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Government Size, Unemployment, and Inflation Nexus in Eight Large Emerging Market Economies

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Abstract

Using a panel of eight large emerging market economies from 1980 to 2015, this paper seeks to assess the causal linkages between government size, unemployment, and inflation. Overall, our results suggest that the government size is positively associated with both unemployment and inflation. The Granger causality runs from the government size to unemployment and to inflation. From our analysis, two aspects stand out. First, the effects of government size on unemployment and inflation depend essentially on how the government size is measured. As long as government consumption spending is considered as the proxy measure of the government size, the government size is significantly and positively correlated with unemployment, and with inflation. Second, indirect taxes, like government consumption spending, have a positive as well as statistically significant association with unemployment. However, the direct taxes solely exert a strong effect on inflation in the countries considered.

Keywords: Government Size, Unemployment, Inflation, Emerging Market Economies.

JEL Codes: H10, E61, E63

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1. Introduction

A public finance topic that has received quite extensive attention is government size. Notably, the association of government size with growth for both developed and developing countries have received tremendous attention from public finance economists and growth theorists. This may be explained because of the following two reasons. First, perhaps the most important one, the government size as a topic is not only economically, but also politically important for almost all countries. The size of government has expanded considerably in a large number of countries especially in the post-World War II period. However, with the influence of neo-liberal policies dominated in the aftermath of the early 1970s, it has relatively tended to downsize. Privatization implementations in many countries have played a key role in downsizing the government. Second, the mixed results with regard to the government size-growth nexus have sparked off conducting more and more studies using different econometrical procedures to different sample size for different single-country and/or country groups.

Consequently, the literature on the nexus between government size and growth has expanded substantially and has been continuing to grow. Among wide literature, the studies by Scully (1989), Barro (1991), Engen and Skinner (1992), Fölster and Henrekson (2001), Dar and AmirKhalkhali (2002), Bose et al. (2007), Afonso and Furceri (2010), Ghose and Das (2013) and Christie (2014) are some of them that deserve to mention at first glance.

Unlike many previous studies that focus extensively on the relationship between government size and growth, this paper seeks to examine the association of government size with unemployment and inflation that has been studied highly less relative to its association with growth. Even more, it has been largely ignored. In fact, it is widely recognized that unemployment and inflation are two major unpleasant things that make economies and societies unhappy. Now then, it is of great importance from the perspective of macroeconomic policymaking to understand how government size affects unemployment and inflation is. To shed light on this issue, the present paper undertakes an empirical investigation.

The novelty of this paper is severalfold. First, to the best of our knowledge, the paper focuses on a country group for which the topic has not been studied up to now. Second, for virtually all countries, including the countries under consideration in this paper (Argentina, Brazil, China, India, Indonesia, Mexico, South Africa, and Turkey), unemployment and inflation are two major macroeconomic problems. Third, the paper employs a panel cointegration and causality approach, contrary to most previous studies that applied time series models, to determine the existence of possible causal linkages among the variables considered. Overall, our results suggest that the government size is positively associated with both unemployment

and inflation. The Granger causality runs from the government size to unemployment and to inflation.

The rest of the paper proceeds as follows. Section 2 provides a theoretical and empirical literature review on the association of government size with unemployment and inflation, while Section 3 explains the econometric framework. Section 4 reports the estimation results and respective discussion. Section 5 concludes.

2. Theoretical Background and Empirical Literature

2.1. Theoretical Background

2.1.1. Theoretical Background to Government Size–Unemployment Nexus

There is little counter-argument that unemployment and inflation are economically undesirable for societies and they maximize societies' welfare and well-being.[1] Therefore, achieving full employment together with stable prices is always viewed as the two primary goals of macroeconomic policy for virtually all countries. For this reason, it is noteworthy for researchers to investigate the unemployment and inflation-driven factors. One of these factors, perhaps the most important one, is government size.

Prior to linking government size with unemployment and inflation, it would be worth identifying how to measure government size. There are several of ways of measuring government size in the existing literature. For example, some researchers, such as Landau (1983, 1986), Barro (1991), Yamamura (2011), take government consumption over GDP as the measure of the government size, while others like Hsieh and Lai (1994), Chao and Grubel (1998), and Chen and Lee (2005) consider the share of total or central government expenditures in GDP at aggregate level. Some others, e.g., de Mendonça and Cacicedo (2015), take into account the central government or general government's tax revenue as a proportion of GDP. The possible impact of government size on unemployment differs in accordance with how to define or measure it. The common way of defining it is to take into consideration the ratio of general government's spending –to–GDP either at aggregate and their some sub-components' level (see, for example, Barro, 1991; Devarajan et al., 1996; Vedder and Gallaway, 1998; Dar and AmirKhalkhali, 2002; Afonso and Furceri, 2010; Afonso and Jalles, 2016).[2]

[1] It is valuable keeping in mind that there may be some arguments in favour of low and non-high volatile inflation in that it is welfare enhancing and economically desirable for societies. Through the present paper, the term inflation refers to relatively high and highly volatile inflation.

[2] For a comprehensive literature survey, see also Bergh and Henrekson (2011).

Scully (1989) puts forward and then demonstrates that increases in government size trigger unemployment by reducing technical efficiency, which refers to movements away from the production possibility curve.[3] As for Abrams (1999), he asserts that increases in government spending crowd out private investments that are sensitive to interest rates, resulting in not only a reduction in productivity but also a discouragement in technical change even if the spending is allocated for growth-enhancing infrastructure and some others, such as education and health. He goes on to argue that there are also some other explanations of how increases in government size give rise to unemployment. To begin, as we already mentioned, the larger government size means the larger government spending. The larger government spending means the more taxes. Increases in taxes result in the larger transfer of resources from the private sector to the government sector, implying bigger government size.

Unlike Scully (1989) and Abrams (1999), Battaglini and Coates (2011) look the issue from a fiscal policy perspective. The authors argue that increases in government spending or tax cuts (increases or decreases in government size, depending on how to measure or define it) may reduce unemployment rather than increase, but it takes place at the expense of substantial rises in long-run indebtedness of the government. To the authors, for example, tax cuts give the private sector an opportunity of hiring more people, whereas rises in government spending will lower unemployment by creating extra job opportunities in the public sector. However, it is highly likely that both actions will impose a significant financial cost on the government. As is seen, a key point to be emphasized here that how government size affects unemployment is closely related to how government size is defined.

With regard to the government size-unemployment nexus, the existing literature has some other alternative explanations. To start with, big governments mean much more taxes, requiring compulsorily more money to be transferred from individuals, households, and firms –labeled simply as economic agents– to the government sector. As a whole, high taxes on economic agents discourage them to save, to consume, and to invest or at least affect their economic decisions in this regard in one way or another. At this point, Abrams (1999) calls attention to that high-income tax rates may affect work-leisure decisions, encouraging not working. Second, in view of an economy that consists of two sectors of the government sector and private sector, ceteris paribus, the upsizing of the government sector result in the downsizing of the private sector. In this case, it becomes important that the net effect of the

[3] Technical efficiency refers to effectiveness of inputs, i.e. labour and capital, by which the output is produced. It establishes a physical link between resources –that are labour and capital– and outcome produced. A technical efficiency is said to be achieved the maximum possible improvement in outcome is obtained by using a given set of inputs. This is to say that there would not be any possibility of boosting output as long as at least one of the inputs is increased.

variation in the size of the relative government-private sectors on unemployment will depend on which sector creates more employment opportunities. Third, in some cases, the regulatory power of the government can be very strong even though the numerical size of the government, measured by ratios such as the government expenditures or taxes–to–GDP or the government final consumption–to–GDP, is substantially low. In this case, the government can have a potential of strict control over labor market. A case point is a minimum wage and working hours related arrangements of the government. It is very probable that such arrangements influence unemployment in one way another. Lastly but not least, the large government may cause an increase in the size of the informal economy via high taxes and its intensive regulations and arrangements, inciting unregistered employment. Hence, several possible ways associate government size with unemployment.

2.1.2. Theoretical Background to Government Size–Inflation Nexus

In a classic work, Sargent and Wallace (1981) argued that under the inter-temporal government budget constraint, monetary authority's commitment to provide and to maintain price stability would force the fiscal authority to act accordingly. What Sargent and Wallace (1981) call such a regime as monetary dominant or Ricardian regime. To put it simply, according to the authors, a monetary authority that is committed to price stability can control inflation inasmuch as the fiscal authority respects the monetary authority's commitment. However, if the fiscal authority does not act in accordance with the monetary authority's commitment that refers to fiscal dominant or non-Ricardian regime, in such case government spending is financed by money creation and it may put pressure on prices indirectly, depending on the extent to which monetary policy is loose or tough.

Similar to the Sargent and Wallace's (1981) unpleasant monetarist arithmetic discussed above, the fiscal theory of price level (FTPL) developed by Leeper (1991), Sims (1994), and Woodford (1994, 1995, 2001) and some others establishes a direct causal link between government size and inflation. The FTPL challenges the Milton Friedman's (1963) conventional proposition that "inflation is always and everywhere a monetary phenomenon", and claims that the price level is determined as well as maintained by fiscal policies, but rather monetary policies as asserted by Friedman.

Referring to a fiscal dominant regime, the FTPL proponents argue that the fiscal dominant regime emerges especially when fiscal policy is weak and government bonds are considered net wealth. According to them, all these make difficult for a monetary authority to

be conducted its price stability objective, no matter how it is a commitment to low inflation (see, for instance, Leeper, 1991; Sims, 1994; Cochrane, 2001).

The advocates of the FTPL go on to argue that the intertemporal government budget constraint plays a key role in determining as well as stabilizing the price level. They go on to argue that inter-temporal budget constraint can be satisfied without fiscal authority having to adjust their policy if prices are endogenous. This is the case especially when government bonds are nominal. Because of this, fiscal policy in general, government spending, in particular, will be indicative of the price level. Under the FTPL, the monetary authority does not have to undertake such assignment of accommodating increases in government spending through printing money. If fiscal authority raises government spending independently of monetary authority, then the government saving –that is the difference between taxes and government spending– will decrease. The decrease in government saving will result in an increase in prices.

Briefly, unlike the traditional or monetarist view that claims that fiscal policy regime is Ricardian, the FTPL postulates that fiscal policy regime is non-Ricardian. If the authority has an opportunity of choosing primary surplus independently of public debt, and then it is the price level that has to adjust the present value government budget constraint (Sala, 2004). For this reason, the price level in an economy is determined and stabilized by the fiscal authority, rather than monetary authority.

Another explanation of the possible nexus between the government size and inflation could be through aggregate demand-aggregate supply model. In the context of this model, the Keynesian view argues that increases in government spending drive up aggregate demand, depending on the spending component whether it is real government spending, i.e. consumption and investment, or transfer payments. Under the assumption of fixed aggregate supply, an increase in aggregate demand resulting in increases in prices as long as the economy is not in the Keynesian extreme case of underemployment.

A linkage between government size and inflation could be established by means of the financing way of government spending by which it may lead to inflation. If the bond-financed spending is the case, then it will push interest rates up.[4] Rises in interest rates will affect negatively those private investments that are sensitive to interest rate and thus output, referring to the case of so-called crowding-out effect. Regardless to say that emerging this process hinges critically on some factors, such as the state of the economy, the time horizon, and

[4] Of course, the occurrence of this process is subject to the assumption that the money supply is exogenous and fixed by government or monetary authority and if the interest rate equates the demand for and supply of money. See Arestis and Sawyer (2003) for more details.

whether the bond-financed spending is temporary or permanent. If the crowding-out effect is large or even full, as argued by non-Keynesian views, the multiplier for government spending tends to become zero or even negative, implying that the expansionary effect of government spending will give rise to a reduction in GDP. The reductions in GDP, other things being equal, will increase inflationary pressures. If the spending is financed by printing money, in this case, the central bank will go to base money creation that will drive up the aggregate money supply. In the absence of an increase in money demand, increases in money supply will create higher inflation.

An interesting theoretical explanation that relates the government size to inflation comes from Cuciniello (2009). The author argues that an increase in government size, defined as a share of government spending or its equivalent taxes in national income, not only widens the gap between efficient and natural output but also increases real money demand. Both effects obligate the monetary authority to pursue an expansionary monetary policy, resulting in an increase in inflation. The monetary authority undergoes a reduction in the marginal cost of inflation that it faces by lowering the leisure cost and by raising the demand for real money balances. To express more specifically, an increase in government size reduces the marginal utility of consumption under the assumption that government spending is financed by equal taxes.[5] Based on this argument, the author infers that the overall impact of an increase in government size on inflation is positive. Namely, inflation moves in the same direction with government size. Cuciniello (2009), on the other hand, notes that an increase in the degree of central bank conservatism exerts a negative effect on inflation.

The last, but not least, explanation that connects government size with inflation could be through the government spending pressure that emerges in the absence of sufficient tax systems, largely stemmed from the large size of the informal sector, to meet government spending. In such cases, as discussed by Phelps (1973), the lack of sufficient tax revenue may compel governments to impose "just another tax or just one form of taxation"[6] –that is inflation tax– to raise government revenue through money creation. This may be the case especially

[5] An increase in taxes triggers a reduction in private consumption and thereby in utility. In such a case, the fiscal authority has to equate the sum of marginal utilities originated from larger public spending and leisure to the marginal disutility due to less private consumption. For further details, see Cuciniello (2009).

[6] The discussions on whether inflation should be treated as "just another tax or just one form of taxation" is based on the Phelps's (1973) public finance approach to monetary policy. Phelps (1973) argues that as a part of discussion about optimal taxation. The optimal taxation in public finance requires some use of each of the available distorting taxes, including the inflation tax, to minimize the extent to which any of the others must be used. For further details, see Grilli et al. (1991), Nolivos and Vuletin (2014) and the references cited therein.

when the monetary authority's independence is low. In such a case, as argued by Nolivos and Vuletin (2014), the fiscal authority effectively controls monetary policy and attempts to get benefit from inflation to cover some part of its revenue needs.

On the other hand, the Phelps' (1973) public finance approach to monetary views inflation as a source of distortion like any other ordinary tax. Under the principle of optimal taxation in public finance, which is a part of the related discussion, taxes should be designed in a manner that the last amount collected with each tax should have equal distortionary. This requires that a change in a tax should be followed by a parallel change in all the other taxes. In such a case, a plausible expectation related to the correlation between non-inflation taxes and inflation would be positive (see Grilli et al., 1991).

2.2. Empirical Literature

As highlighted earlier, in the empirical literature the relationship between government size and growth has been extensively studied but continue to grow. The existing empirical literature related to the government size–growth nexus seems to be expanding further in the nearest future partly since how the size of government should be is both economically and politically sensitive subject among different layers of the society. The reason is not known well, for us at least, however, in the same literature, it appears that the association of government size with unemployment and inflation has been studied rather less in relation to, e.g., government size–growth nexus. In what follows, we review only the studies that take the issue in the context of government size and unemployment and inflation linkages respectively.

2.2.1. Empirical Literature on Government Size–Unemployment Nexus

An early work by Karras (1993) examined the relative impact of government spending by categorizing them as permanent and transitory government consumption on employment and growth in a panel of 37 countries, comprising developed and developing ones. In the context of employment, his empirical findings indicated that in general terms, permanent (or persistent) changes in government consumption exerts a larger impact on employment than do transitory (or cyclical) changes of the same size. Based on the findings, he deduces that employment reacts more to permanent changes compared to transitory ones in government spending.

In a groundbreaking study, Abrams (1999) investigated whether there exists a relationship between government size and unemployment rate using data from 20 OECD countries for the period of 1984-1993 by employing the pooled OLS estimation technique. He found evidence that there is a positive causality between the government size, proxied by the total government outlays over GDP, and unemployment, running from the former to latter. According to this much-cited paper's findings, increases in government size, ceteris paribus, generally generates expenditure and tax effects that lead to increases in reported unemployment.

A related work by Wang and Abrams (2007a) explored the dynamic effects of government outlays on economic growth and the unemployment rate in the context of a VAR framework by utilizing data from 20 OECD countries for three recent decades. Relating to the government size-unemployment linkage, they concluded: i) positive shocks to government outlays raise the unemployment rate; ii) the effects of government outlays on unemployment vary with the types of outlays, e.g., transfers and subsidies generate a larger effect than government purchases; iii) there exists a unidirectional causality between two variables, running from government outlays to the unemployment rate; iv) how government finance its outlays does not influence findings. In their working paper series (Abrams and Wang, 2006; Wang and Abrams, 2007b; Wang and Abrams, 2011) employing different econometric techniques and data samples, they provided further evidence. They reached almost similar results confirming that government size moves positively with unemployment. Based on their findings, Wang and Abrams (2007b; 2011) hypothesized that the steady-state unemployment rate –that refers to the natural rate for the economy, so-called the NAIRU, in which the expected inflation equals to the actual inflation– is determined by government size along with various institutional factors unlike the short-run fluctuations in the unemployment rate that is influenced by business cycles and inflation shocks.

Similarly, an empirical study of 10 European countries by Christopoulos and Tsionas (2002), covered the period of 1961-1999, reached the conclusion that there is unidirectional causality running from government size to unemployment rate. On the same country group for the same period, a further study by Christopoulos et al. (2005) found evidence of a positive long-run relationship between government size and unemployment rate, confirming the validity of the so-called the Abrams curve. In another major study, Feldmann (2009) proposed that a large government sector is likely to raise unemployment for 58 developing countries using the OLS method. They went further in that the greater share of government consumption in total consumption and the greater share of transfers and subsidies in GDP reflecting a greater government size have a detrimental effect on employment for developing countries. However,

he did not find any evidence that a state-owned enterprise dominant structure in the economy and high share of public investment in total investment had either a positive or a negative effect on unemployment. In his a subsequent work, Feldmann (2010) examined how the government size affects unemployment for 52 countries. As in his previous study, Feldmann (2009) held the view that a large government sector appears to increase the unemployment rate. Based on this finding, Feldmann (2010) drew attention to that a larger government sector is associated with higher unemployment rates among the total labour force as well as among women and youths. What is more, he argued that a larger government sector means a larger share of long-term unemployed.

Using a data set for 83 countries, 51 of which are developing countries, a follow-up study by Sa (2011) examined the relationship among government size, economic growth, and unemployment. He found, inter alia, that the larger government size the higher unemployment rate for both country groups studied. They argued further that the relative effect of government size on the unemployment rate was nearly three times higher in developing countries in relation to developed ones. Based on this, they concluded that the effect of government size on the unemployment rate might vary from one country to another, depending on the countries' development level.

In a nutshell, Abrams (1999) and a large subsequent literature revealed that government size is positively correlated with the unemployment. It can be argued with reference to the available literature that the empirical studies tend to support the existence of a positive relationship between government size and unemployment, confirming the validity of the Abrams curve (see Table A1 of the Appendix for the synopsis of the studies above).

2.2.2. Empirical Literature on Government Size–Inflation Nexus

Another body of the related literature is concerned with the link between the government size and inflation. However, to our knowledge, this sort of studies are rather scant in the literature. In a comprehensive study on inflation performances of countries for the 1973-1994 period, Campillo and Miron (1997) demonstrated that countries with greater government expenditure needs make greater use of the inflation tax. A further point by the authors is that countries that have difficulty in generating non-inflation tax revenue rely more on the use of inflation tax. Empirically, the author found that government expenditure, as a share of output, has a positive impact on the inflation, although its the statistical significance is not overwhelming.

The findings of Campillo and Miron (1997) also showed that as with the ratio of the expenditure over output, the government debt –to– output exerts positive as well as the robust impact on the inflation. Along similar lines, in a single-country study, Wang and Wenn (2017) looked into the macroeconomic effects of government spending in China. Regarding inflation, the authors' findings indicated that government spending Granger-causes inflation in this country. The authors explain this with reference to public finance considerations in developing countries that are the determinants monetary policy as well as the proximate cause of inflation. They argue that the China's case is not exceptional from this.

Another study by Han and Mulligan (2008) examined the existence of a causal relationship between government size, measured as the government spending as well as its sub-components (non-defence and defence spending) –to– GDP, and inflation, the average growth rates of the consumer price index, and narrow money supply in a sample of 80 countries over the period 1973-1990.

Contrary to the conventional view that big government and inflation are closely related, their cross-country analysis demonstrated that the size of government was significantly as well as positively related to inflation only in special cases, e.g., mainly when periods of war and peace were compared. More importantly, their study indicated that there was a weak positive peacetime time series correlation between inflation and the government size and a negative cross-country correlation of inflation with non-defence spending.

On the other hand, more fresh study by Nguyen (2016) considering the case of three Asian emerging market economies (India, China, and Indonesia) by using the cointegration and VECM to time series data over the period 1970-2010 produced mixed results. Exploring the short- and long-run impact of government spending on inflation, the author concluded that there is a cointegrating causal association between government spending, expressed as a proportion of GDP, and inflation in the long run in all three countries studied whatever their institutional governance is. For the short run, however, he found that government spending appears to have a negative impact on inflation in China, while a positive effect in the other two.

Overall, the available literature on the government size-inflation nexus yield mixed results. These findings may be attributed in part to the limited availability of empirical studies (see Table A2 of the Appendix for the synopsis of the studies above).

3. Econometric Framework

3.1. Model Specification

To examine the existence of a possible relationship between government size and unemployment and government size and inflation the following two equations are estimated:

$$U_{i,t} = \alpha_1 + \beta_1 GovSize_{i,t} + \gamma_1 GovSize_{i,t}^2 + \Lambda_1' X_{i,t} + w_{it} \quad (1)$$

$$\pi_{i,t} = \alpha_2 + \beta_2 GovSize_{i,t} + \gamma_2 GovSize_{i,t}^2 + \Lambda_2' X_{i,t} + v_{it} \quad (2)$$

where $U_{i,t}$ is the unemployment rate in country *i* and year t (*i* = 1, …n; *t* =1980-2015, 1990-2015, …, 2005-2015), $\pi_{i,t}$ is the inflation, $GovSize_{i,t}$ refers to different measures of government size which will be mentioned in the data section, as a fraction of GDP, X_{it} is a vector of control variables which includes the real per capita gross domestic product ($Y_{i,t}$), the real exchange rate ($REER_{i,t}$) and population growth rate (POP_{it}). Additionally, Eq. (1) and (2) also include square terms for (GovSize) in order to test the possible reversal effect of different government sizes on unemployment and inflation, and the existence of an optimal government size. All the variables are in their log forms with the exception of inflation.

3.2. Methodology

3.2.1. Panel Unit Root Tests

In the literature, there are several approaches aiming at detecting the presence of unit roots in a panel data. Panel-based unit root tests are proved to have higher power than unit root tests based on individual time series. Broadly speaking, the literature contains two types of panel unit root tests as first and second-generation unit root tests. The first generation panel unit root tests are based on the studies by Maddala and Wu (1999), Hadri (2000), Choi (2001), Levin et al. (2002), Im et al. (2003), which assume that the individual time series in a panel are cross-sectional independently distributed. The second-generation panel unit root tests that allow to cross-sectional dependence are the tests proposed by Phillips and Sul (2003), Bai and Ng (2004), Moon and Perron (2004), and Pesaran (2007). In this paper, we employ two different panel unit root tests that are proposed by Levin et al. (2002) and Im et al. (2003), respectively.

3.2.1.1. Levin–Lin–Chu Test

Levin et al. (2002) developed a number of pooled panel unit root tests with various specifications relying on the treatment of the individual-specific intercepts and time trends. These

tests impose homogeneity on the autoregressive coefficient that indicates the presence or absence of unit root problem, while the intercept and the trend can vary across individual series. Levin-Lin-Chu (LLC) unit root test follows ADF regression for the investigation of unit root hypothesis. The general model of the LLC test, including only the intercept term, is as follows:

$$\Delta_{y_{i,t}} = y_{0i} + \rho y_{it-1} + \sum_{j=1}^{\rho i} y_{1i}\Delta y_{i,t-j} + \mu_{i,t}. \quad (3)$$

In Eq. (3), y_{0i} is the intercept term that varies across cross-sectional units, ρ is the homogenous auto-regressive coefficient, ρ_i is the lag order, and $\mu_{i,t}$ is the error term assumed to be independent across panel countries and follow a stationary ARMA process for each cross-sectional,

$$\mu_{i,t} = \sum_{j=1}^{\infty} \vartheta_{ij}\mu_{i,t-j} + \varepsilon_{i,t}.$$

The null hypothesis and the alternative hypothesis of the unit root test are as follows:

$H_0 : \rho_i = \rho = 0$
$H_1 : \rho_i = \rho < 0$ for all *i.*

The LLC model is based on *t*-statistics: $t_\rho = \frac{\hat{\rho}}{S.E.(\hat{p})}$.

where ρ is assumed to be remained constant across individuals under both the null and alternative hypotheses. In the presence of independently and normally distributed error term and cross-sectional independence, the panel regression test statistics t_ρ converge to standard normal distribution when *N* and $T \to \infty$ and $\sqrt{\mathrm{N/T}} \to 0$. The LLC unit root test suggests that both the variables are stationary at first difference.

3.2.1.2. Im–Pesaran–Shin Test

The strong assumption for homogenous ρ in the LLC test is difficult to satisfy because cross-sectional units may have a different speed of adjustment process towards the long run equilibrium. Relaxing this assumption, Im et al. (2003) developed a panel unit root test that allows ρ to vary across all *i*. The test proposed by Im et al. (2003) involves computing the ADF test for per country and the mean of all countries' ADF statistics gives the overall t-test statistic. The Im-Peseran-Shin (IPS) test progresses through the following ADF equation:

$$\Delta y_{i,t} = \alpha_i + \rho_i y_{i,t-1} + \sum_{j=1}^{\rho i} \theta_{ij} \Delta y_{i,t-j} + \varepsilon_{it}. \quad (4)$$

The IPS test allows for the heterogeneity in the value ρ_i under the alternative hypothesis, with H_0 : ρ_i=0 for all i and $H_1 : \rho_i < 0$ for at least one i. This is a more efficient and powerful test than the usual single time series test. The estimable equation of the IPS unit root test is expressed as follows: $\bar{t}_T = \frac{1}{N}\sum_{i=1}^{N} t_{i,t}\ (\rho_i)$, where $t_{i,t}$ is the ADF t statistics for the unit root tests of each country and ρ_i is the lag order in the ADF regression, and then the test statistic is calculated as follows:

$$A_{\bar{t}} = \frac{\sqrt{N(T)}[\bar{t}_T - E(t_T)}{\sqrt{var(t_T)}}.$$

As explained before for $\bar{t}$, the values for E[t_{iT} (ρ_i, 0)] can be obtained from the results of Monte Carlo simulation performed through the IPS. They have calculated and tabulated them for various periods and lags. The IPS simulation indicates that in the presence of no serial correlation, the $\bar{t}_T$ statistics is more powerful even for small sample size. When the error term is serially correlated with the heterogeneous panel as well as both *N* and *T* is sufficiently large, then, the power and size of $\bar{t}_T$ is just satisfactory. Another prominent characteristic of the IPS test is that its power is relatively more affected by a rise in *T* than a rise in *N*.

3.2.2. Panel Cointegration Test

We proceed with applying panel cointegration tests developed by Pedroni (1999; 2004). To test the cointegration relationship, Pedroni (1999; 2004) proposes several test statistics based on the residuals of the Engle and Granger (1987) cointegrating regression in a panel data model that allows for considerable heterogeneity. The formulation by Pedroni (1999; 2004) allows for the heterogeneity across the cross-sections by permitting individual specific fixed effect, slopes and deterministic time trend for each cross-section. To test the cointegration, the following bivariate regression equation is estimated:

$$y_{it} = \gamma_i + K_{it} + \lambda_i X_{it} + \varepsilon_{it}. \quad (5)$$

For t =1, … T and i = 1, …, N. The fixed effects γ_i and the slope coefficient λ_i are allowed to vary across individual countries.

$$\varepsilon_{it} = \psi_i \varepsilon_{it-1} + \nu_{it}. \quad (6)$$

where ψ_i is the autoregressive coefficient of the residual ε_{it} from Eq. (6). Pedroni (1999; 2004) proposes several test statistics based on the residuals of Engle and Granger (1987) cointegrating regression in a panel data model that allows for considerable heterogeneity. In this case, the test statistics are constructed using the residuals from the following hypothesized cointegrating regression based on Eq. (5).

Under the null hypothesis of no cointegration in heterogeneous panels i.e. $\hat{\varepsilon}_{it}$ is nonstationary, Pedroni (1999; 2004) develops seven different test statistics[7] based on the estimated error term e_{jt} in equation. These tests can be divided in two groups. The first group tests, "within dimensions" contain four test statistics termed as panel-v, panel-p, panel-t non-parametric (PP) and panel-t parametric (ADF). The second group "between dimensions" contains three test statistics termed as group-p, group-t non-parametric (PP) and group-t parametric (ADF). The estimated statistic will be the average of the individual statistics. The rejection of null of no cointegration indicates that the cointegration holds at least for one individual.

The within-dimension statistics test the null hypothesis of no cointegration, $H_0 : \psi_i = 1$ for all i against the alternative, $H_A : \psi_i = \psi < 1$ for all *i*. The null hypothesis of the between-dimension statistics is given by $H_0 : \psi_i = 1$ for all *i* and the alternative is $H_A: \psi_i < 1$for all *i*.

With the panel cointegration test statistics, Pedroni (1999; 2004) shows that the standardized statistic is asymptotically normally distributed as follows:

$$\mathrm{K} = \frac{(K_{N,T} - \mu(N)^{1/2})}{(V)^{1/2}} \Rightarrow \mathrm{N}(0,1).$$

Pedroni (1999; 2004) reports the critical values for μ and ν for different values of a number of regressors in cointegration relationship.

3.2.3. Estimation and Inference of Panel Cointegration Model

To obtain the panel cointegration vector based on the panel DOLS estimator, the following model is estimated with the OLS for each member of the panel. The DOLS estimator, β, can be obtained by Kao et al. (1999):

[7] For a broader discussion of panel cointegration tests, see Pedroni (1999).

$$y_i = \mu_i + x'_{it}\beta_i + \sum_{k=-pi}^{pi} \delta_{ik}\Delta x_{it-k} + \varepsilon_{it} \quad (7)$$

where γ denotes the dependent variables, x is the matrix of the explanatory variables, Δ is the first-difference operator, p_i is the lead and lag length. The panel cointegration parameter is constructed as $\hat{\beta}_{PDOLS} = N^{-1} \sum_{i=1}^{N} \beta_{i,DOLS}$ which is the cointegration parameter obtained from the individual DOLS estimation of Eq. (7) and the associated t-ratio for the panel cointegration parameter is derived as $t_{\hat{\beta}_{PDOLS}} = N^{-1/2} \sum_{i=1}^{N} t_{\hat{\beta}_{i,DOLS}}$.

3.2.4. Panel Granger Causality

Since the cointegration analysis provides no information regarding the direction of causality, a widely applied approach in the literature is to investigate causal interactions between the variables once cointegration is established. To do so, we utilize the two-step Engle and Granger (1987) approach. As the authors demonstrate, inferences from a causality test based on a vector autoregression (VAR) model in first differences would be misleading when the variables are cointegrated. To remove this problem, it is essential to estimate a vector error correction model (VECM) by augmenting the VAR model with one-lagged error correction term. So, in order to investigate the short- and long-run Granger-causal relationship between the variables under consideration, the following VECM models are estimated in a panel data:

$$\Delta lnU_t = \delta_{1i} + \sum_{p=1}^{k} \delta_{11ip} \Delta \ln GovSize_{it-p} + \sum_{p=1}^{k} \delta_{12ip} \Delta lnU_{t-p} + \sum_{p=1}^{k} \delta_{13ip} \Delta ln\pi_{t-p} + \emptyset_{1i}\hat{\varepsilon}_{it-1} + \nu_{1it} \quad (8)$$

$$\Delta ln\pi_t = \delta_{2i} + \sum_{p=1}^{k} \delta_{21\,ip} \Delta lnGovSize_{it-p} + \sum_{p=1}^{k} \delta_{22ip} \Delta \ln U_{t-p} + \sum_{p=1}^{k} \delta_{23ip} \Delta ln\pi_{t-p} + \emptyset_{2i}\,\hat{\varepsilon}_{it-1} + \nu_{2it} \quad (9)$$

where *k* is the optimal lag length(s) and $\hat{\varepsilon}_{it}$ is the residuals. As mentioned above, this specification for the Granger-causality allows us to investigate both the short-run and long-run causality. The

short-run causality, for example from GovSize to U, is tested with the Wald test by imposing δ_{12ip}= 0. The long-run causality, however, is examined by statistical significance of the t-statistics on the error correction parameter $\emptyset$ (ECT). For instance, the statistically significant $\emptyset_{1i}$ implies that GovSize Granger causes U in the long run.

4. Analysis and Discussion

4.1. Data

To determine the possible existence of the relationships among government size, unemployment, and inflation, the present paper employs a panel cointegration and causality approach to a panel dataset of eight economies that are listed by the IMF as the large emerging market economies. Subject to data availability, we select the broadest sample of countries and consider the longest sample periods. Accordingly, the economies in the sample are Argentina, Brazil, China, India, Indonesia, Mexico, South Africa, and Turkey. We study on annual time series data and the data period ranges from 1980 to 2015. In addition to this basic sample, we consider some sub-periods for some sample countries for which larger data is unavailable. The purpose is to broaden the number of countries in the sample by overcoming data limitations and to obtain results from a larger country spectrum that falls into the same country group from the standpoint of their economic development levels. All data are from the two international sources, the IMF and World Bank databases.

We work with three main variables that are composed of government size (GovSize), an unemployment rate (U), inflation (π), along with some control variables. As the proxy variables for government size, we treat in turn total general government spending (GovS) and taxes (T). In addition, we consider total spending and taxes and their breakdowns as the proxy of the GovSize. Accordingly, Total General Government Spending (GovS) and its sub-components; Government Consumption Spending (GovCS), Social Transfers (STRs), and Subsidies (SUBs). As for the breakdown of taxes, we decompose them into three as Direct Taxes (DTAX), Indirect Taxes (INDTAX), and Social Contributions (SCont).

Our second major dependent variable is unemployment rate (U). In line with the literature, "U" is defined as the proportion of total unemployed people in the total labour force, and is measured annual basis. As for the third major variable, it is inflation (π). Inflation is based on the consumer price index (CPI) and measured annual percentage change in the CPI over the previous year. With the exception of the inflation variable, all the other variables are expressed as the percentage of GDP.

As the control variables, we use real effective exchange rate (REER), population growth (POP) and real per capita gross domestic product (Y). The REER measures developments in prices and costs in the sample countries and in their main trading partners, providing information regarding the countries' international competitiveness. The summary statistics of the variables and the scatter diagrams on the relationship of country's government size, unemployment rate and inflation trend for each sample countries can be seen in Table A3 and Figure A1 of the Appendix.

4.2. Results and Discussion

Testing the relationship between government size, unemployment and inflation will be performed through following three steps: to begin with, we test the univariate time series properties of all variables considered in analyses and then, we test for cointegration and finally causality among variables.

We assess the long-run relationship by using various proxies for government size. Each of the following models presents the long-run association of unemployment and inflation with the each of the explanatory variable(s) added to the model:

Model 1A: (U) = f(GovCS, STRs, SUBs, X), (10.1)

Model 2A: (U) = f(DTAX, INDTAX, SCont, X), (10.2)

Model 1B: (π) = f(GovCS, STRs, SUBs, X), (10.3)

Model 2B: (π) = f(DTAX, INDTAX, SCont, X). (10.4)

Prior to testing panel cointegration, we employ panel unit root tests proposed by Levin et al. (2002) and Im et al. (2003) to determine the order of integration of panel data series. In addition to the panel unit root tests, we also perform the ADF developed by Maddala and Wu (1999) and the PP unit root test by Choi (2001) on the variables for the robustness of results.

We implement each of the tests above including an intercept, as well as an intercept and linear trend. The first step in analyzing the existence of possible relationships among government size, unemployment, and inflation is to check stationary properties of variables. The results obtained from panel unit root tests are listed in Table 1. Table 1 also indicates the results of unit root tests based on the first differences of all variables. The values in brackets are probabilities. What is seen from the table is that all tests [Levin et al. (2002), Im et al. (2003), ADF and PP] reject the null hypothesis of the presence of unit roots for all variables. Thus, we can conclude that the variables are stationary in their first differences and are thus integrated of order one, I(1).

Therefore, this implies a possibility of long-run cointegrating relation among government size, unemployment, and inflation. What follows is testing for cointegration in the next step of the empirical analysis.

Tables 2A and 2B present only the result of various panel cointegration tests applied to Models 1A and 1B and Models 2A and 2B which we defined in Section 3.1. respectively, corresponding to different assumed proxy variables.

Tables 2A and 2B tabulate the Pedroni's (1999, 2004) panel cointegration tests using three alternative measures proxied for government size. As shown in Table 2A, three out of seven statistics tests reject the null hypothesis of no cointegration. These are in turn Panel PP-statistic, Panel ADF-statistic, and Group ADF-statistic. Based on these findings, we can argue that the panel tests tend to support the presence of a cointegrating relationship among variables in the sample countries. Empirical evidence indicates that the null hypothesis of no cointegration can be rejected by all the three tests. These findings make clear that when Models 1A and 1B is considered, there is a support for the presence of one joint cointegrating relationship among all variables in the model over time across in the countries under consideration.

Considering Table 2B in which Models 2A and 2B are presented, the results reveal that four out of seven statistics reject the null hypothesis of no cointegration. These are in turn Panel PP-statistic, Panel ADF-statistic, Group PP, and Group ADF. Therefore, the evidence from these panel tests appears to support the presence of a cointegrating relationship among variables in the sample of eight large emerging market economies.

Table 1. Panel unit root test results.

Variables	Levels				First Differences			
	Levin et al.	Im et al. W-stat	ADF- Fisher Chi-square	PP- Fisher Chi-square	Levin et al.	Im et al. W-stat	ADF- Fisher Chi-square	PP- Fisher Chi-square
U	-1.50126	-0.45712	17.70	47.02	-8.771	-7.12	44.65	66.37
	(0.113)	(0.015)	(0.007)	(0.011)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
π	-2.18391	-2.66609	6.54	56.12	-6.522	-18.86	89.01	89.732
	(0.006)	(0.021)	(0.047)	(0.009)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
GovS	-3.86470	-2.4312	15.99	75.71	-11.715	-17.79	140.88	81.60
	(0.321)	(0.411)	(0.067)	(0.005)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
GovCS	-2.3679	-2.2254	9.03	58.17	-13.29	-15.11	104.55	61.99
	(0.017)	(0.007)	(0.051)	(0.008)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
STRs	-1.3177	-1.4951	4.21	87.14	-15.89	-12.42	112.67	95.06
	(0.090)	(0.011)	(0.032)	(0.011)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
SUBs	-2.98134	-2.9221	12.34	95.03	-9.19	-21.15	154.91	107.44
	(0.030)	(0.044)	(0.014)	(0.023)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
SCont	-1.4236	-1.5171	15.66	85.53	-12.48	-19.44	125.11	98.66
	(0.211)	(0.006)	(0.032)	(0.009)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
T	-1.8982	-1.8967	12.60	45.94	-15.02	-17.03	54.99	71.77
	(0.005)	(0.012)	(0.005)	(0.011)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
DTAX	-2.4378	-2.6602	9.97	48.83	-9.37	-19.15	93.00	87.54
	(0.012)	(0.009)	(0.077)	(0.035)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
INDTAX	-1.6602	-1.601	4.40	77.02	-11.42	-4.11	103.41	126.747
	(0.019)	(0.112)	(0.025)	(0.021)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
REER	-4.4581	-3.98138	32.51	68.32	-17.13	-16.83	84.49	149.274
	(0.006)	(0.021)	(0.042)	(0.007)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
POP	-3.21715	-3.4252	28.37	81.07	-12.62	-21.76	104.49	105.505
	(0.021)	(0.081)	(0.060)	(0.051)	(0.000)*	(0.000)*	(0.000)*	(0.000)*
Y	-1.13981	-0.4631	19.41	51.13	-11.63	-15.43	97.37	124.032
	(0.019)	(0.030)	(0.064)	(0.097)	(0.000)*	(0.000)*	(0.000)*	(0.000)*

*Notes: U: Unemployment, π: Inflation, GovS: Total General Government Spending, GovCS: Government Consumption Spending, STRs: Social Transfers, SUBs: Subsidies, T: Taxes, DTAX: Direct Taxes, INDTAX: Indirect Taxes, SCont: Social Contributions, REER: Real Effective Exchange Rate, POP: Population Growth, Y: Real Per Capita Gross Domestic Product. Values in parentheses are p-values. The maximum number of lags is set at three. Schwarz information criterion (SIC) is used to select the lag length. Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. * Denotes statistical significance at the 1% level.*

Table 2A. Panel cointegration results of Models 1A and 1B.

Pedroni Cointegration	Constant		Constant and Trend	
	Test Statistic	ρ-value	Test Statistic	ρ-value
	Model 1A Dependent Variable: U Explanatory Variables: GovCS, STRs, SUBs, REER, POP, Y			
Panel ν–statistic	0.29	0.57	0.12	0.42
Panel ρ–statistic	0.18	0.21	1.33	0.12
Panel PP-statistic	-3.12*	0.00	-3.54*	0.00
Panel ADF-statistic	-3.70*	0.00	-3.41*	0.00
Group ρ–statistic	1.14	0.32	1.74	0.55
Group PP-statistic	1.72	0.17	1.04	0.42
Group ADF-statistic	-4.05*	0.00	-4.90*	0.00
	Model 1B Dependent Variable: π Explanatory Variables: GovCS, STRs, SUBs, REER, POP, Y			
Panel ν–statistic	1.52	0.11	2.11	0.33
Panel ρ–statistic	1.66	0.77	1.55	0.17
Panel PP-statistic	-4.20*	0.00	-3.41*	0.00
Panel ADF-statistic	-4.11*	0.00	-4.17*	0.00
Group ρ–statistic	2.03	0.18	1.50	0.58
Group PP-statistic	1.90	0.55	1.09	0.56
Group ADF-statistic	-4.77*	0.00	-4.39*	0.00

*Notes: U: Unemployment, π: Inflation, GovCS: Government Consumption Spending, STRs: Social Transfers, SUBs: Subsidies, REER: Real Effective Exchange Rate, POP: Population Growth, Y: Real Per Capita Gross Domestic Product. The tests were performed with two lags. Null hypothesis: No cointegration. * Denotes statistical significance at the 1% level.*

Table 2B. Panel cointegration results of Models 2A and 2B.

Pedroni Cointegration	Constant		Constant and Trend	
	Test Statistic	ρ-value	Test Statistic	ρ-value
	Model 2A Dependent Variable: U Explanatory Variables: DTAX, INDTAX, SCont, REER, POP, Y			
Panel ν–statistic	1.22	0.19	2.29	0.17
Panel ρ–statistic	1.92	0.44	1.55	0.33
Panel PP-statistic	-4.11*	0.00	-4.24*	0.00
Panel ADF-statistic	-5.02*	0.00	-4.17*	0.00
Group ρ–statistic	1.54	0.33	1.56	0.18
Group PP-statistic	-3.78*	0.00	-3.59*	0.00
Group ADF-statistic	-3.48*	0.00	-3.65*	0.00
	Model 2B Dependent Variable: π Explanatory Variables: DTAX, INDTAX, SCont, REER, POP, Y			
Panel ν–statistic	1.22	2.07	1.12	0.55
Panel ρ–statistic	1.69	1.77	2.55	0.20
Panel PP-statistic	-5.32*	0.00	-5.04*	0.00
Panel ADF-statistic	-5.11*	0.00	-4.87*	0.00
Group ρ–statistic	1.50	1.87	1.98	0.11
Group PP-statistic	-4.22*	0.00	-4.66*	0.00
Group ADF-statistic	-4.70*	0.00	-4.47*	0.00

*Notes: U: Unemployment, π: Inflation, DTAX: Direct Taxes, INDTAX: Indirect Taxes, SCont: Social Contributions, REER: Real Effective Exchange Rate, POP: Population Growth, Y: Real Per Capita Gross Domestic Product. The tests were performed with two lags. Null hypothesis: No cointegration. * Denotes statistical significance at the 1% level.*

Given the presence of cointegration, the DOLS technique for heterogeneous cointegrated panels is estimated to determine the long-run equilibrium relationship, and the empirical results are reported in Table 3. DOLS estimator allows for greater flexibility in the presence of heterogeneous cointegrating vector. This estimator is also robust to the omission of variables that do not form part of the cointegration relationship. The fundamental idea behind this estimator is to account for possible serial correlation and endogeneity of the regressors. Therefore, an important property of this estimator is that it generates unbiased estimates for variables that are cointegrated, even with endogenous regressors. As in the case of Models 1A and 1B in Table 3, our results reveal that the government consumption spending (GovCS) as a share in GDP is positive as well as statistically significant determinants of unemployment rate and inflation. However, DOLS estimations demonstrate that real exchange rate (REER) and population (POP), as control variables, only effects unemployment. These effects are positive and significant. Taking into consideration Models 2A and 2B, it appears that indirect taxes as a fraction of GDP along with the control variables above put a positive and significant effect on unemployment rate. As for the inflation, we find that direct taxes exert the only effect on inflation. Based on these findings, one can argue that linking government size with inflation can only the case when direct taxes as a proportion of GDP are considered as the proxy measure of the government size.

Table 4A shows the Granger causality test results based on the panel VECM. For choosing the optimal lag order, we set the maximum at three lags in the VAR regressions and selected lag length with a minimum value of SIC information criteria. The F statistics for the serial correlation test in the last column indicate that the null hypothesis of all serial correlations is rejected. This implies that VECM is well specified and the empirical results robust.

As shown in Table 4A, government consumption spending (GovCS) Granger causes unemployment rate (U) and inflation (π). From the same table, it can also be seen consumption spending (GovCS) causes real GDP per capita (Y) for both unemployment and inflation. On the other hand, in Model 1A, real exchange rate (REER) and population (POP) have a causal effect on unemployment. Turning to Table 4B, indirect tax (INDTAX), real exchange rate (REER) and population (POP) have a causal effect on unemployment. Direct taxes (DTAX) and population (POP) cause inflation. Meanwhile, the error correction terms reported in Table 4 display that the error correction term derived from the equilibrium relationship implies the elimination rate of the short-run disequilibrium in the long run.

Table 3. Results of DOLS estimations for Models 1A and 1B, and for Models 2A and 2B

Model 1A Dependent Variable: U Explanatory Variables: GovCS, STRs, SUBs, REER, POP, Y			**Model 1B** Dependent Variable: π Explanatory Variables: GovCS, STRs, SUBs, REER, POP, Y			**Model 2A** Dependent Variable: U Explanatory Variables: DTAX, INDTAX, SCont, REER, POP, Y			**Model 2B** Dependent Variable: π Explanatory Variables: DTAX, INDTAX, SCont, REER, POP, Y		
Explanatory variable	Coefficient	t statistic	Explanatory variable	Coefficient	t statistic	Explanatory variable	Coefficient	t statistic	Explanatory variable	Coefficient	t statistic
GovCS	1.42	3.76*	GovCS	1.15	2.54*	DTAX	0.74	1.07	DTAX	1.41	5.08*
STRs	0.23	1.22	STRs	0.95	1.34	INDTAX	1.43	2.30*	INDTAX	0.74	1.72
SUBs	0.59	1.80	SUBs	0.50	0.76	SCont	1.68	1.57	SCont	0.58	0.88
REER	2.78	2.41*	REER	1.06	1.53	REER	1.17	3.35*	REER	1.77	1.41
POP	1.05	2.69*	POP	1.22	1.37	POP	1.25	4.59*	POP	1.43	1.77
Y	1.70	1.59	Y	1.27	1.00	Y	0.83	1.94	Y	1.78	1.64

*Notes: U: Unemployment, π: Inflation, GovCS: Government Consumption Spending, STRs: Social Transfers, SUBs: Subsidies, DTAX: Direct Taxes, INDTAX: Indirect Taxes, SCont: Social Contributions, REER: Real Effective Exchange Rate, POP: Population Growth, Y: Real Per Capita Gross Domestic Product. The maximum number of lags is set at three. Schwarz information criterion (SIC) is used to select the lag length. Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. * Denotes significance at 1% levels, respectively.*

Table 4A. Granger Causality based on panel VECM for Models 1A and 1B

Dependent Variables	**Model 1A** Dependent Variable: U Explanatory Variables: GovCS, STRs, SUBs, REER, POP, Y								
	ΔU	ΔGovCS	ΔSTRs	ΔSUBs	ΔREER	ΔPOP	ΔY	ECT_{it-1} (Coefficient)	F-statistics
ΔU	---	1.16	0.70	2.72	0.89	2.16	2.34	-0.04	2.22
		(0.00)***	(0.33)	(0.31)	(0.01)**	(0.00)***	(0.61)	[-1.09]	(0.07)
ΔGovCS	1.15	---	0.44	1.55	1.22	1.71	1.58	-0.02	3.47
	(0.37)		(0.65)	(0.10)	(0.10)	(0.63)	(0.42)	[-2.22]***	(0.13)
ΔSTRs	0.34	0.55	---	0.80	1.45	0.65	1.03	-0.02	2.34
	(0.13)	(0.32)		(0.93)	(0.54)	(0.20)	(0.11)	[-2.36]***	(0.22)
ΔSUBs	0.77	1.69	0.29	---	0.98	1.01	2.66	-0.05	2.17
	(0.22)	(0.72)	(0.32)		(0.13)	(0.22)	(0.54)	[-2.55]***	(0.45)
ΔREER	1.33	1.87	1.22	0.78	---	1.56	1.36	-0.02	2.36
	(0.41)	(0.22)	(0.17)	(0.18)		(0.41)	(0.25)	[-2.50]***	(0.34)
ΔPOP	0.68	1.49	0.56	1.21	1.70	---	0.55	-0.03	3.01
	(68)	(0.19)	(0.13)	(0.67)	(0.39)		(0.17)	[-3.31]***	(0.15)
ΔY	2.16	2.09	1.25	0.55	2.62	1.60	---	-0.05	2.23
	(0.49)	(0.00)***	(0.64)	(0.13)	(0.14)	(0.33)		[-2.43]***	(0.33)
Dependent Variables	**Model 1B** Dependent Variable: π Explanatory Variables: GovCS, STRs, SUBs, REER, POP, Y								
	$\Delta\pi$	ΔGovCS	ΔSTRs	ΔSUBs	ΔREER	ΔPOP	ΔY	ECT_{it-1} (Coefficient)	F-statistics
$\Delta\pi$	---	2.33	0.54	0.68	1.17	2.11	0.51	-0.02	3.23
		(0.00)***	(0.12)	(0.81)	(0.19)	(0.71)	(0.17)	[-2.34]***	(0.23)
ΔGovCS	1.33	---	0.46	0.40	0.95	1.77	0.89	-0.03	3.18
	(0.07)		(0.11)	(0.09)	(0.13)	(0.33)	(0.44)	[-3.48]***	(0.11)
ΔSTRs	1.78	2.11	---	1.22	0.55	0.66	1.19	-0.05	2.01
	(0.09)	(0.44)		(0.45)	(0.32)	(0.16)	(0.23)	[-2.31]***	(0.93)
ΔSUBs	0.60	1.99	0.84	---	0.88	1.41	0.59	-0.04	2.61
	(0.36)	(0.51)	(0.51)		(0.11)	(0.13)	(0.44)	[-2.19]***	(0.87)
ΔREER	1.07	0.69	1.30	0.78	---	0.87	1.43	-0.02	3.51
	(0.54)	(0.25)	(0.78)	(0.33)		(0.39)	(0.30)	[-3.17]***	(0.19)
ΔPOP	1.72	1.71	1.87	1.08	1.55	---	0.92	-0.02	2.75
	(0.09)	(0.68)	(0.13)	(0.54)	(0.70)		(0.19)	[-2.58]***	(0.34)
ΔY	1.58	1.60	0.55	0.69	0.66	1.60	---	-0.04	2.55
	(0.36)	(0.00)***	(0.43)	(0.11)	(0.44)	(0.14)		[-3.11]***	(0.16)

*Notes: U: Unemployment, π: Inflation, GovCS: Government Consumption Spending, STRs: Social Transfers, SUBs: Subsidies, DTAX: Direct Taxes, INDTAX: Indirect Taxes, SCon: Social Contributions, X: Control Variables (REER: Real Effective Exchange Rate, POP: Population Growth, Y: Real Per Capita Gross Domestic Product). Values in parentheses and brackets are p-values and t-statistics, respectively. ** and *** significance at 5% and 1% levels, respectively.*

Table 4B. Granger Causality based on panel VECM for Models 2A and 2B

Dependent Variable	**Model 2A** Dependent Variable: U Explanatory Variables: DTAX, INDTAX, SCont, REER, POP, Y								
	ΔU	ΔDTAX	ΔINDTAX	ΔSCont	ΔREER	ΔPOP	ΔY	ECT_{it-1} (Coefficient)	F-statistics
ΔU	---	1.34	2.33	0.72	2.07	1.33	0.33	-0.05	1.55
		0.11	(0.00)***	(0.89)	(0.02)**	(0.00)***	(0.65)	[1.45]	(0.12)
ΔDTAX	1.97	---	0.72	0.28	1.22	0.79	0.45	-0.03	2.51
	(0.33)		0.13	(0.41)	(0.44)	(0.01)**	(0.34)	[-2.22]***	(0.04)
ΔINDTAX	1.33	0.90	---	0.65	1.79	0.55	0.78	-0.02	2.89
	0.09	0.22		(0.19)	(0.38)	(0.78)	(0.22)	[-3.11]***	(0.68)
ΔSCont	2.09	2.61	1.02	---	1.50	1.07	1.26	-0.01	2.90
	0.32	0.14	0.65		(0.11)	(0.55)	(0.45)	[-2.14]***	(0.15)
ΔREER	1.23	2.03	0.65	1.13	---	0.67	0.88	-0.02	3.04
	0.64	0.44	0.12	0.22		(0.26)	(0.53)	[-3.21]***	(0.17)
ΔPOP	1.26	1.09	1.45	0.75	0.33	---	1.33	-0.04	2.72
	0.42	0.18	0.22	(0.14)	(0.17)		(0.16)	[-2.34]***	(0.09)
ΔY	1.68	0.69	2.03	1.15	0.78	1.32	---	-0.02	2.50
	0.44	0.17	0.41	(0.22)	(0.25)	(0.22)		[-2.19]***	(0.33)
Dependent Variable	**Model 2B** Dependent Variable: π Explanatory Variables: DTAX, INDTAX, SCont, REER, POP, Y								
	$\Delta\pi$	ΔDTAX	ΔINDTAX	ΔSCont	ΔREER	ΔPOP	ΔY	ECT_{it-1} (Coefficient)	F-statistics
$\Delta\pi$	---	1.26	0.89	0.55	1.07	1.07	1.26	-0.02	2.11
		(0.00)***	(0.45)	(0.88)	(0.28)	(0.04)**	0.45	[-2.34]***	(0.07)
ΔDTAX	2.04	---	0.17	0.77	0.89	1.40	1.33	-0.03	2.40
	(0.18)		(0.65)	(0.13)	0.21	0.39	0.12	[-3.57]***	(0.40)
ΔINDTAX	1.66	1.87	---	1.36	1.03	0.45	1.39	-0.02	3.00
	(0.41)	(0.75)		(0.24)	0.72	0.11	0.09	[-2.24]***	(0.17)
ΔSCont	0.77	0.66	1.22	---	0.39	1.33	1.10	-0.04	2.15
	(0.51)	(0.25)	(0.25)		0.11	0.13	0.07	[-2.40]***	(0.32)
ΔREER	1.03	1.36	0.57	0.58	---	1.22	1.05	-0.04	2.25
	(0.20)	(0.39)	(0.17)	0.22		0.87	0.33	[-3.09]***	(0.17)
ΔPOP	0.25	2.12	1.10	1.06	0.79	---	0.68	-0.02	3.22
	(0.57)	(0.19)	(0.56)	0.54	0.22		0.17	[-2.41]***	(0.08)
ΔY	0.66	0.94	1.29	0.41	0.58	0.78	---	-0.02	1.14
	(0.33)	(0.64)	(0.22)	0.16	0.09	0.22		[-2.04]***	(0.55)

*Notes: U: Unemployment, π: Inflation, GovCS: Government Consumption Spending, STRs: Social Transfers, SUBs: Subsidies, DTAX: Direct Taxes, INDTAX: Indirect Taxes, SCont: Social Contributions, X: Control Variables (REER: Real Effective Exchange Rate, POP: Population Growth, Y: Real Per Capita Gross Domestic Product). Values in parentheses and brackets are p-values and t-statistics, respectively. ** and *** significance at 5% and 1% levels, respectively.*

5. Conclusion

This paper examined the long run relation among government size, unemployment, and inflation and in a panel framework of eight large emerging market economies (Argentina, Brazil, China, India, Indonesia, Mexico, South Africa, and Turkey) over the period 1980-2015.

Therefore, we have used panel cointegration and causality techniques. Based on the results emerged from the present papers, the following arguments can be made in general terms. Government size is in a relationship with unemployment, and with inflation. In the former case, our findings seem to confirm the validity of the Abrams curve, establishing a long-run association between government size and unemployment rate. However, this verification depends on how the government size is measured.

Accordingly, the findings suggest that as long as government consumption spending and indirect taxes are considered as the measure of government size, there is a relatively strong, positive and statistically significant relationship between government size and unemployment. This relationship seems to be in the form of a one-way causality running from government size to unemployment. In the case of the indirect taxes, this causality becomes even most robust. In all other cases, the relationship between government size and unemployment disappears totally.

As for the nexus of government size and inflation, our results indicate that there exist a positive association between two. However, the presence of this nexus depends essentially upon how the government size is measured. As long as the following two variables −government consumption spending and direct taxes− are taken into consideration as the proxy measure of the government size, the results give support to the existence of this relationship. The direction of this Granger causal relationship is from government size to inflation.

Although there is inconclusive evidence as to whether the government size triggers either unemployment or inflation in the existing literature, concerning the government size-unemployment nexus our results overlap with the general tendency, corroborating the idea of the Abrams curve that establishes a long-run relationship between government size and unemployment rate. As regards the government size-inflation nexus, our results are virtually in line with the few studies available in the current literature.

Overall, whether the government size exerts an effect on the unemployment rate and inflation changes in accordance with how the size of government is measured. Accordingly, the most effective proxy measure of the government size in explaining variations in unemployment is indirect taxes expressed as a percentage of GDP. This is followed by the government consumption spending in the case of unemployment. As concerns inflation, direct taxes and

government consumption spending, as a share of GDP, are the two most important proxy measures of the government size that make possible establishing an association of government size with inflation.

The results we obtained may be interpreted from different angles and used to draw policy implications. The first thing that comes to one's mind is that government consumption spending may have brought about a crowding out effect that put downward pressure on private investments that are sensitive to the results of government action, increasing the unemployment rate. The second conclusion, a boosting in growth resulting from increases in government spending have may not have created job opportunities due to the so-called hormone-injected growth, that is a growth without creating employment. In addition, the increasing rate of active population may be higher than that of growth in the examined period. Finally, looking at the issue from tax perspectives, higher taxes mean higher cost of production. On the other hand, higher taxes are likely to negatively affect the disposable income of consumers, leading to lower demand for goods and services produced. Taken together, there would be less job opportunities for job seekers, resulting in a higher unemployment rate. Turning to inflation, an increase in government spending may have fostered aggregate demand and thus resulted in inflation. The financing of government spending could also be another channel in explaining the nexus of government size and inflation.

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Appendix

Table A1. Synopsis of Existing Empirical Studies on Government Size and Unemployment Nexus

Study[a]	**Country or Countries**	**Econometric Method**	**Proxy Measure of Government Size**[b]	**Empirical Finding**	**Government Size–Unemployment Nexus**
Sa (2011)	32 developed and 51 developing countries. Totally, 83 countries.	OLS regression	Government consumption	The larger government size, the higher unemployment.	Positive
Wang and Abrams (2011)	20 OECD countries	Panel error-correction model	Total government outlays and their sub-components	Different types of government outlays have different effects on employment. There is one-way causality running from government size to unemployment rate.	Positive and negative, depending on types of government outlays.
Feldmann (2010)	52 developing countries	OLS regression	Government size component of Economic Freedom of the World Index, consisting of four equally weighted sub-components: i) government consumption ii) transfers and subsidies, iii) government enterprises and investment iv) top marginal tax rate	It is likely that a large share of government sector increases unemployment in developing countries. Additionally, a large government sector is likely to substantially increase the share of long-term unemployed in the total number of unemployed.	Positive
Feldmann (2009)	58 developing countries	OLS regression	Government size component of Economic Freedom of the World Index, consisting of four equally weighted sub-components: i) government consumption ii) transfers and subsidies iii) government enterprises and investment iv) top marginal tax rate	It is likely that a large share of government sector increases unemployment in developing countries.	Positive

Table A1. Continued …

Study[a]	Country or Countries	Econometric Method	Proxy Measure of Government Size[b]	Empirical Finding	Government Size–Unemployment Nexus
Wang and Abrams (2007b)	20 OECD countries	Error correction model	Total government outlays and their sub-components	Government size, measured as total government size–to–GD plays an important role in affecting the steady-state unemployment rate. However, when government outlays are disaggregated as transfers and subsidies, and government purchases of goods and services, the above finding change. Accordingly, the former sub-component affects the steady-state unemployment rate while the latter sub-component does not have any significant effect.	Positive and negative, depending on types of government outlays.
Wang and Abrams (2007a)	20 OECD countries	VAR	Total government outlays and their sub-components	Different types of government outlays have different effects on employment. There is one-way causality running from government size to unemployment rate.	Positive and negative, depending on types of government outlays.
Christopoulos et al. (2005)	10 EU countries	Panel cointegration analysis and estimation techniques	Total government expenditure	In the long run, there is one-way causality that runs from government size to unemployment rate, supporting the validity of the Abrams curve.	Positive
Christopoulos and Tsionas (2002)	10 EU countries	Causality and cointegration techniques	Total government expenditures	Abrams curve is valid. Accordingly, there is unidirectional causality running from government size to unemployment rate.	Positive
Abrams (1999)	20 OECD countries	Pooled OLS estimation technique	Total government outlays	Increases in government size induce unemployment.	Positive
Karras (1993)	37 developed and developing countries	Two-stage LS (2SLS)	Government spending and its sub-components: i) Permanent government consumption ii) Transitory government consumption	Both components of government spending positively affect employment. However, the effect of the permanent consumption is larger than the other's effect.	Negative
Scully (1989)	115 developed, developing and less developed market economies	OLS estimation technique	Government expenditures	Increases in government size trigger unemployment.	Positive

[a] According to inverse chronological order.

[b] Unless otherwise indicated, as a share of GDP.

Table A2. Synopsis of Existing Empirical Studies on Government Size and Inflation Nexus

Study[a]	Country or Countries	Econometric Method	Proxy Measure of Government Size[b]	Empirical Finding	Government Size–Unemployment Nexus
Wang and Wen (2017)	China	VAR	Government spending	Government spending Granger-causes inflation	Positive
Neguyen (2016)	3 Asian emerging market economies: India, China, and Indonesia	Cointegration and VECM	Government spending	There is a long-run causal link between government spending and inflation in the long run for all these countries. However, in the short run, government spending seems to have a negative impact on inflation in China, while a positive impact in the other two.	In the long run positive, whereas in the short run, mixed.
Tehranchian et al. (2010)	Iran	Cointegration and VECM	Total government expenditure	There is a negative unidirectional causality running from economic growth to inflation.	Positive
Han and Mulligan (2008)	80 countries	OLS regression	Government spending and its sub-components: i) Non-defense spending ii) Defense spending	Government size is significantly and positively related to inflation only in special cases, e.g., mainly when periods of war and peace were compared.	Only in special cases, there is a positive relationship between government size and inflation.
Campillo and Miron (1997)	62 developed and developing countries	OLS regression	Government expenditure	A greater government expenditure requires a greater use of inflation tax.	Positive

[a] According to inverse chronological order.

[b] Unless otherwise indicated, as a share of GDP.

Table A3. Summary statistics for the panel, 1980-2015

Variable	Mean	Std. Dev.	Min.	Max.	Obs.
U	7.7	6.45	1.50	28.00	288
π	82.39	347.77	-1.40	3079.81	288
GovS	169.11	139.42	110.80	446.00	288
GovCS	12.56	4.34	5.34	20.70	288
STRs	18.64	25.56	3.43	66.04	288
SUBs	8.90	16.73	5.17	47.15	288
SCont	43.6	20.44	12.33	15.98	288
T	29.27	37.46	4.87	27.04	288
DTAX	12.126	55.63	11.17	47.08	288
INDTAX	42.476	36.80	1.68	91.00	288
REER	61.18	57.34	48.06	278.32	288
POP	3.53	4.50	1.70	1.37	288
Y	296.8	255.9	10.107	966.28	288

Notes: U: Unemployment, π: Inflation, GovS: Total General Government Spending, GovCS: Government Consumption Spending, STRs: Social Transfers, SUBs: Subsidies, T: Taxes, DTAX: Direct Taxes, INDTAX: Indirect Taxes, SCont: Social Contributions, REER: Real Effective Exchange Rate, POP: Population Growth, Y: Real Per Capita Gross Domestic Product.

Figure A1. The scatter diagrams of inflation, unemployment, government size for sub-sample periods of countries under consideration
(U: Unemployment Rate, π: Inflation, Govs: Total General Government Spending)

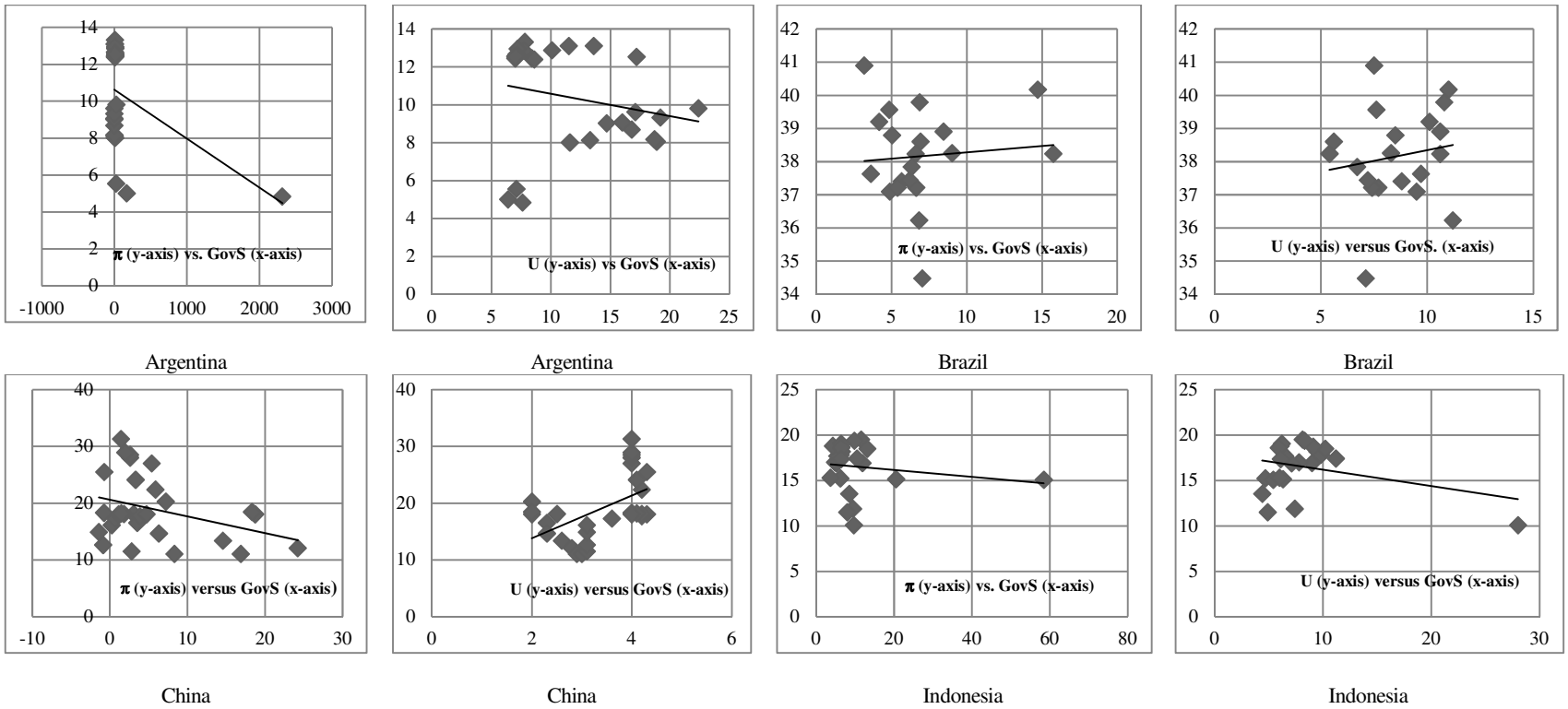
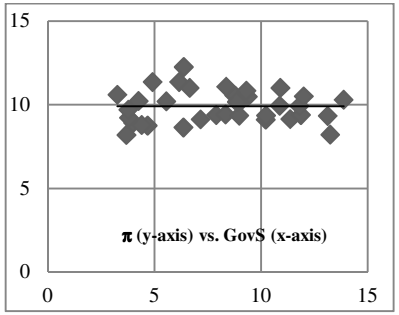
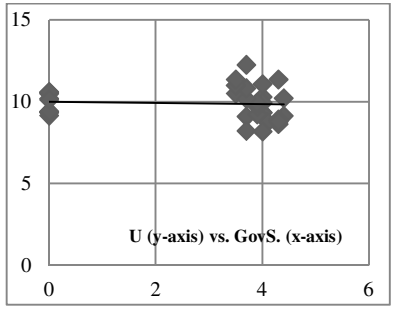


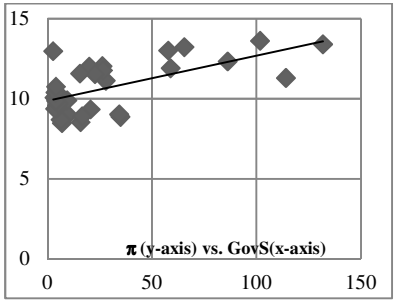
Figure A1. Continued …



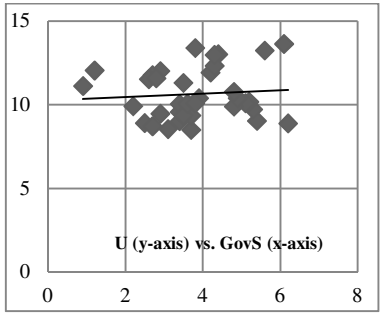
India



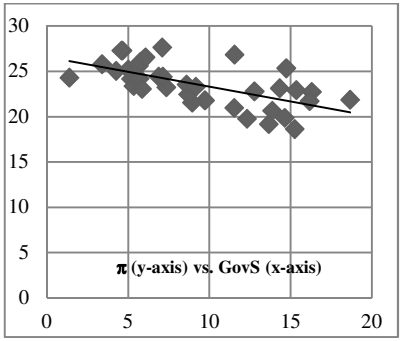
India



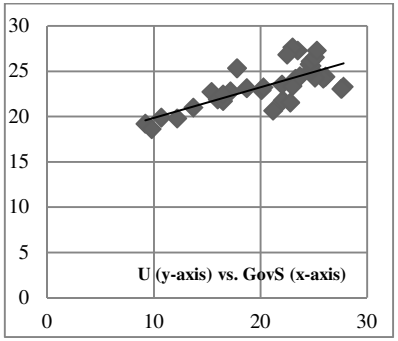
Mexico



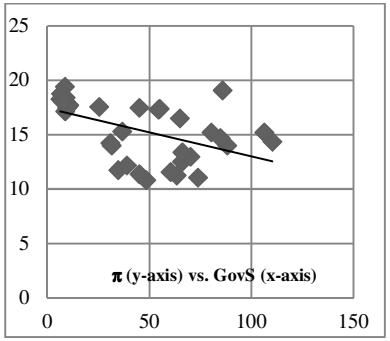
Mexico



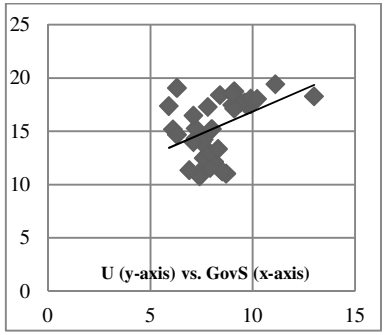
S. Africa



S. Africa



Turkey



Turkey