and F_{LRS}) is a clear suggestion of the insignificantly different positive and negative squares and implying to the symmetric nature of the unemployment-output tradeoff. This is in accordance with Ouardighi and Munier (2019) in France, but finds supporting evidence, among them, in Malta, Austria, Belgium, and Estonia that unemployment asymmetrically(symmetrically) responds to cyclical output in the long (short) run. Our findings also contradicts Lim et al. (2019) that asymmetric relationship in US with greater weight by negative than positive shocks to unemployment of 0.6 (0.4) for fire/hire, respectively; Shin et al. (2014) with findings that the Canadian firms are easier to fire than hire with large response to slump than boom and similarly, Cosar and Yavuz (2019) for Turkey.

Table 5. Dynamic parameter estimations to unemployment.

Symmetric estimates		asymmetric estimates	
constant	0.049** [0.020]	un_{t-1}	–1.468** [0.483]
$\Delta\, y_t$	–0.029** [0.010]	y^{+}_{t-1}	–0.295** [0.089]
$\Delta\, y_{t-1}$	0.196** [0.045]	y^{-}_{t-1}	–0.294** [0.088]
$\Delta\, y_{t-2}$	0.105*** [0.028]	Δun_{t-1}	0.380 [0.249]
$\Delta\, y_{t-3}$	0.039** [0.015]	$\Delta\, y^{+}_{t}$	–0.068* [0.034]
Ect(-1)	–1.126*** [0.185]	$\Delta\, y^{+}_{t-1}$	0.229*** [0.061]
y_t	–0.274*** [0.079]	$\Delta\, y^{+}_{t-2}$	0.105** [0.041]
π_t	0.005[0.004]	$\Delta\, y^{+}_{t-3}$	0.061[0.032]
F_{LRS}	10.52***[6.36]$^{I(1)}$	$\Delta\, y^{-}_{t}$	–0.009[0.031]
P(F-stats)	(0.015)	$\Delta\, y^{-}_{t-1}$	0.181** [0.067]
R^2	0.788	$\Delta\, y^{-}_{t-2}$	0.117** [0.023]
$\chi^{s/correlation}$	0.587(1.000)	$\Delta\, y^{-}_{t-3}$	0.042 [0.0233]
$\chi^{normality}$	0.494(0.780)	$\Delta\, \pi_t$	0.004[0.005]
χ^{arch}	0.247(0.618)	constant	–0.089[0.067]
χ^{RESET}	0.038(0.848)	F_{PSS} statistic	6.642*** [6.622]$^{I(1)}$
		LR_{y^+}	–0.201* [5.107]
		LR_{y^-}	0.202* [5.108]
		F_{LRS}	0.004(0.951)
		F_{SRS}	0.011(0.919)
		P(F-stats)	(0.015)
		R^2	0.943
		$\chi^{s/correlation}$	4.826(0.776)
		$\chi^{normality}$	0.032(0.971)
		χ^{arch}	0.019(0.888)
		χ^{RESET}	0.071(0.972)

Note: ***, **, * designates the 1,5 and 10% significance respectively. Unemployment and inflation designates to cyclical components. Round (square) brackets represents the standard errors(p-values). WLS regression is weighted using inverse of standard deviation. F_{PSS} designates the symmetric statistic on the null $\rho = \varphi^{+} = \varphi^{-} = 0$ that no asymmetric long run correlation. Superscript I(1) is the 1% C.V. of the upper bound statistics on Pesaran et al. (2001) table. F_{LRS} designates the null $\varphi^{+} = \varphi^{-} = 0$ and F_{SRS} to the null $\eta_i^{-} = \eta_i^{+} = 0$.

The symmetric nature demonstrates why the long run coefficients both have similar absolute weights. However, assuming the insignificance of long run symmetry statistic (F_{LRS}) and with long run coefficient –0.201 and 0.202 for LR_{y^+} and LR_{y^-}, an expected economic upturn of 4.98% and downturn of 4.95% could have decreased and increased unemployment, respectively. This could only be achieved via plausible structural reforms.

Regarding the dynamic multiplier, we analyze how cyclical unemployment changes to new found balance from the previous equilibrium in response to 1% standard shock to y_t^+ and y_t^- to find the impression created due to cumulative long run output dynamics on unemployment[3]. Figure 3&4 represents the unemployment-output and unemployment-inflation tradeoff multipliers, respectively. The shaded is the 95% C.I while imposed restrictions are in line with the insignificant asymmetry test in Table 5 and clearly suggesting to invalidity of long run asymmetry despite correct model specification. Figure 3 suggests that cyclical unemployment for shortest while in short run period sharply responds to economic slump (negative shocks) but the impact is not sufficiently spatial for the dynamics to domineer for whole of short run. However, from rest of short run period, shocks in output becomes insignificant as unemployment becomes unresponsive to any shock and continually carries on the symmetric equilibrium to the long run. This implies that first, if polices are significant, then slump in economy would sensitively surge unemployment. Second, the long run nature of unemployment-output tradeoff is symmetric and positive output shocks cannot sufficiently be used to reduce cyclical unemployment after recession. Therefore, previous structural reforms have been implausible in significantly decreasing cyclical unemployment without specific reforms. This partially enlightens why the persistent unemployment rates and apparently upward trending may not plausibly be downsized without feasible specific structural reforms.

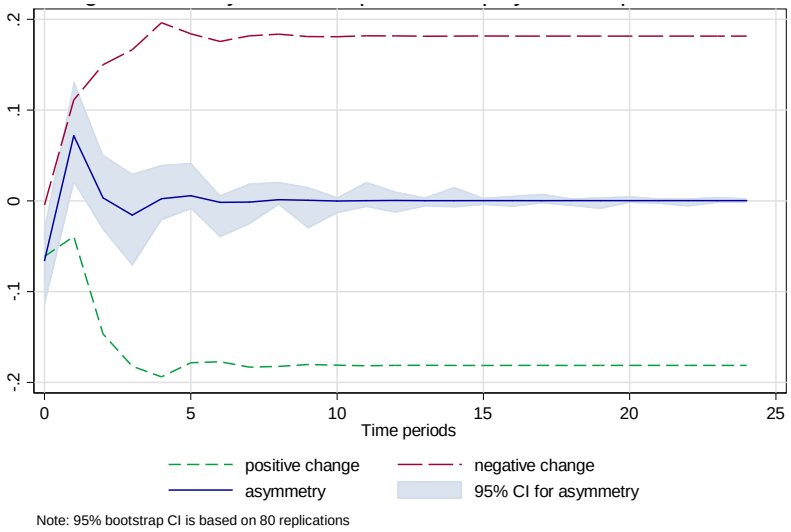

Figure 3. The dynamic multier: Unemployment-output trade-off.

Figure 4 also implies to similar behavior: The unemployment-inflation tradeoff is symmetric in the long run so that changes in business cycle output may not effectively be implied in reducing inflation and this accounts for why the high average inflation rates of over 1.7 times higher than the

[3] Initial equilibrium is the former steady tradeoff stance before the dynamics are subjected to a standard shock.

monetary authorities rate. But for the short run, negative inflation shocks are seemingly significant for the shortest while with unemployment sharply responding to inflation slump although the impact is not temporal enough for the dynamics to significantly domineer the whole of short run. This explains the negative but insignificant sign of inflation to unemployment and the symmetric response to new long run equilibrium.

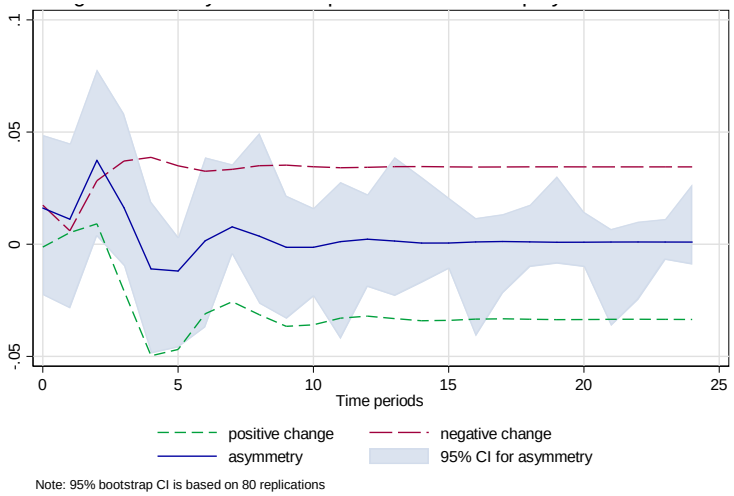

Figure 4. The dynamic multiplier: Inflation-unemployment trade-off.

4.3. Determining factors of Labor market

In this section, previous asymmetric behavior by unemployment is adopted and tested in the fiscal and labor market to implore its response in attempt to find short to end term feasible policies that may supplement the usually long horizon structural reforms in unemployment alleviation. And, therefore, in the next step, we affirm the significance of output shocks considering that the irrelevance of asymmetric shocks as in Table 5 could compromise the dynamic multipliers(Shin et al., 2014). Their comparison statistics[4] shows that the aggregate sum by y_t^+ is 17.01 and greater than the –3.5 by y_t^-. Similarly, the average by y_t^+ is 0.7 and greater than the 0.2 by y_t^- while their respective probabilities also suggests to positive shocks. Therefore, the size by positive shocks seems greater than that by negative shocks implying that the positive and negative shocks are asymmetric but not reflected by the dynamic multipliers. Unfortunately, the asymmetries do not significantly coexist to pose plausible effects. This could be related to the insignificant structural reforms that fails to induce specific business cycle growth such as improving the productivity of output and labor force that fills than creating employment opportunities. The many structural reforms since previous periods such as the annual mass employment by the government in many sectors is one such labor reform that however mismatched creation of employment opportunities in Kenya (Subbo, 2007; Hongo et al., 2019). The missing asymmetry in this studies is also reported in France, Belgium and Austria (Tang

[4] [$\sum y_t^-$ = –3.51 and $\sum y_t^+$ = –17.01; $\sum \overline{y_t^+}$ = 0.731 and $\sum \overline{y_t^-}$ = –0.152; Prob(y_t^-) = 0.171 and Prob(y_t^+) = 0.829; n = 23]

and Bethencourt, 2017). However, such findings do not provide a succinct basement for judging firms real response to business cycle regarding hire and fire in the country.

We therefore analyze the cumulative effects of long run shocks (L_i^{asy}) in unemployment to labor and fiscal market to find the general macroeconomic determinants of unemployment as a conclusive rejoinder couldn't be made from the dynamic multipliers. Table 6 demonstrates the results which generally reveals significant linkage between minimum wage rates, industrial production, foreign trade and government surplus. Minimum wage rate increases unemployment and implying that by increasing minimum wage, it renders the cost of inputs costlier while employers refrain from more employment and renews the incumbent contracts from short to long run employment without creating more jobs. The tax burden, government surplus and export reduces unemployment rates. This means that high taxes by government boost domestic consumption and creates more revenue that supports increased expenditure and for export promotion. Together with increased export earnings, they reduce the symmetries in the unemployment-output linkage. The impact by imports although insignificant, its contradictory in both models and thus no significant analysis is made.

Industrial production is also heightening the unemployment-output symmetry and seemingly suggesting to the increasing wage rates that heightens the cost of inputs and hence, the increased prices of outputs diminishes their real income while reducing the industries leverages in creating jobs and addressing labor demands and supply. Moreover, increasing state expenditure that couples short run increasing consumption requires appropriate tax structures in stabilizing the resulting macroeconomic environment and directing appropriate growth that finally reduces unemployment to the end. Importance of fiscal reforms to reduce cyclical unemployment in this study are in accordance to (Cosar and Yavuz, 2019; Tang and Bethencourt, 2017; Lim et al., 2019) and specifically, the unemployment-tax burden tradeoff supports works of (Anderson et al., 2014; Saraceno, 2016) implying to the importance of the regulatory effect.

Table 6. Labor market determinants.

	Weighted LS	Robust LS
Minimum wage rate	1.813***[0.291]	2.084***[0.395]
Tax burden	–0.063***[0.007]	–0.051***[0.011]
Industrial production	1.776*[0.767]	2.432***[0.874]
Imports (% of GDP)	–0.070[0.295]	0.621[0.388]
Government surplus/deficit	–3.597**[0.689]	–0.789*[0.313]
Exports (% of GDP)	–1.772*[0.689]	–0.817[0.541]
constant	2.121[3.419]	–19.12***[5.488]
Tests		
P(F-stats)	0.000	(0.000)
R^2	0.999	0.995
$\chi^{normality}$	0.570(0.751)	9.032(0.010)
χ^{arch}	2.227(0.135)	--
χ^{RESET}	0.972(0.254)	--

Note: ***, **, * designates the 1,5 and 10% significance respectively. Unemployment and inflation designates to cyclical components. Round (square) brackets represents the standard errors(p-values). WLS regression is weighted using inverse of standard deviation.

4.4. Synopsis of results

The findings reported by current study generally regards to three integrated objectives. In the first one is the analysis of the influence of unemployment-inflation tradeoff on SWB using output gap to regulate the effect on a quadratic model and second, the response of unemployment to output with a regulated impact using output gap in consideration of the tradeoff using the NARDL framework. In both cases, non\linearity's are considered while forwarding robust and consistent findings. In the third place an endogenously predetermined objective is analyzed that is the asymmetric determining factors of labor market based on behavior demonstrated by the unemployment variable in the previous analysis.

Therefore, by first objective, both inflation and unemployment destroys subjective wellbeing but with a larger effect by unemployment than inflation of individuals as the effects by unemployment is accompanied by both joblessness and missing income unlike inflation tied mainly to the distorted prices of goods and services. However, their aggregate impact generally, reduces the stance of individual's income, tightens the cost of living via declining creation of employment opportunities with declining self-esteem, confidence and control over life among the citizens. Therefore, results show that this thrilling impacts may be offset by realistic growth and development in output per capita which reduces the discrepancies by heightening growth and development of necessary supporting structures to condense the inflation-unemployment negativities on SWB. This is demonstrated empirically when the output gap (and or its levels) is incarcerated in the quadratic model and ultimately demystifying the fact that sound economic growth critically moderates uncertainties to subjective wellbeing.

With regard to the second objective, confounding linear results is demonstrated in both runs where unemployment increases with increasing short term output growth but the relationship tradeoffs towards the long run. This may be implied to short run seemingly infeasible policies that heightens the level of activities in the goods and labor markets but fails to create job employment that when stabilized and extended to the long run together with aggregate demand creating policies, they alleviate unemployment. However, with regard to the queer behavior by unemployment as persistent, the volatile slumping tints by trends in output growth and the significant tests for symmetries which supports nonlinearities in unemployment-output, called for asymmetric analysis. Therefore, by this results, although unemployment is asymmetrically responding to output. The asymmetric tradeoff shows that unemployment is reduced if output is increased but increased when output is decreased and implying, policy specific reforms which supports productive growth in both goods and labor markets to the long run require plausible implementation. However, although the asymmetric effects are weakly supported by the respective statistic, the dynamic multiplier still suggests to the viability of unemployment-output asymmetries in the business cycle especially in the short run.

Least but not last, by the third objective as an extension of unemployment asymmetries in the labor market analysis testing, demonstrated that unemployment response is plausible with the fiscal side of the economy than to the industrial\firm\manufacturing side. Specifically, minimum wage rates and industrial production increases unemployment unlike taxation, government surplus and export with reducing effects while imports have confounding results. And therefore the view that, there's need for accountability and feasibility of government expenditures to in addition heighten the contribution of fiscal side supporting the reduction of labor market discrepancies.

5. Conclusion

Unemployment, inflation and output growth changes the stance of subjective wellbeing as on the other hand, changes in output growth reduces unemployment. The study expands on the trade-off analysis and on the determinants of SWB and unemployment. We explored this effects and specifically the nonlinear response of SWB on the three macroeconomic variables and the asymmetric response of cyclical unemployment to business cycle output for Kenya between 1991–2018. The period was banked upon based on the longest data span determined by unemployment series availability.

The main results report that first, output per capita gap is important in regulating the inflation-unemployment tradeoff and negativities to SWB with costlier effects by unemployment than inflation. Secondly, unemployment trades off with long run shocks in cyclical output although they exhibit symmetric nature of Okun law. Thirdly, unemployment negatively relates with fiscal side of the economy in the long run (i.e., government expenditure, tax rate and export) as the tradeoff is supported.

On policy commendation, policy makers continually desire sustainable inflation and high economic growth to support high employment that heightens subjective well-being. This demonstrates the linkage income growth and unemployment has with happiness. An insight from this study demonstrates how plausible levels of economic growth offsets inflation-unemployment uncertainties to alleviate SWB and thus the need for targeting stable growth gaps and low inflation. Unemployment has on the other hand pointed to tradeoff with long run positive (negative) shocks in output with significant symmetric response of unemployment to the goods and labor market. We therefore suggest policies that could stabilize inflation to expected rates, boost growth and create employment opportunities and however, be specific to address the asymmetric behaviors in the business cycle will stabilize the wide unemployment gap. Therefore, discretionary labor supply side and fiscal reforms implemented could shortly replace the structural reforms which take far too long from implementation to effect.

The policies interactively imply that a sound economic growth that supports increasing economic productivity supports the necessary structures such as financial development and stable monetary policy which absorbs the negativities by inflation to both goods, service and labor market. With stable inflationary conditions on both firm's activities, income, wages and prices, the relatively stable economy creates more jobs as the unemployed joins the labor force participation. Further, the improved growth conditions reduce the growth gap that controls the stance by which inflation and poor growth demeans employment and relative prices. The general citizens also feel a sense of improving livelihoods with those out of employment and missing income still feeling a manageable life with increased satisfaction with both government and own life. The happy individual in turn has the self-esteem for seeking employment and nation building. In that line, that due to increasing labor force, the state uses feasible fiscal and monetary sides to stimulate long run economic productivity for employment creation. Therefore, with prudent and accountable government expenditure, appropriate tax structures and increased exports that boost the balance of trade, facilitates development of supporting structures via which the unemployment gap is minimized. This consequently weakens the negativities by unemployment to SWB.

Concerning the empirical and theoretical contributions, the temporal behavior in economic growth and inflation seems to suggest consequential shifts in structural policies since previous periods. The seemingly persistent unemployment also suggests to the continually implausible reforms since the 90s period that have insignificantly shifted the labor market and distorted

nonlinearities. The insignificant thresholds and symmetric equilibrium suggests to the claims. And, substantially, despite the symmetric nature, there still dominates tints of evidence of asymmetry but not strong enough for causing significant influence in the unemployment-output-SWB relationship or were inappropriately identified due to presumed regimes in the data. Therefore, this analysis could be re-exploited in account of structural breaks.

Declarations

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Conflict of interest

The authors declare no conflict of interest.

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