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# Business confidence as a strong tracker of future growth: is it driven by economic policy uncertainty and oil price shocks in the OECD countries?

Oluwasegun B. Adekoya\*  and Johnson A. Oliyide

## Abstract

Business confidence matters for future growth as it relies on opinion surveys of developments in production activities, orders and stocks of finished products. Is it then affected by economic policy uncertainty and oil price asymmetries in the OECD countries? With limited evidence in the literature, we adopt the Augmented Mean Group (AMG) estimator following the evidence of cross-sectional dependence, non-stationarity and cointegration in the panel series. The full sample results show that business confidence is negatively affected by economic policy uncertainty and oil price. Moreover, the role of asymmetries cannot be neglected as both positive and negative oil price changes show different impacts on business confidence. The sub-sample results further reveal that the impacts of economic policy uncertainty and oil price on business confidence are higher in the Eurozone countries than in their non-Eurozone counterparts. We believe this is due to the central economic coordination and higher net-oil dependence and import status of the Eurozone countries.

**Keywords:** Economic policy uncertainty, Oil price shocks, Business confidence, Asymmetries, OECD countries

## Introduction

Undoubtedly, investors' and entrepreneurial decisions, to some extent, are guided by the feelings and expectations about the economy and businesses [13]. This future expectation of business outcome is regarded as business confidence. In other words, business confidence relates to the degree of optimism regarding (or firms' perceptions of) the current business climates and the expected business condition in the future [30]. Of utmost importance is the perception of firms and businessmen regarding future wellness of businesses due to its influence on the ease of doing business and the predictability of future growth path of the economy.

With business activities covering virtually all sectors of the economy, business confidence becomes one of the most crucial tools in tracking output growth and predicting possible economic expansion and contraction. Due to this unassailable role, researchers and policy makers have been challenged with the need to determine the drivers of business confidence. Unfortunately, not much has been empirically done in this regard in recent years. Available studies have largely concentrated on domestic macroeconomic and political factors. For instance, Konstantinou and Tagkalakis [12] reveal that expansionary fiscal policies (that is, increase in government spending and reduction in tax) increase business confidence, while increase in wages or government investment influences business confidence negatively. Adding monetary side to their focus, Montes and Bastos [17] note that fiscal and monetary policies, as well as monetary policy credibility, utilize the business expectations channel to influence

\*Correspondence: adekoyaob@gmail.com  
Department of Economics, Federal University of Agriculture, Abeokuta, Nigeria

economic activity in Brazil. The findings of Montes and Bastos [17] seem to be supported by the recent study of de Mendonça and Almeida [7] which investigates the main factors affecting the confidence of entrepreneurs in Brazil. They prove that a credible monetary policy fosters improvement in entrepreneurs' decision making, but institutional instability deteriorates business confidence.

Considering other macroeconomic indicators, Khumalo [11] unravels that inflation uncertainty causes negative shocks on how South African business owners and managers perceive the future of their business prospects. Martinez-Serna and Navarro [14] analyze how interest rate volatility affects business cycle expectations in the USA and Germany. Their results suggest that increasing interest rate volatility accounts for negative expectations as regards future business and economy outcome. In a totally different development, Montes and Almeida [16] address political concerns as the study analyzes the effect of corruption on business confidence in 40 countries. The major conclusion from the study is that corruption negatively impacts business confidence. This evidence mirrors the conclusion of de Mendonça and Almeida [7] on the adverse impact of institutional instability on business confidence.

In general, empirical assessment of the determinants of business confidence across countries is just budding, especially since the last decade. Moreover, the extant studies are more concentrated on macroeconomic variables (inflation, interest rates, output) and, to an insignificant extent, political factors, with strong evidences of their impacts accordingly established. Against limited evidence in the literature, however, we take a departure from extant studies by enquiring into the influencing role of economic policy uncertainty and oil shocks on business confidence in the Organisation for Economic Cooperation and Development (OECD) countries. While there is hardly any economic sector and business activity that seems to be disconnected from oil, the construction of the US economic policy uncertainty index in 2016 by Baker et al. [5] has led researchers to reveal how it affects the macroeconomy which cuts across the economic, finance and business spheres. We suspect that these global factors would also matter for business confidence.

Mokolo and Seetharam [15] note that uncertainty tends to linger in the sub-conscious mind of different business stakeholders including company executives, clients and policy makers in relation to the future outlook of business activities. The implication is that economic policy uncertainty could adversely affect prices, consumption and outputs (see Alam, [3]), all of which are strong determinants of overall business performance. More succinctly, increase in economic policy uncertainty creates a shady environment for business as investors' risks tend

to increase while business profitability has the likelihood of falling. On the other hand, oil serves as a critical production input and aid for business performance. However, due to frequent economic and financial turmoils, oil prices have been plagued with multiple shocks over time [2]. For instance, the two consecutive oil shocks in the 1970s, the global financial crisis of 2008 and the oil price collapse of 2014–2015, among others, have proven that risks arising from the crude oil market could have detrimental effects on economic activities and outcomes, business conditions and investors decisions (See [8, 9, 22]). Generally, a rise in oil price depresses economic activity as production and investment costs simultaneously rise. This further adversely affects consumers as they reduce consumption following high cost of goods and services induced by the higher price of oil [1]. The summation of these effects is that they create fears in market participants, thereby influencing the confidence investors and entrepreneurs have in businesses as regards future expectations.

Against this established transmission, the main aim of this study is to examine the impact of economic policy uncertainty and oil shocks on business confidence in the OECD countries. The OECD countries are largely industrialized and constitute the largest users of crude oil globally. In addition, they play crucial role in the global economic policy environment. It is thus a worthy empirical consideration to determine the influence of these global factors on their business prospects. To the best of our knowledge, this is the first study to go in this direction of empirical analysis for this country group. Furthermore, we partition the OECD countries into Eurozone and non-Eurozone areas for a comparative analysis. This is motivated by two factors. Firstly, the Eurozone countries are more oil import-dependent than their non-Eurozone counterparts. Secondly, The entire European Union (EU) which all the Eurozone countries of the OECD belong, have formalized monetary system through the adoption of common trading currency (i.e., the Euro) and the establishment of the European Central Bank (ECB) that jointly works with their domestic national banks to ensure stable economic performance, among other proposed benefits. Thus, we perceive that the perception of entrepreneurs as regards future business expectations may be differently affected in the two zones. Furthermore, we account for the role of asymmetries in oil price through its decomposition into positive and negative changes following Shin et al. [25]. This would ensure that the impacts of these changes are differently examined on business confidence in the countries. Our last contribution is methodological. We employ the second generation-based long-run estimator, namely Augmented Mean Group (AMG), which is capable of addressing inherent

heterogeneity, non-stationarity and cross-sectional dependence of the panel series. In the presence of these undesirable statistical features commonly associated with panel data, accurate results are produced.

The remainder of this study is structured as follows: “**Methods**” Section describes the underlying data and develops the adopted methodology. “**Results and discussion**” Section presents and discusses the empirical results. Section 5 concludes the entire paper.

## Methods

### Data

This study uses monthly data from January 2000 to March 2020 (making 243 observations) obtained for 27 OECD countries. For comparative analysis, the OECD countries are further divided into 16 Eurozone and 11 non-Eurozone countries. The country-specific data include business confidence index, interest rate and unemployment rate, while the global data are global oil prices (Brent and West Texas Intermediate (WTI)) and global economic policy uncertainty index. Accordingly, the country-specific and global series are, respectively, sourced from the databases of the OECD (data.oecd.org) and the Federal Reserve (fred.stlouisfed.org).

### Methodology

#### Augmented Mean Group (AMG) estimator

We evaluate the impact of economic policy uncertainty and oil price shocks on business confidence in the OECD countries. This leads to the initial specification of the equation below to capture the nexus:

$$bc_{it} = \beta_0 + \beta_1 oil_{it} + \beta_2 epu_{it} + \beta_3 X'_{it} + \mu_{it}; i = 1, 2, \dots, N; t = 1, 2, \dots, T \quad (1)$$

where  $bc$ ,  $oil$  and  $epu$ , respectively, denote business confidence and oil price and economic policy uncertainty.  $X'$  is a vector of control variables incorporated to guard against possible problem of omission bias. They are real interest rate and unemployment rate.  $\mu$  is the error term. In order to express the variables in the same unit of measurement and for the ease of comparison, the business confidence indices, global economic policy uncertainty indices and oil prices are logarithmically transformed.

To account for asymmetries in oil price, we follow the decomposition approach of Shin et al. [25]<sup>1</sup> to partition oil price into positive and negative shocks as follows:

$$oil_t^+ = \sum_{j=1}^t \Delta oil_{ij}^+ = \sum_{j=1}^t \max(\Delta oil_{ij}, 0) \quad (2a)$$

$$oil_t^- = \sum_{j=1}^t \Delta oil_{ij}^- = \sum_{j=1}^t \min(\Delta oil_{ij}, 0) \quad (2b)$$

where  $oil^+$  and  $oil^-$ , respectively, represent positive and negative asymmetries in oil price. Thus, Eq. (1) is re-specified as:

$$bc_{it} = \beta_0 + \beta_1^+ oil_t^+ + \beta_1^- oil_t^- + \beta_2 epu_{it} + \beta_3 X'_{it} + \mu_{it}; i = 1, 2, \dots, N; t = 1, 2, \dots, T \quad (3)$$

Equation (3) explains that positive and negative asymmetries affect business confidence differently.

Due to some statistical properties of panel series including cross-sectional dependence, non-stationarity, cointegration and heterogeneity of slope parameters, we employ a second generation-based long-run estimator, namely Augmented Mean Group (AMG) to estimate Eq. (1). The AMG estimator was developed by Eberhardt and Bond [27], and it is suitable for producing consistent and efficient estimators in the presence of all these statistical features contrary to the static and dynamic panel estimators earlier developed. Essentially, AMG differentiates the imposed effect of the observed regressors from the unobserved common factors in the estimation model. In so doing, Eberhardt and Bond [27] introduce dummy parameters to capture the dynamic effects so that the evolution of the unobserved factors is clearly shown in their level forms. The two-step approach followed by this estimator is captured thus:

Stage 1:

$$\Delta y_{it} = \gamma_i + \vartheta_i \Delta x_{it} + \rho_i f_t + \sum_{t=2}^T \delta_i \Delta D_t + \varepsilon_{it}. \quad (4)$$

Stage 2:

$$\hat{\vartheta}_{AMG} = N^{-1} \sum_{i=1}^N \hat{\vartheta}_i \quad (5)$$

where the dependent variable (i.e., business confidence) is denoted by  $y_{it}$ , the independent variables are captured by  $x_{it}$ .  $\vartheta_i$  denotes the country-specific parameters, while  $f_t$  denotes the unobserved heterogeneous common factor. The  $D_t \delta_i$  term describes the common dynamic process that is captured by the dummy variable,  $D_t$ . The main AMG estimator is finally denoted by  $\hat{\vartheta}_{AMG}$ .

Meanwhile, there is another variant of the AMG estimator which is the Common Correlated Effects

<sup>1</sup> This approach has also enjoyed a wide use in many other empirical panel works including Altintas and Kassouri [4], Kasouri and Altintas (2020b), and Adekoya and Adebiyi [1], among others.

Mean Group (CCEMG) proposed by Pesaran [19]. Like the AMG estimator, the CCEMG estimator also produces reliable estimates when correlation between the observed regressors and common factors is evident (see [24]). However, the advantage of the AMG estimator over the CCEMG estimator is seen in its ability to give proper economic meaning to the unobserved factors in the panel model. This is unlike the CCEMG estimator that treats them as nuisance parameters. In addition, under appropriate conditions, the AMG estimator can be adjusted to impose a unit coefficient on the common dynamic process, thus making it to be more flexible than its competing model. These outstanding merits and attractions of the AMG estimator make it to be considered in this study.

Furthermore, we develop the methodologies for the relevant preliminary tests which qualify our choice of the AMG estimator. We begin with cross-sectional dependence test. The four notable cross-sectional dependence tests in the literature are considered for robustness since they have different underlying assumptions. The first one is the Lagrange multiplier (LM) test developed by Breush and Pagan [6] which is given as:

$$LM_{BP} = \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\beta}_{kj}^2 \quad (6)$$

where  $\hat{\beta}_{kj}^2$  denotes the coefficient of the pair-wise correlation of the residuals obtained from the ordinary least squares (OLS) estimations. One of the assumptions underlying the LM statistic is that it observes asymptotic distribution with the degrees of freedom of the Chi-square given as  $\frac{1}{2}(N^2 - N)$ . Also, the validity of the LM test is holds for panel series with large time periods,  $T$ , and fixed number of cross sections,  $N$ . On the contrary, if  $T$  is fixed and  $N$  is large, bias results can be produced by the LM test. Thus, Pesaran rescales the expression in Eq. (4) to give:

$$LM_{PS} = \sum_{i=1}^{N-1} \sum_{j=i+1}^N (\hat{\beta}_{kj}^2 - 1) \sim N(0, 1) \quad (7)$$

In the case of large  $T$  and  $N$ , however, Pesaran further develops the cross-sectional dependence (CD) test as shown below:

$$CD_{PES} = \sqrt{\left(\frac{2T}{N(N-1)}\right)} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\beta}_{kj}^2\right) \sim N(0, 1) \quad (8)$$

Interestingly, the CD test in Eq. (6) can additionally account for error variances in the heterogeneous

dynamic panel model and inherent structural breaks in the slope coefficients. These make it superior to the previously developed models. However, the CD test is not without its own weakness. Pesaran et al. [21] observe that as the mean of the average cross section of the factor loading approaches zero, it may produce inconsistent estimates. Therefore, Pesaran et al. [21] consider the variance and exact mean of the original LM statistic to produce an adjusted LM test devoid of any potential bias. This is given as:

$$LM_{ADJ} = \sqrt{\left(\frac{2}{N(N-1)}\right)} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\beta}_{kj}^2 \quad (9)$$

$$\frac{(T-k)\hat{\beta}_{kj}^2 - \mu_{Til}}{\sqrt{v_{Til}^2}} \sim N(0, 1)$$

where  $i$  denotes the number of explanatory variables,  $v_{Til}^2$  and  $\mu_{Til}$ , respectively, denote the variance and exact mean of  $(T-k)\hat{\beta}_{kj}^2$ .

#### Panel unit root tests

Unit root tests are important to show the stationarity properties of the series under consideration and to determine appropriate estimation techniques. Due to the probable evidence of cross-sectional dependence among panel series, we consider the second-generation unit root tests which are capable of producing accurate results in the presence of the undesirable statistical feature. In particular, cross-sectional augmented Dickey–Fuller (CADF) and cross-sectional augmented Im, Pesaran and Shin (CIPS) unit root tests developed by Pesaran [20] are employed. For the first test, i.e., the CADF, the traditional ADF test is augmented with the averages of the cross sections thus:

$$\Delta y_{it} = \psi_0 + \psi_1 y_{i,t-1} + \psi_2 \bar{y}_{t-1} + \sum_{j=1}^p \omega_{1ij} \Delta \bar{y}_{i,t-j} \quad (10)$$

$$+ \sum_{k=0}^q \omega_{2ij} \Delta y_{t-k} + \mu_{it}$$

where the lagged cross-sectional means at level and first difference are represented by  $\bar{y}_{t-j}$  and  $\Delta \bar{y}_{t-j}$ , respectively.

Then, the CIPS unit root test is obtained as:

$$CIPS = \frac{1}{N} \sum_{i=1}^N CADF_i \quad (11)$$

Interestingly, another merit of the CIPS test is that it can conveniently account for autocorrelation if present (see [10]). Moreover, making conclusion with the results

of the CIPS test is based on critical values calculated in Pesaran [20].

### Westerlund [26] panel cointegration tests

Next, we explore the possibility of the panel series to cointegrate in the long-run through the panel cointegration test of Westerlund [26] which is also notable in dealing with cross-sectional dependence. This is specified as:

$$\Delta y_{it} = \xi'_i d_t + v_i y_{i,t-1} + \varpi'_i x_{i,t-1} + \sum_{j=1}^{p_i} v_{1ij} \Delta y_{i,t-j} + \sum_{j=-k_i}^{q_i} v_{2ij} \Delta x_{i,t-j} + \mu_{it}. \quad (12)$$

where the deterministic component is represented by  $d_t$ . If  $d_t = (1, t)$ , the model contains both intercept and trend. If  $d_t = 1$ , only intercept is contained in the model. The last scenario is if  $d_t$  is not different from zero, indicating that the model is generated without any deterministic terms. In addition,  $y_{it}$  and  $x_{it}$  are said to cointegrate if  $v_i < 0$ . Essentially, the value of  $v_i$  below zero is suggestive of the existence of error correction, i.e., adjustment to long-run equilibrium. Thus, if  $v_i$  is not significantly different from zero, error correction, and by implication cointegration between  $y_{it}$  and  $x_{it}$ , does not exist. Meanwhile, Westerlund [26] shows that the cointegration test is in dual form, i.e., the group and panel tests. For the group test, the null hypothesis of no cointegration (i.e.,  $H_0 : v_i = 0$  for all  $i$ ) is tested against the alternative given as  $H_1^g : v_i < 0$  in a minimum of one cross section,  $i$ . The implication is that the equality of the  $v_i$  s is not compulsory for the group test. Only the panel test requires that equality is established for the  $v_i$  s for all the cross sections,  $i$ . This leads to the testing of the  $H_1^p : v_i = v < 0$  null hypothesis.

## Results and discussion

### Preliminary results

The first set of results required for analyses with causal relationship are the preliminary results. Apart from describing the statistical properties of the series being considered, they are instrumental in informing and validating the main empirical models to be employed. We therefore start with the descriptive statistics of the series followed by their trends over the periods being studied. Their cross-sectional dependence, stationarity properties and cointegration results follow in that order. Since the scope of this study also covers the comparative performance of the oil price–business confidence nexus between the Eurozone and non-Eurozone areas, the preliminary analyses are made to distinctly capture the full

**Table 1** Descriptive statistics of series

Variables	Mean	Maximum	Minimum	Std. dev	No. of obs
Panel sample					
<i>Full sample</i>					
<i>bci</i>	100.1647	107.7152	87.4210	1.8043	6561
<i>int</i>	2.4547	21.2500	−0.7900	2.5946	6561
<i>unm</i>	7.9365	27.9000	1.8000	4.3983	6561
Eurozone					
<i>bci</i>	100.2415	107.7152	87.4210	2.0978	3888
<i>int</i>	1.9151	21.2500	−0.4176	2.2094	3888
<i>unm</i>	9.3276	27.9000	1.8000	4.7348	3888
Non-Eurozone					
<i>bci</i>	100.0530	103.9544	94.0971	1.2526	2673
<i>int</i>	3.2395	19.8200	−0.7900	1.2526	2673
<i>unm</i>	5.9130	20.5000	1.8000	2.8230	2673
<i>Global (cross-section invariant) series (2000M1–2020M03)</i>					
<i>brent</i>	64.3794	132.7200	18.7100	29.8653	243
<i>WTI</i>	61.5607	133.8800	19.3900	26.0753	243
<i>epu</i>	121.4435	344.1584	47.2237	54.9635	243

sample and the two divisions. The only exemption is the graphical illustration which only presents for the sub-samples. Also, since the oil prices and economic policy uncertainty are cross-section-invariant because they are global series (i.e., not country-specific), they cannot be captured in panel forms under the descriptive statistics, cross-sectional dependence and unit root tests.

Table 1 presents the descriptive statistics of the series with the entire OECD enjoying fairly strong business confidence on average since the index exceeds 100 (100.1647). Their average cost of capital, measured through interest rate and the rate of unemployment are mild at 2.4547% and 7.9365%, respectively. Comparing the two sub-groups, Eurozone countries are seen to have higher business confidence on average than their non-Eurozone counterparts. Interestingly, the former group with higher business confidence is also associated with higher average unemployment rate given as 9.3276% compared to the former with unemployment rate of just 5.9130%. It appears more costly to borrow in the non-Eurozone countries given their average interest rate to be 3.2395%. This is unlike the Eurozone countries where the average cost of capital is just 1.9151%. Without doubt, all these indices are more volatile in the Eurozone countries, judging by their higher standard deviation statistics when compared with those of the non-Eurozone countries. The last panel of Table 1 is devoted to the cross-section-invariant series, particularly oil price and global economic policy uncertainty. The differences in the statistics of Brent and WTI oil prices are not too wide apart, reflecting their strong correlation and competition. While the mean



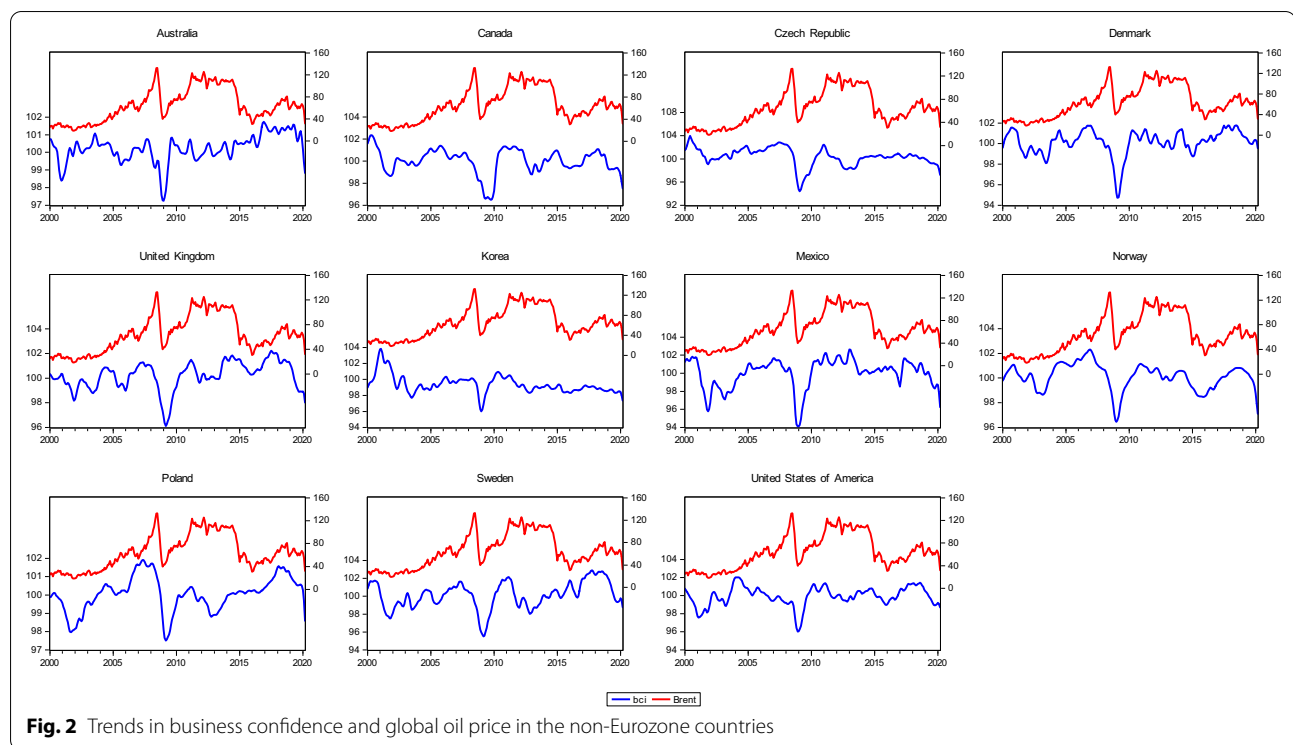


value of Brent is \$64.3794, it is \$61.5607 for WTI. Also, the global economy seems to have been thrown into a more severe uncertainty since about the last two decades as revealed by the high average economic policy uncertainty of 121.4435. In addition, these global series exhibit high fluctuation and volatility.

To trace out any possible co-movements in the business confidence and each of oil price and economic policy uncertainty series, the trends are plotted in Figs. 1, 2, 3 and 4 for the Eurozone and non-Eurozone countries. In both groups, a negative correlation seems to be inherent between both factors and business confidence, coupled with significant fluctuations. It thus appears that a lower business confidence level could be informed by a rising oil price and economic policy uncertainty. Based on these reports, it makes sense to examine the likelihood of these global factors affecting business confidence for the fully sampled OECD countries and the two sub-samples.

The remaining preliminary analyses results have implications for the choice of estimation techniques to be employed. At the highest level of significance, Table 2 shows that all the panel series (i.e., business confidence,

interest rate and unemployment rate) exhibit interdependencies across the cross sections and in all the sampled cases. The presence of cross-sectional dependence among the series informs the choice of the two second-generation unit root tests (CIPS and CADF) developed by Pesaran [20], which are capable of handling this feature. The findings show that the integration properties of the series are best described as mixed between level- and first-difference stationarities (see Table 2). For the global series, a battery of robust time series-based unit root tests is used since they are invariant across cross sections. For comprehensiveness, three tests are employed with the first two (Phillips–Perron (PP) and Dickey–Fuller generalized least squares (DFGLS)) being unable to account for structural breaks in the series, but have higher power than the conventional augmented Dickey–Fuller (ADF) unit root test. The third is the structural breaks version of the ADF test (ADF-SB) which can conveniently account for one endogenous break. Except for the fully sampled economic policy uncertainty index under PP test that shows stationarity at level, all other scenarios depict that all the global series are non-stationary (Tables 3 and 4).



Having established the non-stationarity of most of the series, their analysis can either show spurious results or be cointegrated. It therefore becomes necessary to further explore the likelihood of long-run relationship among the series. Again, second-generation cointegration test due to Westerlund [26] is employed following the evidence of the cross-sectional dependence and non-stationary behavior of the series. To create basis for the consideration of asymmetries in oil price in the nexus, the cointegration test is conducted for both the symmetric and asymmetric models. Regardless of the proxy for oil price, whether Brent or WTI, no single case is the null hypothesis of no cointegration not rejected for all the samples (full and sub-samples). In other words, both the group and panel mean statistics of the cointegration test consistently prove the presence of long run relationship among the series for both the symmetric and asymmetric models, mostly at the 1% significance level.

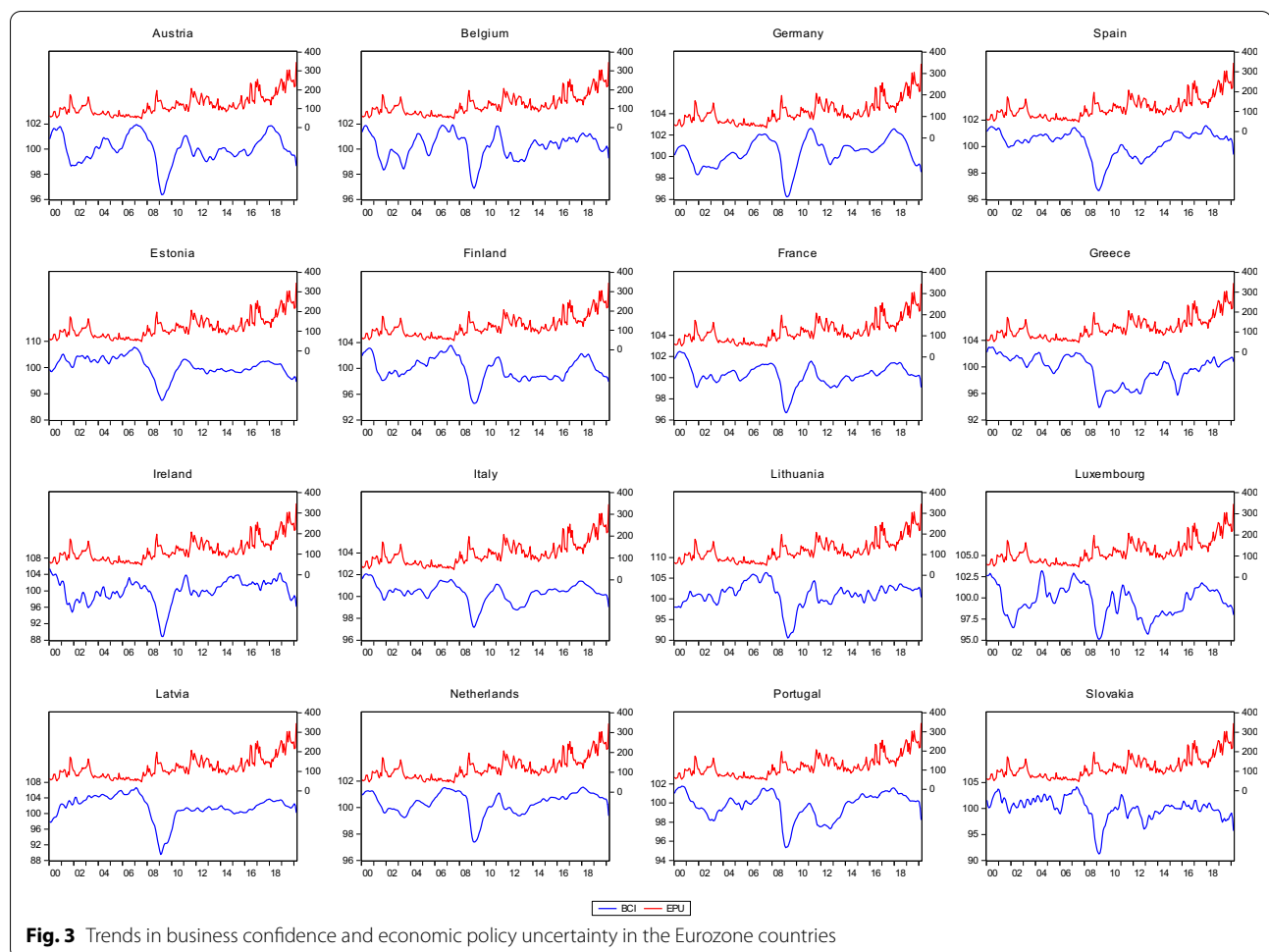
#### Long-run estimation results

So far, we have established the presence of statistical features including cross-sectional dependence, non-stationarity and cointegration in the panel series. Two facts are basically drawn from these results. One, the presence of non-stationarity and cointegration among the series suggests the consideration of a long-run estimator. Two, among available long-run estimators, only the second-generation estimators are appropriate for this

study due to the evidence of cross-sectional dependence. Based on these facts, this study employs the Augmented Mean Group (AMG) estimator proposed by Eberhardt and Bond [27]. Thus, the results are in various subsections covering the full sample, sub-sample and the role of asymmetries.

#### *Oil price-economic policy uncertainty-business confidence nexus in OECD countries*

In Table 5, we find that the effect of oil price on business confidence in the OECD countries is evidently negative, although small, implying that people's confidence in doing businesses drop during the periods of increasing oil price. In particular, business confidence responds adversely by 0.0042% or 0.0088% (depending on the proxy for the global oil price) to a unit percentage change in oil price. The OECD group largely consists of highly industrialized countries with significant consumption of crude oil for production purposes. For instance, the share of oil consumption of the OECD countries alone in global demand is about 47% in 2018, and oil demand is still on the increase in this group, especially by the USA, the world's largest consumer of the commodity [29]. Their net oil importing status on average makes them particularly vulnerable to increases in oil price. Oil price increase causes higher inflation, higher production cost and reduction in investment prospects in these countries. It also drains consumers' disposable income and



limits their retail spending. In addition, there is a decline in tax revenue, and therefore, budget deficits are experienced, which further raises the interest rate. Besides, higher price of oil puts pressure on nominal wage to increase following resistance to wage decline. The combined effects of the reduced demand and wage pressure tend to result in higher unemployment which eventually adversely impact consumer and business confidence.

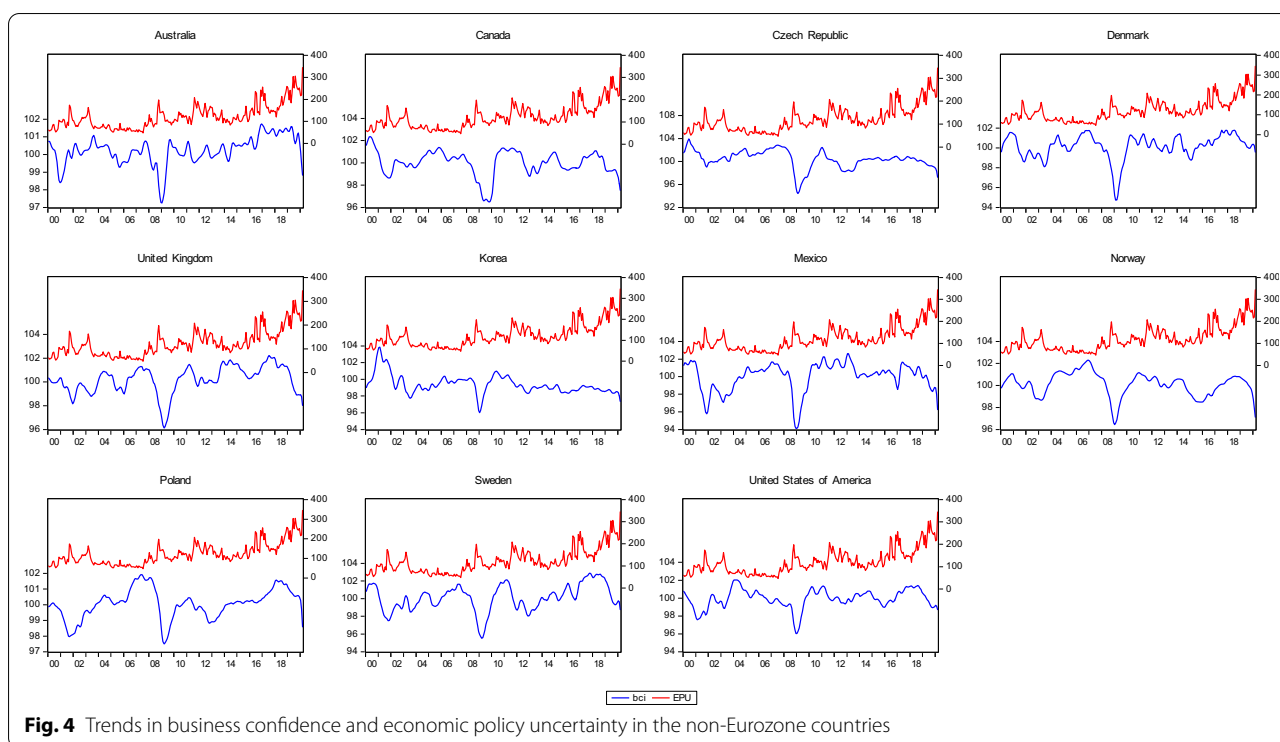
Similarly, there is an adverse influence of economic policy uncertainty on business confidence. Interestingly, its impact is greater than oil price (0.0183% and 0.0185% under Brent and WTI as proxies for oil price, respectively), suggesting the critical role uncertainty due to economic policy plays in business performance. Also, it is observed that one other influencing factor, particularly interest rate, has negative impact on business confidence. While higher interest rate penalizes investments, surges in uncertainty in economic policy increases systemic risks, dampens investment and spending decisions of individuals and firms. This evidence aligns with the discoveries of past studies as regards the influence of

macroeconomic indicators on business confidence (see [7, 14].

#### *The role of asymmetries in the nexus*

We hypothesize that positive changes in oil price would not have equal impact on business confidence as negative changes. Numerous studies have shown that due to the highly volatile nature of the global oil market, oil prices often exhibit positive and negative shocks whose impacts on economic indicators such as inflation, commodity prices and stock returns have unequal weights (see, for instance, [1, 28, 23]). We follow suit to examine the possibility of business confidence in the OECD countries to respond to positive and negative asymmetries in oil price differently. The results are presented in the last two columns of Table 5 for the two proxies of oil price. At a glance, two notable facts are drawn from the results. First, our hypothesis is right following the significance of both the positive and negative oil price changes at the highest significance level, with the negative impact being greater for the former. In other words, increase



**Table 2** Cross-sectional dependence tests results

	Full sample			Sub-sample					
	<i>bci</i>	<i>int</i>	<i>unm</i>	Eurozone			Non-Eurozone		
	<i>bci</i>	<i>int</i>	<i>unm</i>	<i>bci</i>	<i>int</i>	<i>unm</i>	<i>bci</i>	<i>int</i>	<i>unm</i>
<b>LM<sub>BP</sub></b>	35,171.23 <sup>#</sup>	62,258.10 <sup>#</sup>	18,104.35 <sup>#</sup>	15,543.15 <sup>#</sup>	24,427.71 <sup>#</sup>	6894.06 <sup>#</sup>	4038.21 <sup>#</sup>	8243.77 <sup>#</sup>	2712.09 <sup>#</sup>
<b>LM<sub>PS</sub></b>	1313.19 <sup>#</sup>	2335.51 <sup>#</sup>	669.04 <sup>#</sup>	994.53 <sup>#</sup>	1568.02 <sup>#</sup>	436.23 <sup>#</sup>	378.73 <sup>#</sup>	779.72 <sup>#</sup>	252.30 <sup>#</sup>
<b>LM<sub>ADJ</sub></b>	1313.13 <sup>#</sup>	2335.46 <sup>#</sup>	668.98 <sup>#</sup>	994.49 <sup>#</sup>	1567.99 <sup>#</sup>	436.20 <sup>#</sup>	378.71 <sup>#</sup>	779.69 <sup>#</sup>	252.27 <sup>#</sup>
<b>CD<sub>PES</sub></b>	178.90 <sup>#</sup>	246.57 <sup>#</sup>	76.26 <sup>#</sup>	122.66 <sup>#</sup>	155.16 <sup>#</sup>	45.13 <sup>#</sup>	58.20 <sup>#</sup>	89.81 <sup>#</sup>	28.10 <sup>#</sup>

The cross-sectional dependence tests are not conducted for the global series (oil prices and economic policy uncertainty) because they are cross-section invariant. # indicates significance at 1% critical level

**Table 3** Unit root tests results

Variables	Full sample	Sub-sample		Full sample	Sub-sample	
		Eurozone	Non-Eurozone		Eurozone	Non-Eurozone
	CIPS			CADF		
<i>bci</i>	−2.635 <sup>a,***</sup>	−2.108 <sup>a,***</sup>	−2.635 <sup>a,***</sup>	−5.020 <sup>a,***</sup>	−4.826 <sup>a,***</sup>	−5.511 <sup>a,***</sup>
<i>int</i>	−6.420 <sup>b,***</sup>	−3.571 <sup>a,***</sup>	−2.424 <sup>a,**</sup>	−3.436 <sup>a,***</sup>	−3.210 <sup>a,***</sup>	−2.263 <sup>a,**</sup>
<i>unm</i>	−6.420 <sup>b,***</sup>	−6.190 <sup>b,***</sup>	−2.525 <sup>a,***</sup>	−6.152 <sup>b,***</sup>	−6.036 <sup>a,***</sup>	−6.343 <sup>a,***</sup>
Global (cross-section invariant) series (2000M1–2020M03)						
	PP		DFGLS		ADF−SB	
<i>brent</i>	−11.017 <sup>b,***</sup>		−8.745 <sup>b,***</sup>		−12.457 <sup>b,***</sup>	
<i>WTI</i>	−10.089 <sup>b,***</sup>		−6.002 <sup>b,***</sup>		−11.673 <sup>b,***</sup>	
<i>epu</i>	−4.6207 <sup>a,***</sup>		−4.8178 <sup>b,***</sup>		−6.4700 <sup>b,***</sup>	

The stationarity feature of the global series (Brent, WTI and epu) is conducted with time series unit root tests since they are cross-section invariant. a and b, respectively, denote level and first difference stationarities. \*\*\* and \*\* denote significance at 1% and 5% critical levels

**Table 4** Results of Westerlund [26] panel cointegration test

Statistics	Full sample		Sub-sample			
			Eurozone		Non-Eurozone	
	Brent	WTI	Brent	WTI	Brent	WTI
<i>Symmetric model</i>						
$G_t$	−3.310***	−3.168***	−3.549***	−3.366***	−3.132***	−3.039**
$G_a$	−19.083***	−18.549***	−19.330***	−18.822***	−19.574***	−19.003***
$P_t$	−14.344***	−14.116***	−11.769***	−11.579***	−10.247***	−9.975***
$P_a$	−17.241***	−16.963***	−17.908***	−17.653***	−18.923***	−18.351***
<i>Asymmetric model</i>						
$G_t$	−3.198***	−3.175***	−3.447***	−3.444***	−3.071*	−3.095*
$G_a$	−18.070**	−19.069***	−18.570**	−2.233**	−18.576*	−19.863**
$P_t$	−14.141**	−14.033*	−11.503**	−1.760**	−10.175**	−10.210**
$P_a$	−16.043***	−16.840***	−16.678***	−2.855***	−17.632***	−19.164***

$G_t$  and  $G_a$  denote group mean tests, while  $P_t$  and  $P_a$  denote panel mean tests. \*\*\*, \*\* and \* indicate significance at 1%, 5% and 10% critical levels, respectively

**Table 5** Long-run estimation results in OECD

Regressors	Symmetry		Asymmetry	
	Brent	WTI	Brent	WTI
<i>oil</i>	−0.0042*** (0.0013)	−0.0088*** (0.0014)		
<i>oil</i> <sup>+</sup>			−0.0128*** (0.0013)	−0.0109*** (0.0014)
<i>oil</i> <sup>−</sup>			−0.0162*** (0.0013)	−0.0145*** (0.0014)
<i>epu</i>	−0.0183*** (0.0019)	−0.0185*** (0.0019)	−0.0168*** (0.0019)	−0.0183*** (0.0019)
<i>int</i>	−0.0009* (0.0005)	−0.0009* (0.0005)	−0.0009* (0.0005)	−0.0009* (0.0005)
<i>unm</i>	0.0001 (0.0005)	0.0001 (0.0005)	0.0001 (0.0005)	0.0001 (0.0005)
<i>c</i>	4.7098*** (0.0147)	4.7256*** (0.0152)	4.7418*** (0.0147)	4.7436*** (0.0151)
<i>Diagnostics</i>				
Wald Chi-sq	130.50*** [0.0000]	116.51*** [0.0000]	580.781*** [0.0000]	4562.75*** [0.0000]
RMSE	0.0100	0.0100	0.0099	0.0100
Obs	6561	6561	6561	6561

Values in brackets are standard errors, while those in parentheses are probabilities. \*\*\*, \*\* and \* indicate significance at 1% and 10% critical levels, respectively

in negative oil price asymmetry appears to relatively reduce business confidence than increase in positive oil price asymmetry. Second, a higher effect of oil price on business confidence is established with the asymmetric model compared to the symmetric model. Using Brent for instance, intuitively, using Brent for instance, a 1% positive change in oil price reduces business confidence by 0.0128%, whereas a 1% negative change in oil price

enhances business confidence by 0.0162%. It thus seems that accounting for asymmetries leads to more accurate and reliable results as the aggregation bias of the original oil price under the symmetric model is circumvented. In essence, the role of asymmetries in the oil price–business confidence relationship in the OECD countries is crucial and should not be jettisoned.

However, while the impact of oil price increases when asymmetries are accounted for, there appears to be a mild reduction in the impact of economic policy uncertainty whose new coefficients are estimated as −0.0168% (Brent) and −0.0183% (WTI) unlike −0.0183% and −0.0185%, respectively, recorded for Brent and WTI under the symmetric oil price scenario.

#### **Eurozone versus non-Eurozone**

Countries in the OECD group can further be divided into two groups reflecting their currency status. Countries in the Eurozone are those that have approved the euro as their national currency, while the non-Eurozone countries consider otherwise. Meanwhile, the Eurozone countries tend to have uniform and formalized monetary system as the European Central Bank (ECB) works hand-in-hand with the national coordinating banks of all member countries in order to maintain fairly stable economic system and promote growth and economic integration. Certainly, this would have implications on how businesses in these countries would strive and the degree of sensitivity of business confidence to external factors including oil shocks. Due to this faction in the OECD group therefore, we set out to answer the poser: does oil price affect business confidence in the Eurozone and non-Eurozone countries of the OECD group differently?

**Table 6** Long-run estimation results for sub-samples using Brent

Regressors	Eurozone		Non-Eurozone	
	Symmetry	Asymmetry	Symmetry	Asymmetry
<i>oil</i>	−0.0107*** (0.0019)		−0.0043*** (0.0010)	
<i>oil</i> <sup>+</sup>		−0.0175*** (0.0019)		−0.0047*** (0.0011)
<i>oil</i> <sup>−</sup>		−0.0212*** (0.0019)		−0.0078*** (0.0010)
<i>epu</i>	−0.0173*** (0.0028)	−0.0159*** (0.0028)	−0.0162*** (0.0022)	−0.0158*** (0.0022)
<i>int</i>	−0.0009 (0.0006)	−0.0009 (0.0006)	−0.0024*** (0.0006)	−0.0024*** (0.0006)
<i>unm</i>	−0.0001 (0.0004)	−0.0001 (0.0004)	−0.0019* (0.0010)	−0.0019* (0.0010)
<i>c</i>	4.7287*** (0.0207)	4.7568*** (0.0207)	4.7191*** (0.0139)	4.7287*** (0.0139)
<i>Diagnostics</i>				
Wald Chi-sq	55.12*** [0.0000]	7177.84*** [0.000]	92.29*** [0.0000]	20,679.5*** [0.0000]
RMSE	0.0112	0.0112	0.0063	0.0063
Obs	3888	3888	2673	2673

Values in brackets are standard errors, while those in parentheses are probabilities. \*\*\* and \* indicate significance at 1% and 10% critical levels, respectively

**Table 7** Long-run estimation results for sub-samples using WTI

Regressors	Eurozone		Non-Eurozone	
	Symmetry	Asymmetry	Symmetry	Asymmetry
<i>oil</i>	−0.0014 (0.0020)		−0.0043*** (0.0010)	
<i>oil</i> <sup>+</sup>		−0.0009 (0.0020)		−0.0047*** (0.0010)
<i>oil</i> <sup>−</sup>		0.0003 (0.0020)		−0.0068*** (0.0010)
<i>epu</i>	−0.0187*** (0.0029)	−0.0188*** (0.0029)	−0.0167*** (0.0022)	−0.0166*** (0.0022)
<i>int</i>	−0.0009 (0.0006)	−0.0009 (0.0006)	−0.0024*** (0.0007)	−0.0024*** (0.0007)
<i>unm</i>	−0.0001 (0.0004)	−0.0001 (0.0004)	−0.0019* (0.0010)	−0.0019* (0.0011)
<i>c</i>	4.7045*** (0.0215)	4.6993*** (0.0214)	4.7216*** (0.0140)	4.7298*** (0.0140)
<i>Diagnostics</i>				
Wald Chi-sq	89.55*** [0.0000]	1055.49*** [0.0000]	96.19*** [0.0000]	2090.39*** [0.0000]
RMSE	0.0112	0.0112	0.0063	0.0063
Obs	3888	3888	2673	2673

Values in brackets are standard errors, while those in parentheses are probabilities. \*\*\* and \* indicate significance at 1% and 10% critical levels, respectively

Tables 6 and 7 present the comparative results. When Brent serves as the proxy for the global oil price, oil price has higher negative influence on business confidence in the Eurozone countries than their non-Eurozone counterparts regardless of the consideration of the role of asymmetries or not (see Table 6). The symmetric results reveal a negative oil price impact of 0.0107% on business confidence in the Eurozone countries, while it is just 0.0043% in the non-Eurozone countries. Turning to the asymmetric case, negative relationship is again found between positive and negative oil price changes and business confidence, with the magnitudes of effects being 0.0175% and 0.0212%, respectively, in the Eurozone countries, and just 0.0047% and 0.0078% in the non-Eurozone countries, respectively. In Table 7, it is observed that the WTI oil price fails to have a significant impact on the Eurozone countries, but not in the non-Eurozone countries. The probable reason for these differences in results is that Brent oil price is the international benchmark used by the Organization of Petroleum Exporting Countries (OPEC) unlike WTI oil price that represents the benchmark of the USA. This accounts for the significance of the WTI oil price in the non-Eurozone countries where the USA is a leading factor, but not in the Eurozone countries. Nonetheless, we rely on the results of the Brent oil price that represents an international benchmark. Thus, despite the central and regulated coordination of the economic system of the Eurozone countries, businesses in these countries are still more sensitive to unfavorable movements in oil price than other OECD countries.

Essentially, the high oil import dependency of the European Union (EU) which virtually all the Eurozone countries belong is responsible for the higher sensitivity of business confidence to oil price changes. For instance, in 2018, the reliance of the EU on net imports of oil and petroleum products consumed in 2018 is 94.6%. In fact, the lowest oil dependency in this region was in 1995 with a rate of 92.9%. Recent years have experienced a significant surge with the highest being 96.7% in 2015.<sup>2</sup> The implication of this high dependency on oil is that an upward push in its price constitutes increase in domestic aggregate price level and production costs which further reduce business and investment chances. On the other hand, although the non-Eurozone counterparts significantly rely on crude oil too, their net-oil dependency rate is lower following the net-oil exporting statuses of a number of countries in the group. Non-Eurozone countries such as Canada, Denmark, Mexico and Norway are

<sup>2</sup> The highlighted information is officially provided by Eurostat and can be explored at [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Oil\\_and\\_petroleum\\_products\\_-\\_a\\_statistical\\_overview&oldid=315177#Oil\\_imports\\_dependency](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Oil_and_petroleum_products_-_a_statistical_overview&oldid=315177#Oil_imports_dependency).

significant players in global oil production and exports. This makes any increase in the price of oil to have lower adverse impact on the domestic economy of the non-Eurozone countries on average, thus making the confidence of businessmen to be less affected.

Moreover, it is worth stressing that economic policy uncertainty is still found to affect business confidence in the two country groups with the influence being marginally greater for the Eurozone countries. This is likely due to the central monetary policy coordination of the countries which could make uncertainty to easily trickle down to member countries through a common channel.

## Conclusion

While future path of growth of an economy, economic cycles and investments have been relatively predicted by the level of business confidence, what factors basically affect the confidence of businesses remains highly understudied in the empirical literature. Rather, speculations have been made without concrete empirical foundation. To cover this gap, this study examines the influence of economic policy uncertainty and oil price shocks on the business confidence of the OECD countries. While uncertainty from economic policy has become very prominent in affecting the macroeconomy in recent years, the importance of crude oil in economic activities and virtually all sectors of the economy cannot be overemphasized. More importantly, the OECD group constitutes the world's most developed, industrialized and prosperous countries which significantly depend on the consumption of crude oil, the world's most traded and consumed commodity. Thus, unfavorable oil price changes could constitute adverse effect on domestic aggregate price level which then causes high production inputs and higher price of non-tradable goods, while economic policy-based uncertainty could lower business prospects. These eventually penalize investments, business activities and then business confidence. In addition, we compare the performance of the oil price-economic policy uncertainty-business confidence nexus for the Eurozone and non-Eurozone countries of the OECD group since they both have certain differing economic structures, such as differences in their official currency and net-oil consumption status.

Our preliminary analyses show evidence of cross-sectional dependence, non-stationarity in some of the series and cointegration among the series. These motivate the use of the Augmented Mean Group (AMG) estimator which suitably handles all the statistical features, in addition to heterogeneous behavior of panel series. The full sample results show that business confidence is adversely affected by both economic policy uncertainty and oil price, with the impact of the former

being greater. The small impact of oil price is obviously due to the non-consideration of asymmetries in the relationship as the global crude oil market has, over time, been sensitive to external crises or shocks that make oil price to exhibit nonlinear dynamics. Accounting for asymmetries therefore, we find significant increase in the oil price coefficients, even though they are still expectedly negative. As against the symmetric negative impact of oil price being 0.0042%, positive changes in oil price adversely affect business confidence, while the reverse is the case for negative changes in oil price. Turning to the comparative analysis, we discover that the impact of the two indicators on business confidence is stronger in the Eurozone countries than their non-Eurozone counterparts. This is consistent regardless of whether asymmetries are accounting for or not. The higher response of business confidence to the factors in the Eurozone countries is due to their centrally coordinated system and higher dependence on crude oil. These findings are largely robust to alternative oil price measures. Other economic indicators that serve as control variables are also found to be significant in most cases, thus justifying their inclusion.

Based on these findings, relevant policy measures can be suggested to the notice of policy makers in these countries. Especially for the Eurozone areas, the adverse impact of positive oil price changes suggests a significant reduction in the overdependence on, and imports of, crude oil for economic and industrial activities. This can be achieved through increased exploration of renewable energy sources so that appropriate energy mix is achieved between them and crude oil. With this, there would be less demand on crude oil which would push down its price and then enhance business confidence, consistent with the negative coefficients of the negative oil price changes. Due to cases where the consumption of crude oil is inevitable, the OECD countries are encouraged to strengthen their domestic economies so that domestic businesses are resilient to shocks in the global crude oil market. Also, since business confidence is crucial for determining and predicting the future path of economic growth and cycles, policy makers must pay attention to the role of asymmetries in oil price which is a notable factor affecting business confidence. In addition, policy makers are advised to monitor movements in global economic policy uncertainty and ensure that their domestic policies are carefully formulated as inappropriateness can dampen business prospects. Lastly, there is need for future studies to still delve into determinants of business confidence across studies as empirical studies on it are still scanty. Such line of study includes the connection of economic policy uncertainties, credit growth, interest rates, exchange rates and political instability, among

others, with business confidence. Cross-country studies would also be a laudable empirical exercise.

#### Abbreviations

OECD: Organisation for Economic Co-operation and Development; CCEMG: Common correlated effects mean group; AMG: Augmented Mean Group; EU: European Union; WTI: West Texas Intermediate; CIPS: Cross-sectional augmented Im, Pesaran and Shin; CADF: Cross-sectional augmented Dickey–Fuller; PP: Phillips–Perron; DFGLS: Dickey–Fuller generalized least square; IEA: International Energy Agency; ECB: European Central Bank; OPEC: Organization of Petroleum Exporting Countries.

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#### Authors' contributions

All the authors have read and approved the manuscript. Their contributions are highlighted as follows: OBA contributed to the conceptualization, data curation, methodology, analysis and supervision. JAO contributed to the writing—original draft preparation, reviewing, editing and validation.

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#### Declarations

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