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Output gap determinants in Ethiopia

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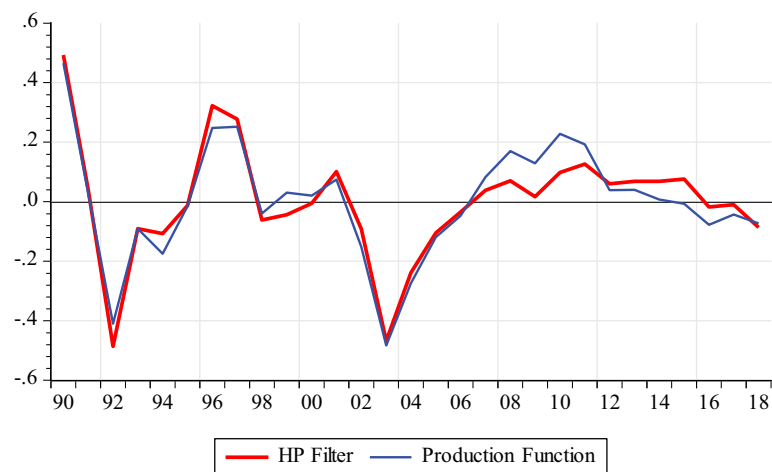
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Output gap determinants in Ethiopia

Adisu Abebaw^{1*}

Abstract: The output gap measured as the percentage deviation of actual output from its potential level is an indicator of an economy's achievement. Output gap has been an important concept used for forming of policies. In this study, we estimated the potential output and output gap, established some of its macro-economic determinants for the Ethiopian economy. By using yearly data spanning from 1990 to 2018, the study estimated the potential output and output gap using HP filtering, and production function approaches. Accordingly, both approaches indicated that the output gap has been fluctuating over the study period—indicating the actual output inconsistently and frequently deviating from its potential level. Mainly, in 1996 and 2003, the actual output showed the highest positive and negative deviations from its potential, respectively. The study also examined the effect of some macro-economic indicators on the output gap using the ARDL framework. Accordingly, inflation, trade openness, lending rate, and FDI are found to be having a significant effect on the output gap. Lending rate and trade openness have positive and significant effect, whereas inflation and FDI have a negative significant effect on the output gap. This study suggests; augmenting domestic production and utilization capacity, avoiding unrestricted importation and, export diversification, lowering lending rate and increasing FDI inflow; helps to reduce output gap. Besides, understanding the trend of potential and output gap would be helpful in dealing with inflation.

Subjects: Macroeconomics; Economic Forecasting; Development Economics

Keywords: Potential output; output gap; HP filter; ARDL

ABOUT THE AUTHOR

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PUBLIC INTEREST STATEMENT

The total output gap, measured as the percentage deviation of actual output from its potential level, indicates the productive capacity of an economy. Potential output on the other hand is designated as a measure of the aggregate supply of an economy. It represents the highest possible output that can be produced through full utilization of the available resources, including technology. The existing literature relates potential output with inflation developments. All else equal, inflation tends to rise (fall) when output is above (below) the potential level. Hence, understanding of the potential output and the output gap gives an early signal of the underlying inflationary/deflationary pressure. The study also identified inflation, trade openness, lending rate and FDI as a determinant of output gap in Ethiopian economy.

Jel codes: C32; E32; E10; O4

1. Introduction

Measuring the overall slack in the economy is an essential concern for both policymakers and academics. Among others, one simplified approach measures the overall slack by estimating the output gap (Grant & Chan, 2017). The total output gaps (hereafter the output gap), measured as the percentage deviation of actual output from its potential level (Weiske, 2018), indicates the productive capacity of an economy. Policy decisions depend much on estimates of potential output, and understanding of potential output gap estimate has several policy implications. Analysis of the output gaps can provide valuable understandings for policymakers when assessing the macroeconomic performance of a country (Fedderke & Mengisteab, 2016). In particular, such information is helpful for the formulation of monetary policy (Tahir & Ahmad, 2017). For instance, it can reveal the cyclical patterns an economy goes through over time (Emmanuel et al., 2019)—which can give an early indication of underlying inflationary pressures. The potential output provides a more broad assessment of how much an economy can produce without triggering above-normal inflation (Coibion et al., 2018).

Whenever the positive output gap—the economy is operating above full capacity (Ministry of Finance and Economic Management of Cook Islands, 2018)—so that actual output is more significant than potential output, inflation will begin to rise in response to excessive demand. At this time, the central banks respond by implementing a contractionary policy (fiscal or monetary). A negative output gap occurs when actual output is less than what the economy could produce at full capacity; consequently, prices will begin to fall to reflect weak demand (Alichi, 2015). This indicates the economy is at slack due to the insufficiency of demand for goods and services. In this case, central banks react by realizing expansionary policies. Conversely, if actual and potential outputs coincide (Zero output gap), there will not be any deflationary or inflationary pressure (Kawamoto et al., 2017). Thus, the output gap and inflation are highly correlated (Maitra & Hossain, 2020).

On one hand, a country with a large output gap and high unemployment is associated with demand constrained; on the other hand a country with a lower output gap and high unemployment may have supply-side shocks. As a result, an underestimate of potential output and output gap may lead policymakers to excessively tighten fiscal and monetary policy and thus cause the economy to underachieve (Rosnick, 2016). Hence, considerable attention should be given in the due process of output gap estimation as long as policy effectiveness is concerned. Albeit the tremendous importance of the output gap, it is not observable and surrounded by considerable uncertainty—it, therefore, needs to be estimated from observed data. However, it can be argued that, in a typical economy, the actual level of output as well as its long-run trend is influenced by movement in other macroeconomic variables, such as unemployment, financial sector stability, and capacity utilization in the economy (Tahir & Ahmad, 2017).

In the developing country output gap is regarded as an information variable in the formulation of anti-inflationary monetary policy (Maitra & Hossain, 2020). Ethiopia, a land-locked developing country, has been achieving a double-digit economic growth in the last two consecutive decades. However, its recent impressive growth has been accompanied by high inflation (Bane, 2018), unemployment, trade balance deficiency, food insecurity, and political instability. Mainly, the inflationary pressure is becoming hard-hitting to the country's economy, particularly in recent days. The inflation rate, as measured by the consumer price index (CPI), has risen particularly from in 2014 onwards. The CPI of the country was registered to be 13.8 in 2018 and 9.2 in 2019. Measuring of potential output, and understanding of potential output gap estimate has several policy implications that are relevant for developing countries such as Ethiopia. Having this said, the objectives of this study are; to estimate the total potential output, the total output gap and to

establish macroeconomic determinants of output gap in Ethiopian economy. Unfortunately, potential GDP is not directly measurable as well defined as GDP (Rosnick, 2016), so that this paper used different methodological approaches such as; the Hodrick-Prescott (HP) filter and the production function approach to estimate potential output and output gap. Besides, it examines the macroeconomic determinants of the output gap in Ethiopia using the Autoregressive Distributed Lag (ARDL) model. We first estimate capital stock data using perpetual inventory technique, and then we extract the potential level of employment, potential level of total factor productivity, potential output and lastly the output gap. Since there are scanty empirical studies on the output gap available for the case of Ethiopia, the paper would have a significant contribution to the existing literatures. In addition, unlike the previous studies, the paper is innovative in applying perpetual inventory technique to extract the capital stock data. The rest of the paper is organized as follows. Chapter two discusses the theoretical and empirical literature review; chapter three presents the methodological aspects of the study, chapter four discusses the findings and analysis of the research and, the last chapter deals with the conclusions of the research.

1.1. Literature review

Output gap can be measured as the difference between actual and trend GDP in the percentage of actual GDP (Carmignani & Moyle, 2018). Potential output (GDP) on the other hand is designated as a measure of the aggregate supply of an economy. It represents the highest possible output that can be produced through full utilization of the available resources, including technology (Casey, 2018). The existing literatures define potential output regarding the full utilization of factor inputs and inflation developments (Okun, 1962). The basic idea is that, all else equal, inflation tends to rise (fall) when output is above (below) the potential level. Inflation above long term sustainable levels is one of the critical indicators of macroeconomic unsustainability (Tahir and Ahmad (2017)). There are several empirical researches conducted regarding on the output gap in different countries of the world. Emmanuel et al. (2019) analyzed the potential output and output gap for the Namibian economy. By using yearly data spanning from 1980 up to 2016, Hodrick-Prescott filter method, and the production function approaches, the study found an annual average growth rate of 3.6% of the potential output of the economy. The estimated Potential output obtained using the production function approach was smooth and stable throughout the study period. Besides, the output gap estimates from the two techniques are comparable, and appear to move together. Casey (2018) estimated of Ireland's output gap. He examined and tested various methods based on univariate/multivariate filters and principal components analysis. Accordingly, his study shows that the results are stable; are less complicated in the structure, can explain price and wage inflation, and—most importantly—yield estimates that are more plausible for Ireland. Using quarterly data from 1999 to 2015, and employing several methods such as, Bayesian methods and the Kalman filter. Kasabov et al. (2017) assessed the link between potential output and inflation in Bulgaria. The results revealed a significant negative output gap between the periods 1999 up to 2003. High inflation was also seen during the same period, which attributes to the transition to a market economy the country achieved through trade openness and privatization. Carmignani and Moyle (2018) investigated the impact of tourist arrivals on a host country's output gap. By using a panel of 179 countries for the period 2002 up to 2015, and panel data methods, the results showed that an increase in tourism arrivals significantly lowers the output gap of the host country. Fedderke and mengisiteab (2016) estimated the potential output of the South African economy. Using a production function approach and several univariate filters to observe the natural growth rate of the South African economy from the period 1960 to 2015, their estimates showed that the natural growth rate is in the 1.9–2.3% range. Tahir and Ahmad (2017) estimated the potential output and output gap for the Pakistan economy using state-space and structural estimation. The study found fall in the potential output growth of Pakistan during 2009–2013, has led the economy to demand shocks. Shaheen et al. (2015) estimated the potential output in Pakistan. Following the production function approach and used over the sample period 1973–74 to 2007–08, their study results showed that the economy was growing beyond its potential level of output from 2003/04 up to 2006/07, and in 2007/08. Moreover, the actual employment was found to be above potential employment from 2002–03 to 2007–08. Osama (2016) estimated Egypt's potential output. Using

the production function method to estimate potential output and output gap over the period 1990 up to 2014, the results revealed that capital stock was the main factor determinant of GDP growth in Egypt. Besides, intellectual property protection, the efficiency of the legal framework in settling disputes, and the strength of investor protection exhibited positive connection with output gap in Egypt.

1.2. Methodology

1.2.1. Data type and source

The study relied on the secondary time series data ranging from 1990 to 2018 that obtained from the National Bank of Ethiopia (NBE) and the World Bank data set. The variables used in this study are; gross domestic product (GDP) measured based on 2010 constant price, labor and capital stock. Some macro-economic variables such as; inflation rate (Measured by annual CPI changes), trade openness (export + import divided by GDP), lending rate and foreign direct investment (FDI) used as a determinant of the output gap in the Ethiopian economy. However, since the actual number of hours worked is not available in Ethiopian economy, the numbers of employed workers are used as the proxy for labour input, and capital stock is computed by using perpetual inventory system.

Since the potential output of an economy is an unobservable variable, it needs to be estimated the observed data using a variety of methods. Some of them include statistical filtering methods, unobservable components models, and the production function model. Statistical filtering tools such as the Hodrick-Prescott filter and the Kalman filter can be used to extract a smoothed trend from an output series. If the trend approximates the path of potential output, then the output gap can be measured as the gap between the trend and actual level of output. Potential output can also be obtained based on assumptions regarding the potential level of factor inputs like capital and labor along with Total Factor Productivity—the efficiency with which factor inputs are used to produce output (Casey, 2018). The present study used two approaches, namely Hodrick-Prescott filtering and production function approaches, in order to estimate potential output for the Ethiopian economy.

1.3. The Hodrick-Prescott filter

The Hodrick and Prescott (1997), is a simple smoothing process that has become common for its flexibility in exposing the characteristics of the fluctuations in trend output (Carlos et al., 2018). The main advantage of the Hodrick-Prescott Filter (HP filter) is that it reduces the output gap stationary over a wide range of smoothing values, and it allows the trend to change over time (Duran, 2019). Moreover, this technique is applicable in developing countries' studies for its considerably fewer data requirements (Emmanuel et al., 2019). The HP filter mainly minimizes the difference between actual and potential output based on the following equation:

$$y_t, HT = \min \left[\sum_{t=1}^T (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} \{(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})\}^2 \right] \quad (1)$$

Where, T is the number of observations, Y_t is actual output, τ_t is the trend value, λ is the determining factor of the smoothing parameter and penalizing shocks. The larger the value of λ , the smoother the growth component, and the greater the variability of the output gap will be (Carlos et al., 2004). Hodrick and Prescott (1997) proposes λ to be 1600 for quarterly data, and 100 is for yearly data. The first term in the above equation, minimizes the distance between the actual (y_t) and the potential (τ_t) value, while the second minimizes the change in the trend value. However, this technique has been criticized due to shortcomings. Firstly, it has little theoretical foundation and draw on limited economic information. Secondly, some of the dynamics of trends produced may not be sensible for economic variables. Lastly, the “end-point problem” can—with some filters—result in estimates that are highly biased at the ends of the sample (Casey, 2018).

1.4. The production function approach

Production function, (typically the Cobb–Douglas production function) is frequently considered as an alternative technique to measure potential output. The technique defines the supply side and shows the relationship between output and its factor inputs (Emmanuel et al., 2019). A particular strength of the production function approach is the reliability of the obtained estimates at the sample endpoints. Under the production function approach, the output gap (OG_t) is calculated as the difference between actual output (Y_t) and potential output (Y*_t). However, the production function approach requires a potential level of total factor productivity (A*_t), potential labor input (potential employment (E*_t)) and potential capital stock (K*_t) that is to be estimated from observed data. To this end, we start with the conventional Cobb–Douglas production function. Looking at equation (2), actual output (Y_t) is represented by a combination of labor (L_t) and capital (K_t) inputs, and multiplied by total factor productivity (A_t). Consider the following equation.

$$Y_t = A_t L_t^\alpha K_t^\beta \tag{2}$$

From the above equation, α and β, whose summation is supposed to be unitary, represent capital and labor share, respectively. Taking the natural log of both sides of the equation results in the following linear regression model,

$$\ln Y_t = \ln A_t + \alpha \ln L_t + \beta \ln K_t + \varepsilon_t \tag{3}$$

Therefore, from the above relationship, lnY_t, lnA_t, lnL_t and lnK_t, respectively, represents the natural log of actual GDP, Total factor productivity (TFP), labor, and capital inputs. Alternatively, TFP can be extracted as a residual as follows.

$$OG_t = \frac{Y_t - Y^*_t}{Y^*_t} \tag{4}$$

To estimate TFP, following Abebaw and Tadesse (2019) and Jungsuk and Jungsoo (2017) a common factor share of 0.6 and 0.4 (1–0.6) was assigned for capital and labor, respectively. These assignments are based on the ground that many developing countries, including Ethiopia, are labor abundant and thus tend to adopt a labor-intensive method of production. Once the value of TFP is estimated, the potential level of TFP (A*) is to be obtained through HP filtering of actual TFP (A). Another precondition for potential output estimation is obtaining the potential level of capital stock and employment. But capital is always assumed to be efficient—where actual capital stock equals the potential capital stock. However, there is no readymade capital data for the case of Ethiopia. Therefore, we estimate the capital stock at the different periods by using a perpetual inventory approach. Following Abebaw & Tadesse, and Anthony and Oluwabunmi (2016), the initial capital stock (K₀) is then estimated based on the Solow model steady-state relationship. Consider the following equation;

$$K_0 \ln Y_t = \ln A_t + \alpha \ln L_t + \beta \ln K_t$$

From the above equation (5) K₀ are I₀ the initial level of capita stock and investment, respectively. While, δ is yearly average depreciation rate (assumed to be 5% per annum) and g is the average geometric growth rate of a real investment over the study period (1990 up to 2018). Once we get the initial capital stock (K₀), we can calculate the level of capital stock of each period by using the following equation.

$$\ln A_t = \ln Y_t - \alpha \ln L_t - \beta \ln K_t \tag{6}$$

To calculate the potential labor input (potential employment), we adopted the filtering method that was used by similar studies. However, in a country such as Ethiopia, there is a considerable shortage of time series data related to labor input data. An alternative method of estimation of potential employment (potential labor input), according to Emmanuel et al. (2019), is implementing filtering techniques. Once the potential TFP, capital stock, and employment data are estimated, the next step is to find out the potential output (Y_t^*) using the following equation (9).

$$K_t = I_t + (1 - \delta)K_{t-1} \quad (7)$$

Where, Y_t^* , A_t^* , L_t^* and K_t^* , represent the potential output, potential total factor productivity, potential labor and potential capital, respectively. By taking the natural logarithm both sides, the above equation (9) can be re-arranged as follows;

$$Y_t^* = A_t^* L_t^{*\alpha} K_t^{*\beta} \quad (8)$$

Finally, the output gap (actual output less potential output) is computed as follows.

$$\ln Y_t^* = \ln A_t^* + \alpha \ln L_t^* + \beta \ln K_t^* \quad (9)$$

1.5. Determinants of output gap in Ethiopian economy

In addition to the extraction of the potential output and the output gap, the study also determines the effect of some macro-economic indicators on the output gap (OG). For this study, we consider inflation (INF), trade openness (TO), lending rate (LR) and foreign direct investment (FDI) as a possible determinant of the output gap in the Ethiopian economy.

$$OG = f(INF, TO, LR, FDI,) \quad (10)$$

To identify the determinants of the output gap in the Ethiopian economy, the study used the Autoregressive Distributed Lag Model (ARDL) Approach. The major advantage of ARDL models is that it can handle both integrated level zero (0), one (I) or a mixture of them (Bane, 2018) compared to the Johansen framework that requires all variables to be I(1). Besides ARDL model is efficient for small sample sizes. If one co-integrating vector is identified, the ARDL model of the co-integrating vector is re-parameterized to give short-run and long-run dynamics of a single model. However, before running the co-integration test, it is essential to assess the undergoing stationary process of the data. To this end, the nature of stationary properties of series is analyzed using the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) stationary tests. Finally, the short-run Error Correction Model (ECM) can be extracted from the ARDL model via a simple linear transformation (Granger, 1988).

1.6. Results and discussion

In this section, we first discuss the results of the HP filter and production function approach to estimate potential output. Then we proceed to the determinants of the output gap in the Ethiopian economy. The results of the potential output estimated by HP filter are presented in Figure 1. As indicated by the figure, both the actual (red line) and potential output (blue line) has been rising over the study period. Potential output has fluctuated as expected prior. The output gap that can be estimated using equation (9) is the crucial variable used for policy preparation. The output gap has been oscillating over the study period. It contains implications for the inconsistency of the performance of the economy. In particular, the output gap was negative in the period of 1992 and 2003. It has been, however, on the rising path started in 2004.

Another alternative approach, to measuring potential output is using production function—by combining the potential level of TFP, capital, and labour. The TFP was estimated using equation (4), assigning 60% share to capital, and 40% share to labor inputs—under constant return to scale assumption. The resultant total factor productivity was transformed into its potential level via HP filtering approach. Potential employment also calculated using a similar filtering approach. However, most similar studies used Non-Accelerating Inflation Rate of Unemployment (NAIRU) technique to calculate potential labor input. Unfortunately, such techniques are sophisticated in addition to its requirement of supplementary information—that is scanty for most developing countries like Ethiopia. Using potential employment (E^*), capital (K^*), and total factor productivity (TFP^*), the potential output (Y^*) was computed using equation (8), and the following result is reported under Figure 2. The output gap was highest positive during the period of 1996 and 2010, whereas, it was the negative 1992 and 2002 particular periods Figure 3. Since the Ethiopian economy is agricultural and highly rain-dependent, such fluctuation in the performance of the economy is not unanticipated. As a result, such variations in the economy results highly volatile inflation in the country during the study period. The analysis of the output gap indicates for the exhibiting of the business cycle in the economy. The negative output gap, for instance, indicates recession—that ultimately leads to downward pressure at the general price level. Whereas, a positive output gap directs to booming in the economy, where actual output outstrips potential output—triggering upward pressure in the general price level.

However, there is a slight difference observed between the two approaches results. HP filters (the blue line) and production function approach (the red line) results are indicated in the Figure 4

Figure 1. Actual and potential Output.

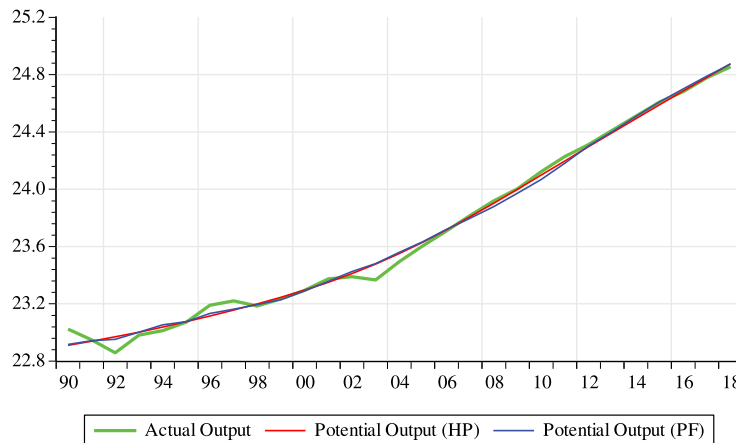
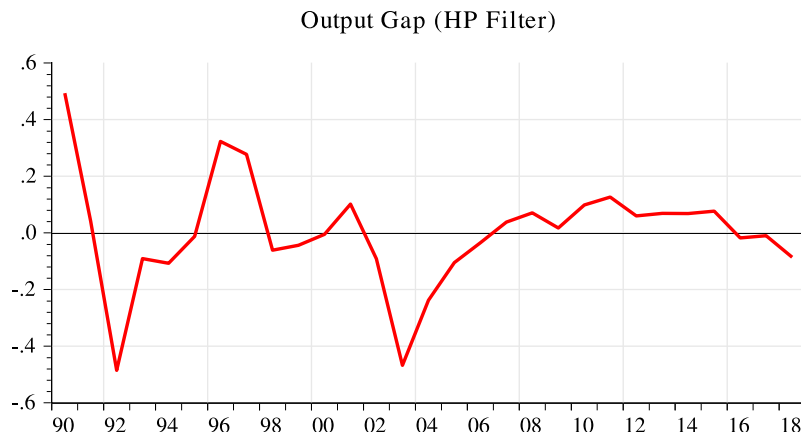


Figure 2. Output gap (HP filtering approach).



below. The HP filter was seemed to be exceeding the production function approach since the period of 2012, whereas, the production function approach was observed to be above the HP from the period of 2006 up to 2011. Otherwise, the two methods revealed almost similar outcomes. The output gap in both cases has been negative in 1992 to 1995, 2002 to 2006 and 2005 to 2018. In these periods, some deflationary pressure is expected. Contrarily, in 1996 to 1998, and 2007 to 2015 output gap was positive—which is possibly related with unemployment and deflation. Normally large output gap and high unemployment is associated with demand constrained; while, lower output gap and high unemployment may have supply-side shocks.

1.7. Determinants of the output gap in Ethiopian Economy

Output gap can be affected by different factors, such as inflation, trade openness, lending rate (a proxy for interest rate), and FDI. The determinants of the output gap in the Ethiopian economy are assessed based on a bound-test approach to co-integration. Before applying any cointegration test the first step is to define the degree of integration of variables in the model (Gebreegziabher, 2018). Accordingly, the unit root test is examined using ADF and PP tests, and the result depicted that the variables under study are a mixture of $I(0)$ and $I(1)$ —suitable for ARDL analysis (see table appendix 1). We have two values of output gap obtained through the HP filter and production approach. For assessing the determinants output gap, we take the result of the production function approach as an explained variable.

The result of ARDL bounds test of co-integration, as displayed in Table 1 shows, the value of F-statistic (5.46964) lies above the upper bound $I(1)$ for all given significance levels. Hence, it indicates that there exists at least one meaningful long-run relationship between output gap, inflation, trade openness, lending rate, and FDI, when the output gap is treated as an explained variable. The long-run and the short-run estimated coefficients of the ARDL model are demonstrated in Table 2.

From the long-run equation (Panel A), the coefficients of all variables; inflation, trade openness, lending rate, and FDI have a significant effect on the output gap. Inflation has a positive effect on output gap at 10% significance level—both in the long run and short run. At the time of high inflation, people might cut their demand for goods and services—that could eventually diminishes aggregate demand and hence, actual output. Lending rate, on the other hand, has a positive and statistically significant effect both in the long run and short-run. The possible justification for such a relationship is that, higher lending rate discourages private investors not to borrow and invest in different sectors of the economy; ultimately, it reduces the actual output—leading to more enormous output gap. This particular finding suggests that extending credit for investors through lowering lending rate is rewarding.

Figure 3. Output Gap (production function approach).

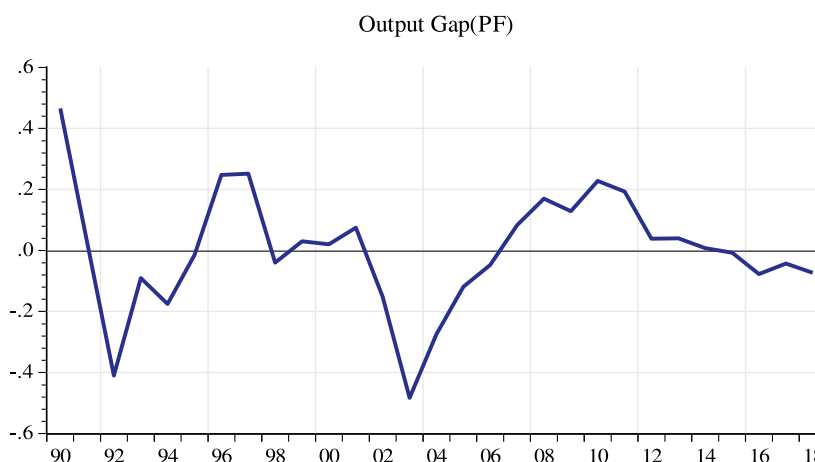


Figure 4. Output Gap (Comparison of HP and Production Function approaches).

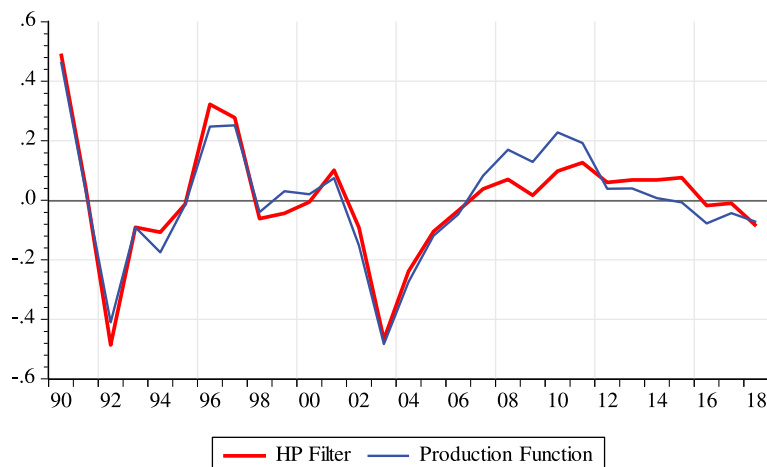


Table 1. ARDL Bound test

ARDL Bounds Test (2, 1, 2, 0, 2)

Test Statistic	Value	k
F-statistic	5.46964	4
Critical Value Bounds		
Significance level	I(0) Lower Bound	I(1) Upper Bound
10%	2.2	3.09
5%	2.56	3.49
1%	3.29	4.37

Note: Source: EViews 10 result

Trade openness, as measured by foreign trade divided by GDP, on the other hand, is found to be having a positive and statistically significant effect on output gap—both in the long run and short run. The significant and positive impact of trade openness on the output gap theoretically, can be traced with trade balance. Almost all developing countries, including Ethiopia, have an unfavorable trade balance due to their structure of exports and imports. These countries export fewer commodities (usually unprocessed and raw materials) and imports more substantial amount of manufactured and processed goods. This unbalanced foreign trade, despite its advantage of technologies and knowledge transfer, discourages domestic production, as local demand shifts from locally produced products and services to imported one. In this case, unrestricted trade openness will have a depressing effect on GDP and leads to more significant output gap. The long run and short run coefficients of FDI indicate the, FDI has negative and statistically significant effect on output gap. Nowadays, FDI is considered as an alternative means of capital creation, which uses the growing young labor force and other productive capacities of the country; though, its effectiveness is ambiguous. This particular result, unlike the ‘market-stealing’ hypothesis of Aitken and Harrison (1999), FDI could increase technological and expertise transfer that ultimately benefits domestic firms. The estimated coefficient of the error correction term found to be -0.42 and statistically significant at 1% level with an expected negative sign. It indicates a moderate speed of adjustment and suggests approximately 42% percent of the disequilibrium from last year’s shock converges back to the long-run equilibrium in this year. In order to analyze validity of the short-run and long-run estimation in the ARDL model, we performed different diagnostic tests such as; Normality, serial correlation, Heteroskedasticity and Ramsey RESET tests were performed (See table appendix 2). Accordingly, the residuals are normally distributed, there is no specification and serial correlation problem, and policy suggestions of the model are consistent. In addition, the

Table 2. Long-run and short-run equation

Panel A		Dependent variable = OG				
Long-Run Coefficients	Variable	Coeff.	Std. Error	t-Statistic	Prob.	
	INF	-0.007989	0.004436	-1.800879	0.0919	
	LNT0	0.268232	0.125812	2.132006	0.0499	
	LR	0.037138	0.016812	2.208993	0.0431	
	FDI	-0.038816	0.018506	-2.097523	0.0533	
	C	0.682176	0.419735	1.625257	0.1249	
Panel B						
Short-Run Coefficients	Variable	Coeff.	Std. Error	t-Statistic	Prob	
	C	0.290919	0.142586	2.040303	0.0593	
	D(OG(-1))	0.193546	0.129065	1.499610	0.1545	
	D(INF)	-0.001800	0.000792	-2.271653	0.0383	
	D(lnTO)	0.129660	0.073587	1.762001	0.0984	
	D(lnTO(-1))	0.063963	0.038044	1.681275	0.1134	
	D(LR)	0.015838	0.004579	3.458606	0.0035	
	D(lnFDI)	-0.021632	0.007745	-2.793080	0.0136	
	D(lnFDI(-1))	-0.014737	0.006462	-2.280621	0.0376	
	ECT(-1)	-0.426457	0.138839	-3.071582	0.0078	

Note: Source: EViews 10 result

CUSUM and CUSUM square plots (See table appendix 3) confirmed the estimated model coefficients are stable.

1.8. Conclusion

The output gap measured by measured as the percentage deviation of actual gross domestic product from its potential level is an indicator of an economy. Output has been an essential variable for policymaking processes. By using annual time series data ranging from the period 1990 to 2018, HP filtering technique and Production function approaches, in this study we estimated the potential output and output gap in Ethiopian economy. Besides we established macro-economic determinants of the output gap by using ARDL bound test approach to cointegration. The output gap, estimated by using the HP filtering and production function approaches, has been fluctuating throughout the study period—indicating the actual output inconsistently and frequently deviating from its potential level. Mainly, in the periods of 1996 and 2003, the actual output showed the highest positive and negative deviations from its potential, respectively. The output gap in both cases has been negative in 1992 to 1995, 2002 to 2006 and 2005 to 2018. In these periods some deflationary pressure is expected. Contrarily in 1996 to 1998, and 2007 to 2015 output gap was negative—which is possibly related with unemployment and deflation.

The study also examined the effect of some macro-economic indicators on the output gap. Accordingly, inflation, trade openness, lending rate, and FDI are found to be having a significant effect on the output gap. Lending rate has a positive and statistically significant influence both in the long run and short-run, implying that more considerable lending rate leads to greater output gap. Higher lending rate discourages private investors not to borrow and invest in different sectors of the economy; ultimately, it reduces the actual output—leading to more enormous output gap. Trade openness, on the other hand, is found to be having a positive and statistically significant effect on output gap—both in the long run and short run. Thus, foreign trade, despite its numerous advantages, discourages domestic production, as local demand shifts from locally produced products and services to imported one. In this case, unrestricted trade openness will have a depressing effect on GDP and leads to more significant output gap. Inflation has a positive effect on output gap only at 10% significance level—both in the long run and short run. The long run and short run coefficients of FDI indicate that, FDI has negative and statistically significant effect on output gap.

Based on the above findings the study recommended that augmenting of domestic production and utilization of capacity will also have an encouraging effect on actual output. Besides, extending credit for investors through lowering lending rate is rewarding. Lower lending rate encourages private investors to borrow and invest in different sectors of the economy; ultimately, it enlarges the actual output and reduces the output gap. Since private sectors are effectual, they can utilize the available resources more efficiently and adequately—instigating higher output growth and the lower output gap. In addition, avoiding unrestricted importation and, export diversification through a broad base of production technologies, would be helpful to reduce the adverse effect of trade openness. Finally, increasing FDI inflow will help to increase actual output and, hence to reduce output gap.

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Cover Image

Source: Author.

Authors' contributions

The entire contribution was provided by “Adisu Abebaw”. The author read and approved the final manuscript.

Availability of data and materials

The data of this study are taken from the National Bank of Ethiopia (NBE) and the World Bank. The dataset used in the empirical analysis is available upon request.

Competing interests

The authors declare that they have no any competing interest.

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References

- Abebaw, A., & Tadesse, D. (2019). Macroeconomic determinants of total factor productivity and its trend in Ethiopia. *International Journal of Research in Business and Social Science*, 8(6), 219-228. www.ssfnet.com
- Aitken, B. J., & Harrison, A. E. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *American Economic Review*, 89(3), 605-618. <https://doi.org/10.1257/aer.89.3.605>
- Alichi, A. (2015). A New Methodology for Estimating the Output Gap in the United States. *IMF Working Paper (WP/15/144)*.
- Anthony, E., & Oluwabunmi, O. (2016). Determinants of Total Factor Productivity Growth in Nigeria, 1970-2009. *Global Business Review*, 17(2), 257-270. <https://doi.org/10.1177/0972150915619801>
- Bane, J. (2018). Dynamics and Determinants of Inflation in Ethiopia. In A. Heshmati & H. Yoon (Eds.), *Economic Growth and Development in Ethiopia. Perspectives on Development in the Middle East and North Africa (MENA) Region*. Springer, 67-84. https://doi.org/10.1007/978-981-10-8126-2_4
- Carlos, H. V. A., Marta, B. M. A., Osmani, T. C. G., & Banco, C. B. (2004). Estimating Potential Output and the Output Gap for Brazil. Anais do XXXII Encontro Nacional de Economia [Proceedings of the 32nd Brazilian Economics Meeting] 041, ANPEC - AssociaÃ§Ã£o Nacional dos Centros de PÃ³s-GraduaÃ§Ã£o em Economia [Brazilian Association of Graduate Programs in Economics].
- Carmignani, F., & Moyle, C.-L. (2018). Tourism and the Output Gap. *Journal of Travel Research*, 1-14. <https://doi.org/10.1177/0047287518769760>
- Casey, E. (2018). Inside the "Upside Down": Estimating Ireland's Output Gap. *Irish Fiscal Advisory Council and University College Dublin. Working Paper No.5*
- Coibion, O., Gorodnichenko, Y., & Ulate, M.,(2018). The Cyclical Sensitivity in Estimates of Potential Output. Brookings papers on economic activity (BPEA). BPEA Conference Drafts
- Duran, H. E. (2019). Structural change and output volatility reduction in OECD countries: Evidence of the Second Great Moderation? *Economic Structures*, 8(38), 1-14. <https://doi.org/10.1186/s40008-019-0171-1>
- Emmanuel, Z., Bernie, Z., Johanna, M., Charlotte, T., & Jaungura, K., (2019). The Output Gap and Potential Output in Namibia. *Journal of Economics and Behavioral Studies*, 111, 69-75. [https://doi.org/10.22610/jeb.v11i5\(J\)](https://doi.org/10.22610/jeb.v11i5(J))
- Fedderke, J. W., & Mengisteab, D. K. (2016). Estimating South Africa's Output Gap Potential Growth Rate. *Economic Research Southern Africa*, Working Paper 585.
- Gebreegiabher, S. (2018). Effects of Tax and Government Expenditure on Economic Growth in Ethiopia. In A. Heshmati & H. Yoon (Eds.), *Economic Growth and Development in Ethiopia. Perspectives on Development in the Middle East and North Africa (MENA) Region*. Springer.
- Granger, C. W. (1988). Causality, cointegration, and control. *Journal of Economic Dynamics & Control*, 12(2-3), 551-559. [https://doi.org/10.1016/0165-1889\(88\)90055-3](https://doi.org/10.1016/0165-1889(88)90055-3)
- Grant, A. L., & Chan, J. C. C. (2017). Measuring the Output Gap Using Stochastic Model Specification Search. CAMA Working Paper 2017-02. *Research School of Economics and Centre for Applied Macroeconomic Analysis*. Australian National University. <https://doi.org/10.2139/ssrn.2897988>
- Hodrick, R. J., & Prescott, E. C. (1997). Postwar US business cycles: An empirical investigation. *Journal of Money, Credit, and Banking*, Pages, 29(1), 1-16. <https://stats.oecd.org/>, Accessed Jan 2020
- Jungsuk, K., & Jungsoo, P. (2017). The Role of Total Factor Productivity Growth in Middle Income Countries. *Asian development bank economics working paper series*.
- Kasabov, D., Kotseva, P., Vassilev, A., & Yanchev, M. (2017). *Relationship between inflation, potential output and structural unemployment in Bulgaria*. Discussion papers, 2017-104, bulgarian national bank, www.bnb.bg
- Kawamoto, T., Ozaki, T., Kato, N., & Maehashi, K. (2017). Methodology for Estimating Output Gap and Potential Growth Rate: An Update. *BOJ Reports and Research Papers*. http://www.boj.or.jp/en/research/research_data/gap/index.htm/
- Maitra, B., & Hossain, T. (2020). Inflation in India: Causes and anti-inflationary policy perception. *IJEPS*, 14(2), 363-387. <https://doi.org/10.1007/s42495-020-00036-z>
- Ministry of Finance and Economic Management of Cook Islands (2018). Estimating the output gap in the Cook Islands - Preliminary analysis Economics Division, Ministry of Finance and Economic Management. Working paper No. 18/2
- Okun, A. M. (1962), "Potential GNP: Its Measurement and Significance", *Reprinted as Cowles Foundation Paper* 190.
- Osama, E.-B., (2016). Estimating Egypt's Potential Output: A Production Function Approach. *Munich Personal RePEc Archive (MPRA)*, Paper No. 71652. <https://mpra.ub.uni-muenchen.de/71652/>
- Rosnick, D. (2016). Potential for Trouble: The IMF's Estimates of Potential GDP.
- Shaheen, F., Haider, A., Jabeen, S., & Husnain, M. (2015). Estimating Potential Output for Pakistan: A Production Function Approach. *British Journal of Economics, Management & Trade* 2278-098X. 9(4), 1-13. 2015 <https://doi.org/10.9734/BJEMT/2015/19814>
- Tahir, M. A., & Ahmad, W. (2017). Estimation of Output Gap for Pakistan. Bank of Pakistan. SBP Working Paper Series No. 85. 1997-3810
- Weiske, S. (2018). Indicator-based estimates of the output gap in the euro area. *German Council of Economic Experts*. Working Paper 12/2018.

Appendix

Appendix 1 Stationary test

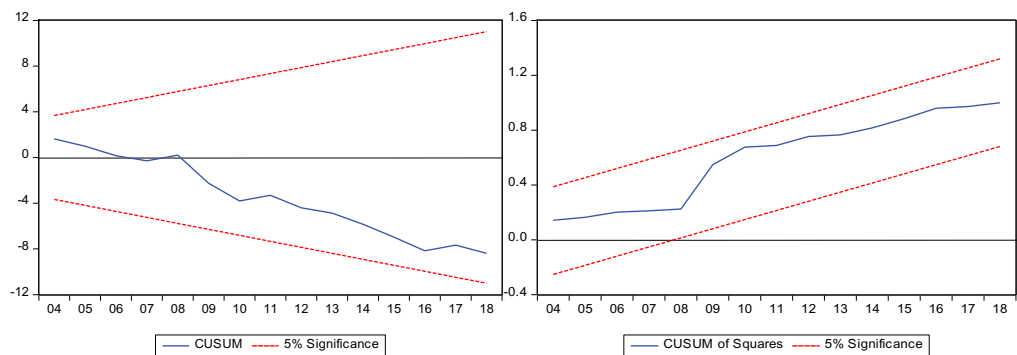
Variables	Level		First difference		Integration
	ADF test stat.	PP test stat.	ADF test stat.	PP test stat.	
OG	-4.211158 (0.0133)	-4.201851 (0.0132)	-6.924693 (0.0000)	-8.060284 (0.0000)	I(0)
INF	-4.051280 (0.0184)	-4.019948 (0.0197)	-7.111393 (0.0000)	-12.84044 (0.0000)	I(0)
lnTO	-2.640858 (0.2666)	-2.838516 (0.1963)	-9.889650 (0.0000)	-9.496935 (0.0000)	I(1)
LR	-1.010411 (0.9227)	-2.834069 (0.1977)	-5.157982 (0.0021)	-5.695499 (0.0004)	I(1)
lnFDI	-2.305944 (0.4174)	-2.200307 (0.4711)	-5.493823 (0.0007)	-5.536154 (0.0006)	I(1)

Note: P-values are in parenthesis

Appendix 2 Diagnostic test

Test	Statistic	P-value
Normality: Jarque-Bera test	0.098333	0.952022
Serial Correlation: Breusch-Godfrey serial correlation LM test	$\chi^2 = 2.086062$	0.3524
Heteroskedasticity: Breusch-Godfrey	$\chi^2 = 12.90778$	0.2994
Ramssey RESET test (F-statistic)	0.008002(1, 14)	0.9300

Appendix 3





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