Corruption, FDI and Growth: All the truths of a corrupted regime before and after the social upsurge in Tunisia

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Abstract

The aim of this paper is to investigate the dynamic relationship between corruption, investment and economic growth in Tunisia within a multivariate framework. In the empirical section we use data span from 1976 to 2013 and we perform a vector error correction model and cointegartion technique to detect causality between corruption, investment, economic growth, credit to the private sector and foreign direct investment. The main findings of this paper show that corruption hampered Tunisia economic growth in the short-run and the long run as well. Corruption could be the main reason of the slowdown of investment activities and the low inflow of capital. Another important conclusion was revealed in this paper is that corruption get worsened in the period that follows the social upsurge of December 2010. Therefore, the main goals of the so called "revolution" are from being achieved yet. Hence, more works are needed to fight corruption in Tunisia.

Keywords: Corruption, investment, Growth, Tunisia

I. Introduction

Corruption is one of the major problems facing societies around the world. There are various definitions of corruption that evolved over the time by economists since the 60s. According to Nye (1967), corruption as "the behavior which deviates from formal duties of a public rule because of private-regarding (personal, close family, private clique) pecuniary or status gains: or violates rules against the exercise of certain types of private-regarding influence." For Nye (1967) corruption is the deviation from the duties of a formal public role for private gain.

In another definition, Macrae (1982) has used the term arrangement to define corruption. For him corruption is an "arrangement that involves a private exchange between two parties (the demander and the supplier)". The arrangement has an influence on the allocation of resources, either immediately or in the future, and involves the use or abuse of public or collective responsibility for private ends. According to Macrae (1982), there is an expectation of a net gain for the both parties from an arrangement concluded. According to the author, the most probably form of arrangement between private individual and public official is the monetary form.

Gould (1991) define corruption as a moral problem, it is "an immoral and unethical phenomenon that contains a set of moral aberrations from moral standards of society, causing loss of respect for and confidence in duly constituted authority". Shleifer and Vishny (1993) define government corruption as "the sale by government officials of government property for personal gain". They present the collect of bribes by government officials as an example of government corruption. Daniel Kaufmann (1997) defines corruption as "the misuse of public office for private gain". He is followed by many authors who attribute the same definition to the concept of corruption. (Treisman (2000), Sandholtz and Koetzle (2003)). Aidt (2003) defines "corruption is an act in which the power of public office is used for personal gain in a manner that contravenes the rules of the game." De Jong and Udo (2006) defined corruption as "the misuse of public power for private benefit (or much alike)." Misuse would be deviating from the formal duties of a public role or a code of conduct. In the context of international trade, corruption would most often take the form of bribery. Corrupt officers extort bribes from a client, who otherwise will not receive assured services, or will receive inferior service. Therefore, businesses and individuals may collude with customs officers to lower customs duties, speed up service or restrict competitors.

The World Bank (WB) defined corruption as "the single greatest obstacle to economic and social development. It undermines development by distorting the rule of law and weakening the institutional on which economic growth depends."

There are various indicators and indices that measure corruption. For example, The Business International (BI) publishes indices on 56 "country risk" factors for 68 countries, for the period 1980-1983, and on 30 country risk factors for 57 countries, for the period 1971-1979. The Business International indices are between 0 and 10 and a high value of the index means that the country in question has "good" institutions (see Mauro 1995). Another database provided by International Transparency (IT) to measure the corruption perception index (CPI) and then ranks countries according to the extent by which corruption is believed to exist. Another important database of corruption is provided by the International Country Risk Guide (IRCG) which rates 140 countries each month on the basis of over 40 risk metrics affecting political, economic and financial risk, dating back to 1984 for most. The ICRG corruption index varies from 0 to 6, with higher values indicating higher corruption. Literature has used these indices to investigate the effects of corruption on economic growth and development using single country study or a group of countries and regions. For instance, literature on corruption and growth versus is vast. However, the empirical results provide conflicting results. In fact while corruption appears to affect growth for some countries, it does not have ant effects for other countries. Therefore, the main purpose of this paper is to investigate the consequences of corruption on Tunisia economy.

Tunisia is an interesting case study. In fact, Tunisia has witnessed buoyant economic growth during the nineties following the adoption of several and various structural reforms. The most important reform was the Structural Adjustment Program (SAP) of late eighties. Moreover, Tunisia ratified and signed the most important international conventions relating to most important economic activities such as: the General Agreement on Tariffs and Trade (GATT henceforth) in 1989 and to the World Trade Organization (WTO henceforth) in 1994 and the signature of multiple accords with the European Union in 1995 followed later, from 2004 to 2005, by the Neighborhood Agreement. These ratifications have considerably boosted up the local economy.

During the 2000s, Tunisia recorded buoyant economic performances with an average growth rate moving between 4% and 5% per annum and Tunisia was frequently top ranked by international organization, notably the World Bank and IMF, in terms of competitiveness. Furthermore, Tunisia was considered as a model for Arab and developing countries as well. The economic and political stability encouraged foreign investors to invest in Tunisia. It recorded a doubling of the FDI crossing from 402, 9 M TND in 1997 to 1015.7 M TND in 2005 with a positive growth rate of 152 %. The report of FDI in Tunisia indicates that the number of foreign companies crossed form 2803 in 2006 to 2966 in 2008 to reach 3135 in 2010.

Despite, the outstanding performance of Tunisia economy, several problems persist and some issues get worsened. The most important problem is the increase of disparity between the regions which in turn created socio-economic unbalances. The regional disparities are stressed in Tunisia by the concentration of public services, investments and economic activities in the coastal region. Consequently, the internal regions have been less served in terms of public services including health, education, telecommunication, etc. Jendouba, for example, is the least governorate in terms of primary health care, with 1,4 general practitioner (family doctor) for 10 000 capita, and less than 1,7 for Sidi Bouzid, Medenine and Gafsa, against a national average of 2,7, whereas in the metropolis of Tunis, the rate is 4,3 (ADB, 2012). The regional disparities have created several economic, politic and social problems including: increase of poverty, rise of unemployment, migration from marginalized regions to Tunis metropolitan and coastal cities, escalation of tensions between regions, discrimination etc**.** For example, unemployment rate[1] in 2013 was above 20 % in Kasserine (21 %), Gafsa (28 %) and Tataouine (24 %), while the national average was 13 %. Regarding graduated unemployment, Gafsa (47 %), Sidi Bouzid (41 %), Kebili (43 %) and Jendouba (40 %) recorded the highest rates much higher than the national average rate (23%). For poverty, the rate is ranged as follows: 7% in Tunis metropolitan, 18% in North-east, 20% in North West region, 25% in the south and 31% in the middle-east (ADB, 2012). These rates show inequality and social exclusion between the regions under ex-deposed President's regime.

[1] For more details see the 2012 report African Development Bank: Tunisie: Défis économiques et sociaux post-révolution. ADB. Tunis.

These problems have intensified when ex-president Ben Ali and his extended family started controlling gradually the most important economic sectors in Tunisia: transport, telecommunication, aviation, banking sector, etc. As the new businessmen and businesswomen have concentrated further their businesses in the coastal region, including Tunis, inequality and regional disparities have deepened. All these conditions increased the level of corruption in Tunisia and were considered as determining factors in the Tunisian revolution of 2011. According to the African Development Bank (ADB, 2012), despite Tunisia succeeded to reduce the rate of poverty, the disparity remains a challenge.

For all these reasons we are aiming in this paper at investigating the dynamic relationship between corruption, investment and economic growth in Tunisia. This could explain the reason of the revolution and whether corruption has been stopped or not following the social uprising of December 2010. In the empirical section we use data span from 1976-2013 and we perform a vector error correction model and cointegartion technique to detect causality between the variables used in the model. To the best of our knowledge, the VECM approach has never been done to date to detect causality and cointegration relationship between the variables of our study. The main findings of this paper show that corruption hampered Tunisia economic growth in the short-run and the long run as well. Corruption could be the main reason of the slowdown of investment activities and the low inflow of capital during the recent period.

The rest of the paper is organized as follows: section 2 describe a literature review, second 3 gives a glance at the propagation of corruption in Tunisia economy, section 4 provides the empirical results and finding while section 5 concludes.

II. Literature Review

During the past few decades, a growing number of studies have been carried out to examine the concept of corruption, its consequences, and the policy responses that could stop its rife. The pioneering theoretical work by Leff (1964) revealed an interesting link between corruption and economic growth. Since that, a huge amount of papers has been done to examine the economic

impact of corruption. Generally, the literature can be classified in two groups: corruption-growth and corruption-FDI.

1.1. Corruption and Growth

Literature on corruption-growth nexus reveals two conflicting results and thus it could be classified in to categories. The first one shows a positive impact of corruption on economic growth. Leff (1964) and Huntington (1968) show that corruption increases economic growth for a number of reasons including helping entrepreneurs to avoid bureaucratic delay by bribing officials. Lui (1965) suggests that corruption minimizes waiting costs thus reducing inefficiency in economic activity. Beck and Maher (1986) and Lien (1986) maintain that allocative efficiency can exist even where corrupt officials grant bids to the highest bidder.

The second category opines that corruption negates economic growth as it increase the cost of business and introduces a significant uncertainty in the decision making process (Murphy et al, (1993), Gould and Amaro-Reyes (1983), United Nations (1990), Mauro (1995), Mo (2000), and Monte and Papagni (2001). Mauro (1995) demonstrated how corruption is negatively and significantly linked to GDP per capita growth rate for a cross-section of 58 countries for the period 1960-1985. Mo (2000) points out that corruption are beneficial to a specific group of people, mainly the elites and political affiliates and create unfairness in opportunities.

Using four measures of corruption and four different sets of cross country regressions for four different time periods: 1980–83, 1988–92; 1984–96 and 1994–96, Rock and Bonnett (2004) tested the robustness of the negative effect of corruption on growth and investment. They found that corruption slows growth and/or reduces investment in most developing countries particularly small developing countries, but increases growth in the large East Asian newly industrializing economies.

Based on a sample of 63 to 71 countries between 1970 and 1998 and using three data sets: macroeconomic data, corruption indices and govemance indicators, Meon and Sekkat (2005) found a significant negative impact of corruption on both investment and growth. This impact is

not only independent from corruption's effect on investment but also tends to worsen as the quality of governance deteriorates.

Svensson (2005) investigated eight questions on corruption. He finds a negative but not signivicative association between corruption and growth. He used Mauro's (1995) sample updated, during the period 1980-2000 and he performed the OLS regression and the fixed effect method. The result of his research indicates that the effect of corruption on development is not significant. He gives the example of China which has been able to grow fast while being ranked among the most corrupt countries.

In their study on the effects of corruption on long-run growth, Mendez and Sepulveda (2006) incorporated measures of political freedom as a key determinant of the relationship. They find that corruption has a positive impact on long-run growth at low levels of incidence but is destructive at high levels.

Fisman and Svensson (2007) tested the relationship between corruption and growth using a unique data set containing information on the estimated bribe payments of Ugandan firms. They found that there is a negative relationship between bribery rates and the short-run growth rates of Ugandan firms, and that the effect is much larger than the retarding effect of taxation over the period 1995–1997. The same result was found by Kimuyu (2007) for the Kenya context.

The study of Aidt, Dutta and Sena (2008) offers theoretical and empirical investigation of the links between corruption, economic growth and institutional quality. They found two governance regimes. In the regime with high quality institutions, corruption is found to have a significant negative impact on growth while in the low quality instutional regime no corruption effect on growth is observed. Meon and Weill (2008) analyzed the interaction between aggregate efficiency, corruption, and different dimensions of governance. Their study is based on a panel of 69 countries, both developed and developing. They used two measures of corruption and two other aspects of governance. They report a detrimental effect of corruption in economies with effective institutions but where institutions are ineffective, there is a positive association between corruption and efficiency in economies.

Evrensel (2010) tested the corruption-growth and the corruption-growth volatility relationships. The cross-section sample used in this study covers 121 developed and developing countries[2]. The average growth rate of real GDP and the growth volatility are calculated based on the period 1990-2000. The growth volatility is measured by the standard deviation of growth rates during the same period. Firstly, the empirical analysis reveals that higher corruption leads to higher growth rates. However, a higher representation of state-owned banks increases growth rates. Secondly, they find that higher government spending and lower risk control decrease growth rates. Finally, empirical findings indicate that openness and financial development have a positive effect on growth rates.

Ugur and Dasgupta (2011) tested the relationship between corruption and economic growth. They found a negative relation between corruption and economic growth in poor income countries as well as in high income countries. For the case of Nigeria, Ajie and Wokekoro (2012) studied the effect of corruption on economic growth and found that corruption impedes economic growth.

Dridi (2013) tested the relationship between corruption and economic growth cross-country data covering 82 countries, both developed and developing, over the period 1980-2002. Results indicate that in the presence of political instability, corruption negatively acts on the economic growth.

Using meta-analysis, Ugur (2013) found a negative correlation between corruption and economic growth. In the same line of idea, Matthew and Idowu (2013) found that political corruption increases poverty as well as unemployment and negatively acts on economic growth.

Saha and Gounder (2013), studied the relationship between income and corruption using recent data covering 100 countries and by regions and income classification for the period 1995 to 2008. To explore the non-linear relationship, they performed linear, quadratic and cubic models. Their results indicate a negative relationship between income and corruption.

[2] Developed (31) and developing (90) countries.

Farooq *et al.* (2013) investigated the effect of corruption on economic growth in Pakistan. They have used time series data covering the period 1987-2009. By incorporating financial development and trade openness in growth model and applying structural break cointegration, their results indicate that corruption impedes economic growth. They also find that financial development adds in economic growth and trade openness stimulates economic growth. Those majors' findings imply that the government must take measures to reduce the level of corruption via improving the governance in the country. Efficient governance leads to a low level of corruption which can be helpful in collecting tax revenues and increased tax revenue would be a fuel for development projects and hence economic growth.

1.2. Corruption and investment

Literature shows that corruption discourages investment (both internal and the foreign direct investment) because it increases the transaction costs of doing business, increases the uncertainty and increase the production cost (Mauro1995; Tanzi and Davoodi, 2002a).

Mauro (1995) was the first who empirically analyzed the relationship between corruption and investment for a sample of 67 countries during the period 1980-1983. The index of corruption and the other institutional variables used in his paper were drawn from Business International (BI)[3]. In his paper Mauro (1995) restricts his analysis to nine indicators of institutional efficiency. He finds a negative and significant association between corruption and investment rate, both in OLS and 2SLS estimations. The results indicate that an improvement in the corruption index is associated with an increase in the investment rate by 2.9 percent. He demonstrates that high levels of corruption are associated with lower levels of investment as a share of Gross Domestic Product (GDP). As an example, Mauro (1995) shows that "if Bangladesh (score of 4.7) were to improve the integrity and efficiency of its bureaucracy to the

[3] BI published indices on 56 "country risk" factors for 68 countries, for the period 1980-1983, and on 30 country risk factors for 57 countries, for the period 1971-1979. The BI indices are between 0 and 10 and a high value of the index means that the country in question has "good" institutions.

level of Uruguay (score of 6.8), its investment rate would increase by almost five percentage points and its yearly GDP growth would rise by over half a percentage point".

In another study based on US outward investment data, Hines (1995) does not find a negative correlation between total inward FDI and the corruption level in host countries. However, Foreign Corrupt Practices Act of 1977 actually weakens the competitive position and FDI growth of the American firms during 1977-1982, without significantly decreasing the importance of bribery to foreign business transactions. Wedeman (1997) tested the association between corruption and growth in Zaire, South Korea and Philippine and find that for countries with low corruption the correlation between corruption and the ratio of investment to GDP might be strong and it loses power for countries with higher levels of corruption.

Wei (2000) studied the effect of corruption on foreign direct investment using a sample covered bilateral investment from twelve source countries to 45 host countries. He performed an OLS, quasi fixed effects, and Tobit estimation and finds that a rise in either the tax rate on multinational firms or the corruption level in a host country reduces inward foreign direct investment (FDI). He also finds that an increase in the corruption level from that of Singapore to that of Mexico would have the same negative effect on inward FDI as raising the tax rate by fifty percentage points.

Habib and Zurawicki (2002) analyzed the relationship between corruption and FDI in a cross-section of 89 developed and less developed countries and find that corruption tends to impede FDI. Akcay (2001) employed a cross sectional data from 52 developing countries with two different indices of corruption to estimate the effect of the level of corruption on FDI inflows. He performed an OLS with region dummies. The overall results fail to identify any significant effect of corruption on FDI. The most significant determinants of FDI are found to be: the market size, corporate tax rates, labor costs and the openness of the economy.

Tanzi and Davoodi (2002) have analyzed the relationship between corruption, public investment and growth. They have used indices or corruption from two sources: Business International (BI) and Political Risks Services (ICRG). Both indices assess the degree of corruption in a country. The IB index ranges 0 (most corrupt) to 10 (least corrupt), while the ICRG index ranges 0 (most

corrupt) to 6 (least corrupt). Tanzi and Davoodi (2002) have multiplied the ICRG index by 10/6 to get ascending indices from 0 to 10. They find that corruption can increase public investment while reducing its productivity. They have also found that higher corruption is associated with higher total expenditure on wages and salaries. Thus, corruption can reduce the quality of infrastructure which increases the cost of doing business for both government and private sector. Consequently, growth is negatively affected.

The study of Egger and Winner (2003) has used a sample of 73 developed and less developed countries over the time period 1995-1999 to test the interaction between the level of corruption and FDI. Using a fixed effect and a Hausman–Taylor model, their result show a positive impact of the viability of contracts on FDI inflows and a positive and significant relationship between corruption and FDI. A high level of corruption is usually associated with an unfavorable institutional environment.

In the Swedish context, Hakkala, Norbaack, and Svaleryd (2008) have used data of multinational firms in manufacturing industries compiled by the Research Institute of Industrial Economics (IUI). By dividing FDI into three categories: horizontal, vertical, and export-platform FDI, they found that corruption has a differential impact on different types of FDI. They found that corruption has a statistically significant impact on vertical and horizontal FDI. Precisely, the finding reveals that more corruption raises vertical FDI, but reduces horizontal FDI.

Barassi and Ying Zhou (2012) tested the relationship between corruption and FDI for a sample of 20 OECD countries and 52 developed and developing countries observed during the period 1996-2003. They modelled the relationship between corruption and FDI using both parametric and non-parametric approaches. Their main findings show that the impact of corruption on FDI stock is different for the different quantiles of the FDI stock distribution.

Gueorguieva and Malesky (2012) have used a novel empirical strategy, drawn from research in experimental psychology, to test the linkage between foreign direct investment (FDI) and corruption. They found a clear evidence of corruption during both registration and procurement procedures in Vietnam. The prevalence of corruption, however, is not associated with inflows of FDI.

III. Corruption in the Tunisian context

Over the past few years, corruption has increased in Tunisia. According to Transparency International, Tunisia's rank in the annual index of corruption perception fell from 33 in 1998 to 77 on 2013. An examination of the most corrupted sectors in Tunisia reveals that the police are the most corrupted with a level of 51%[4], followed by the parliament members and the government officers with a level of 32% and Judges and magistrates with 30% (WJP Rule of law index, 2012). The Tunisian financial sector was also characterized by some financial misconduct and has registered several proclamations of corruption. Tunisian businessmen affirmed that the best relation an investor can have is indubitably with a banker as personal relations can facilitate access to funding without constraints. However, obtaining loans without guarantees can increase the credit risk and affect the performance of the banking system as a whole. In this line of analysis, it is worth recalling that the rate of nonperforming loans in Tunisian banks stood at 19 % during 2000s, which is a high level.

The recent report by Freedom House indicates that Tunisia has recently witnessed a declining institutions as well as increasing monopolization of power and corruption by the ex- president.

During the period under ex-President Ben Ali regime, corruption was widespread in Tunisia and bribery was common. According to Chrisafis (2011), one-third of the county's economy being allegedly siphoned off by the ex-leader and his family. As an example, Ben Ali created early 90s a solidarity fund called 26-26 to collect donations and then using them for improving infrastructure of underdeveloped regions. However, it appears that money collected was used by Ben Ali's family for their personal use like buying illegally real estates, boats, and even private jets[5]. Furthermore, the Trabelsi family (ex-President's family-in-law) has worsened and widespread further the corruption in almost all the sector in Tunisia as they grip most of the sectors in the country. They also manipulated investment laws to further their own business

[4] The US Department of State (2010) attests that the police in Tunisia have frequently used their power to extort money from Tunisian citizens.

[5] According to the World Bank (2013, p5), the seized assets included some 550 properties, 48 boats and yachts, 40 stock portfolios, 367 bank accounts, and approximately 400 enterprises (not all of which operate in Tunisia). The confiscation commission estimates that the total value of these assets combined is approximately 13 billion USD, or more than one-quarter of Tunisian GDP in 2011.

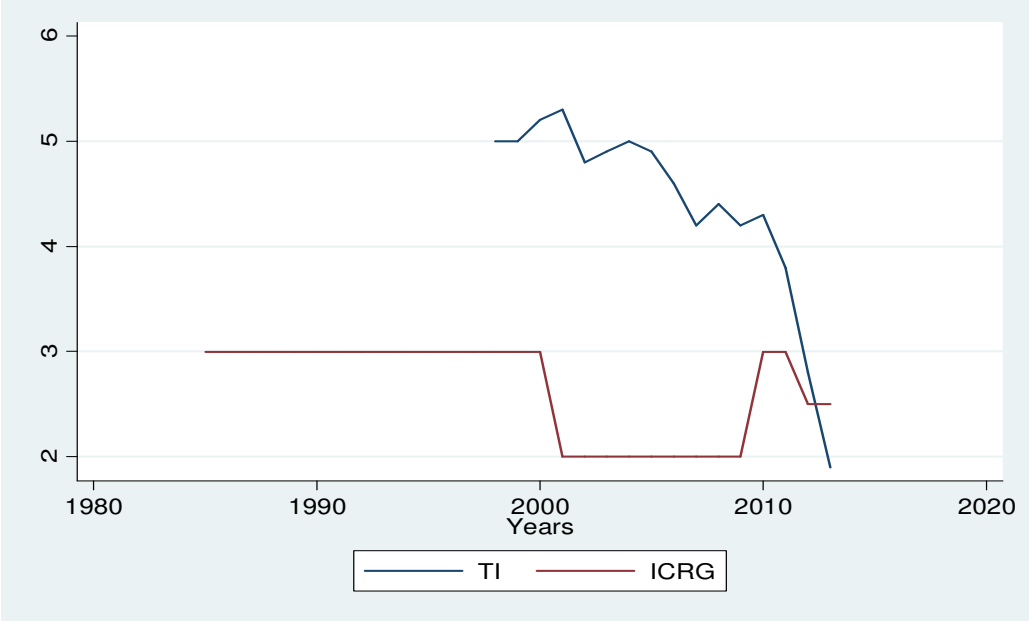
interests. Recently, the World Bank reveals that among 600 000 enterprises in Tunisia, 220 of them[6] were owned by Ben Ali, his wife, and the extended family realized 21% the total private sector profits during 1996-2010 while representing only 3% of the total companies.

The influence of ex-president family has discouraged investors and has generated a drop of FDI inflows these recent years. The volume of the FDI in Tunisia declined of 32.2 % during the first 11 months of year 2009. During year 2009, the FDI reached TND1.972 billion (USD1.528 billion) against TND 2,999 billion (USD 2,324 billion) in 2008.

In the graph 1 below we have used two sources of data on corruption. The first source is the Transparency International index (TI) and the second is the International Country Risk Guide (IRCG). The corruption perception index (CPI) provided by International Transparency (IT) is a ranking of countries according to the extent by which corruption is believed to exist. It was created in 1995 by Transparency International and ranks almost 200 countries on a scale of zero to 10, with zero indicating high levels of corruption and 10 indicating low levels. Developed countries typically rank higher than developing nations due to stronger regulations. The ICRG index rates 140 countries each month on the basis of over 40 risk metrics affecting political, economic and financial risk, dating back to 1984 for most. The ICRG corruption index varies from 0 to 6, with higher values indicating higher corruption.

[6] These firms were confiscated in the aftermath of the Jasmin revolution. The full list of which is available from the Ministry of Finance.

Graph 1: Evolution of the corruption perception index in Tunisia 1985-2013



Sources: International Country Risk Guide and Transparency International index

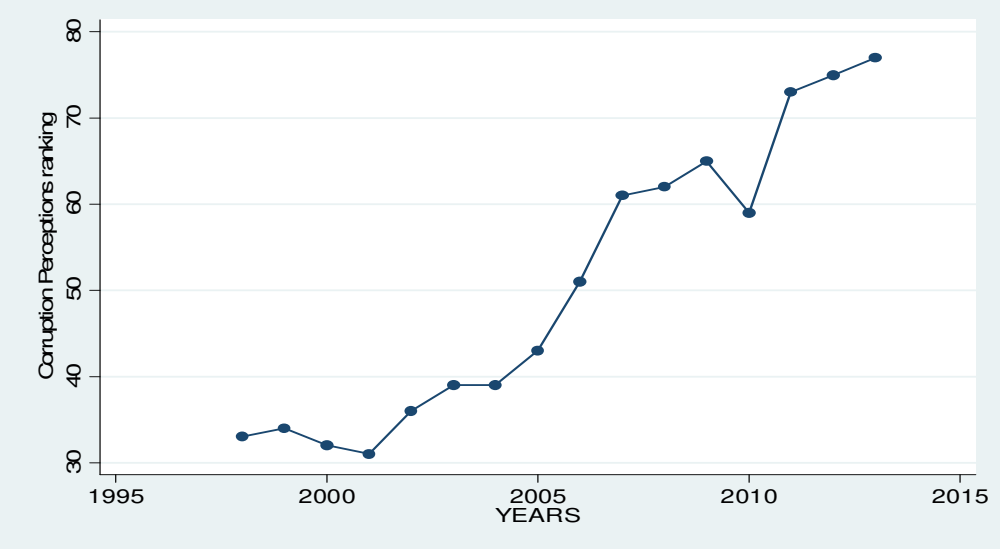
Graph1 reveals a clear and a continuous downward trend in the TI index from 1998 to 2013 what confirms the increase of the corruption in Tunisia. The corruption perception index takes a value of 2.80 on 2012 while it was 5 on 1998. Those values indicate that the level of corruption in Tunisia increased during this period especially after the "Jasmin revolution" of December 2010 as it moved from 3.8 in 2011 to 2.8 in 2012 and 1.9 for 2013. As for the IRCG index, it recorded various trajectories during the period of the study: a constant tendency during 1985-2000 in which the level of corruption was about 3, then downward trends during 2000-2009 and 2012-2013 in which corruption recorded a level of 2 for the first period and 2.5 for the second. Finally, there is an upward trend during the period 2010-2011 in which the ICRG index reached again 3.

The most important remark to be drawn from graph 1 is the intersection of the two curves in 2012. In spite of the different methodology of the two indices, they succeed to get almost the same value in 2012 with 2.5 for ICRG and 2.8 for TI.

According to Transparency International and the World justice project and the Rule of law index, the level of corruption in Tunisia has increased during the last decade as it shifted from the place

33 in 1998 to 73 among 183 countries in 2011 and 77 among 177 countries on 2013 (Graph 2). An examination of the most corrupted sectors in Tunisia reveals that the police sector is the most corrupted with a level of 51%, followed by the parliament members and the State employees of the national government with a level of 32%. In the last rank, we find Judges and magistrates with 30%.

Graph2. Evolution of the Corruption Perception Index



Source: authors using data from TI & WJP Rule of law index

Despite the decline of the Tunisian international position, Tunisia was better ranked in 2009 than its neighbors notably; Egypt (111), Algeria (111) and Morocco (89). In 2010, Algeria continues to be ranked at the top of Arab countries in the corruption perception index with a value of 105 in 2010 and 112 in 2011 while Egypt and Morocco were ranked 98 and 85 respectively in 2010 and 112 and 80 in 2011 (World justice project and the Rule of law index, 2013).

In 2013, Tunisia lost two steps in the last world ranking regarding its efforts for fighting corruption and it was ranked 77th out of 177 countries. However, Tunisia keeps the same score of 41 points as that of the previous years and Tunisia is ranked first in Maghreb and the 8th in the Arabic scale.

IV. Econometric Methodology

Our investigation is to test whether corruption hampered economic growth and the macro-economy o Tunisia. The basic empirical investigation has two purposes. The first one is to examine the long-run relationship corruption and economic growth while the second is to examine the short-run dynamic causal relationship between the different variables. The basic testing procedure requires three steps. The first step is to test whether the variables contain a unit root to confirm the stationarity of each variable. This is done by using the Augmented Dickey–Fuller tests (F-ADF) and Philips–Perron (PP) tests. For a robustness check, we also use the Zivot and Andrews (1992) unit root test with unknown structural break. In the second step we test for the existence of a long-run cointegrating relationship between the variables. This is done by the use of the Johansen-Fisher methods. Finally, the last step, if all variables are integrated of order one I(1) and cointegrated short-run elasticities can be computed using the vector error correction model (VECM) method suggested by Engle and Granger (1987).

4.1. Data

The empirical model includes the following four variables: real foreign direct investment inflows (FDI) to GDP, gross fixed capital formation to GDP as a proxy of investment (INV), total credit to the private sector (CPS). For economic growth we used GDP per capita as it was argued that it is considered as important determinant of the level of corruption. The main source of our data is the World Bank's World Development Indicators (WDI).

Following previous studies by Knack and Keefer (1995); Tanzi and Davoodi (1997); Wei (2000); and Mendez and Speulveda (2006), data on corruption was extracted from *International Country Risk Guide (ICRG)*. The ICRG corruption index varies from 0 to 6, where lower value implies higher corruption. Lower corruption scores indicate that "high government officials are likely to demand special payments" and that "illegal payments are generally expected throughout lower levels of government" in the form of "bribes connected with import and export licenses, exchange controls, tax assessment, policy protection, or loans" (see Knack and Keefer, 1995, p. 225).

The time series data is recorded annually; it covers the period from 1976 to 2013. The data are yearly, and cover the period 1976-2013. All the variables are transformed into log form to reduce the problem of heteroscedasticity.

The correlation coefficients and descriptive statistics for the major variables are summarized in Table 1. Credit to private sector and FDI are found to have a positive correlation with growth while investment and corruption are both negatively correlated with per capita income growth. Furthermore, the correlation matrix reveals the negative correlation between corruption and the other variables.

Regarding the coefficients, they are considered as low which reflect absence of autocorrelation between the variables of the study.

Table 1. Statistical table and the correlation matrix

	LGDPPC	**LINV**	**LCPS**	**LCOR**	**LFDI**
Mean	7.468825	3.200391	4.136842	0.974186	0.694334
Median	7.459339	3.170861	4.106767	1.098612	0.717840
Maximum	7.832808	3.774369	4.410371	1.098612	2.242835
Minimum	7.115582	2.989714	3.940222	0.693147	-0.510826
Std. Dev.	0.254917	0.133632	0.117175	0.182514	0.700823
Jarque-Bera	2.625648	156.7220	2.261253	5.145477	0.584729
Observations	29	29	29	29	29
LGDPPC	1				
LINV	-0.14182	1			
LCPS	0.362972	0.1545964	1		
LCOR	-0.64368	- 0.19448290	-0.0931844	1	
LFDI	0.6454416	0.2654227	0.2264587	-0.552486	1

Note. LGDPpc is the real GDP per capita; LINV is the ratio of investment to GDP, LCPS is the credit to the private sector as a share of GDP, LCOR, the corruption index, LFDI is the foreign direct investment inflows as a percentage of GDP, *L* is the logarithm.

4.2. Econometric approach

4.2.1. Unit root testing and Structural Break

We employ the Augmented Dickey–Fuller (F-ADF) unit root tests to identify whether the variables contain a unit root and confirm the stationarity of each variable. Common criticisms of these tests include sensitivity to the way the test is conducted, such that the wrong version of the ADF test is used. ADF tests are also quite sensitive to any incorrect establishment of lag

parameter. Given this weakness, we also conduct the Phillips-Perron (PP) test (1988), which allows for the presence of a non-zero mean and a deterministic time trend.

As we have presented in the introduction, the Tunisian economy has been subject to a various numbers of economic reforms during the period 1980-2010. Hence, one could conclude that macroeconomic variables are likely to have been subject to a structural break, such as that from the structural adjustment programs in 1987 or the revolution of 2010. In this case, the common ADF and PP unit root tests could not provide reliable results. In fact, the ADF and PP unit root tests are known to suffer potentially severe size distortions in finite samples when errors are serially correlated, especially when the errors are of the moving average type with a root approaching minus one (Haldrup and Jansson, 2005). To overcome these problems many economists insist on the necessity of including breakpoint that can be determined from the data. The debate was initially developed by Perron (1989) who revealed the critical importance of modeling structural breaks when carrying out unit root tests. Hence, Perron suggested allowing for an exogenous structural break in the Augmented Dickey-Fuller (ADF) tests as a solution to increase the power of ADF tests. Following this development, Zivot and Andrews (1992) and later Perron (1997) suggested an alternative method for detecting structural break by allowing for an endogenous or an unknown break point. In this paper we use the Zivot and Andrews (1992) unit root test that allows for endogenous structural breaks which is important since it prevents a data dependent arbitrary choice of the break point.

The test of the Zivot and Andrews (1992) consists in solving the following three types of models. The first model (A) considers a one-time change in the intercept of the variables of the underlying data. Arithmetically, the model is written as follows:

Model (A): $$y_t = \alpha_A + \theta_A DU_t + \beta_A t + \lambda_A y_{t-1} + \sum_{j=1}^{k} \omega_{A,t} \Delta y_{t-j} + \varepsilon_t \qquad (1)$$

The second model (B) allows for a one-time structural break in the slope of the trend function. It is expressed as follows:

Model (B): $$y_t = \alpha_B + \beta_B t + \gamma_B DT_t(\phi) + \lambda_B y_{t-1} + \sum_{j=i}^{k} \omega_{B,j} \Delta y_{t-j} + \varepsilon_t \qquad (2)$$

The third model (C) allows for a one-time structural break in the intercept and trend all together.

Model (C): $y_t = \alpha_C + \theta_C DU_t(\phi) + \beta_C t + \gamma_C DT_t^*(\phi) + \lambda_C y_{t-1} + \sum_{j=1}^{k} \omega_{C,j} \Delta y_{t-j} + \varepsilon_t$ (3)

where, $\phi = d/T$ is the unknown sample ratio to be estimated $(\phi \in \prod = [2/T, (T-1)/T])$, T is the number of observations and d is the unknown breakpoint.

DU is a dummy varibale which is as follows:

$DU_t(\phi)$ = 1 if t > $T\phi$

= 0 otherwise;

DT is the slope dummy written as:

$DT_t^*(\phi) = t - T\phi$ if $t > T\phi$

= 0 otherwise.

The nul hypothesis of a unit root test is that , $\lambda_{i,\phi} = 1$, i= A,B,C. Every model has a unit root with a break under the null hypothesis, as the dummy variable is incorporated in the regression under the null. The alternative hypothesis is a broken trend stationary process. Following Zivot and Andrews (1992), we fixed the trimming region to be at 0.15T, 0.85T and then we choose the breakpoint date according to the given value of the break date.

4.2.2. Cointegration

The cointegration test is based on the multivariate Johansen approach (1988) which uses two statistic tests, namely: Trace test and Max-Eigen value. The likelihood Ratio (LR) test is based on the trace statistics (λ trace) which tests the H_0: $r \leq q$ against H_1: $q = r$ is calculated thus:

$\lambda_{trace}(r) = -T\sum_{l+1}^{p} \ln(1 - \hat{\lambda} i)$ where $\lambda r + i \ldots . \lambda n$, are the least value of eigenvectors $(p - r)$. The second test is the maximal eigenvalue test $(\lambda_{\max})$ which tests the H_0: there are r cointegrating vectors against the H_1: there are $r+1$ cointegrating vectors and is calculated as follows:

$\lambda_{\max}(r, r+1) = -T \ln(1 - \hat{\lambda} r + 1)$.

While numerous papers have used bivariate and trivariate frameworks to test for causality between corruption and economic growth, in this paper we use multivariate procedure by the mean of a Vector Error Correction Model (VECM).

The VECM is now specified as follows:

$$\Delta LGdppc_t = \alpha_1 + \sum_{i=1}^{p} \beta_{1i} \Delta LGdppc_{t-i} + \sum_{i=1}^{q} \beta_{1i} \Delta LFDI_{t-i} + \sum_{i=1}^{r} \beta_{1i} \Delta LCPS._{t-i} + \sum_{i=1}^{s} \beta_{1i} \Delta LIINV_{t-i} + \sum_{i=1}^{s} \beta_{1i} \Delta LCor_{t-i} + \lambda_1 ect_{t-1} + \mu_{1t} \quad (4)$$

$$\Delta LFDI_t = \alpha_2 + \sum_{i=1}^{p} \beta_{2i} \Delta LGdppc_{t-i} + \sum_{i=1}^{q} \beta_{2i} \Delta LFDI._{t-i} + \sum_{i=1}^{r} \beta_{2i} \Delta LCPS._{t-i} + \sum_{i=1}^{s} \beta_{2i} \Delta LIINV_{t-i} + \sum_{i=1}^{s} \beta_{2i} \Delta LCor_{t-i} + \lambda_2 ect_{t-1} + \mu_{2t} \quad (5)$$

$$\Delta LCPS_t = \alpha_3 + \sum_{i=1}^{p} \beta_{3i} \Delta LGdpps._{t-i} + \sum_{i=1}^{q} \beta_{3i} \Delta LFDI_{t-i} + \sum_{i=1}^{r} \beta_{3i} \Delta LCPS._{t-i} + \sum_{i=1}^{s} \beta_{3i} \Delta LIINV_{t-i} + \sum_{i=1}^{s} \beta_{3i} \Delta LCor_{t-i} + \lambda_{31} ect_{t-1} + \mu_{3t} \quad (6)$$

$$\Delta LINV_t = \alpha_4 + \sum_{i=1}^{p} \beta_{4i} \Delta LGdppc_{t-i} + \sum_{i=1}^{q} \beta_{4i} \Delta LFDI_{t-i} + \sum_{i=1}^{r} \beta_{4i} \Delta LCPS._{t-i} + \sum_{i=1}^{s} \beta_{4i} \Delta LIINV_{t-i} + \sum_{i=1}^{s} \beta_{4i} \Delta LCor_{t-i} + \lambda_4 ect_{t-1} + \mu_{4t} \quad (7)$$

$$\Delta LCor_t = \alpha_5 + \sum_{i=1}^{p} \beta_{5i} \Delta LGdppc_{t-i} + \sum_{i=1}^{q} \beta_{5i} \Delta LFDI_{t-i} + \sum_{i=1}^{r} \beta_{5i} \Delta LCPS._{t-i} + \sum_{i=1}^{s} \beta_{5i} \Delta LIINV_{t-i} + \sum_{i=1}^{s} \beta_{5i} \Delta LCor_{t-i} + \lambda_5 ect_{t-1} + \mu_{5t} \quad (8)$$

Where ECT is expressed as follows:

$$ECT_t = LGdppc_t - \alpha_1 - \beta_{1i} LFDI - \beta_2 LCPS._{t-i} - \beta 3 LINV_{t-i} - \beta_4 LCor_{t-i} \quad (9)$$

Where $t=1...T$, denotes the time period.

A major advantage of VECM is that it can also be used to verify causality among the variables in case of cointegrated series. Although cointegration indicates the presence of causality, yet the direction of causality amongst the variables is identified through VECM. Moreover, one can

also distinguish between the short- and long-run causality with the help of vector error correction model (Hamdi and Sbia 2013).

4.2. Empirical results

4.2.1. Unit root tests and Structural Break

The results of the unit root tests of the Augmented Dickey-Fuller (*ADF*) and Phillips-Perron (*PP*) for the four variables of the model are presented in Table 1. The test statistics for the log levels are statistically insignificant. The results show that the null hypothesis cannot be rejected in each series in the level where the series contain a unit root. Therefore, *LGDP*, *LFDI*, *LCPS, LINV* and LCor appear to be non-stationary in the level. By testing through first difference, the results clearly indicate that the null hypothesis of non-stationary can be rejected. This means that *LGDP*, *LFDI*, *LEXPORT and LINV* become stationary and do not contain unit root after first differencing at the 1 per cent level of significance. Hence, from all of the tests, the unit roots tests indicate that each variable is integrated of order one.

Table 1. Augmented Dickey-Fuller (*ADF*) and Phillips-Perron (*PP*) Unit root tests

	ADF		**PP**		**Order of Integration**
	Level	1st diff,	Level	1st diff,	
LGDP	0.481	-5.271***	0.481	-5.2753***	I(1)
LFDI	-1.309	-6.818***	-1.193	-6.7805***	I(1)
LINV	-1.358	-10.435***	-2.054	-11.119***	I(1)
LCPS	-2.2855	-11.9253***	-2.3940	-11.9340***	I(1)
LCor	-1.73	-5.017***	-1.736	-5.04***	I(1)

The results of Zivot-Andrews unit root test are reported in Table-2. The Zivot-Andrews test with one structural break finds no additional evidence against the unit root null hypothesis relative to the unit root tests without a structural break. In other words, in models A, B and C the null hypotheses are not rejected for the variables. This result is consistent with the standard ADF and PP test results.

Table-2: Zivot-Andrews Structural Break Unit Root Test

Variable	Model A		Model B		Model C	
	T-statistic	Time Break	T-statistic	Time Break	T-statistic	Time Break
LGDP	-3.55 (1)	1999	-4.06 (1)	2009	-4.12 (2)	2007
LFDI	-5.832 (2)	1992	-5.02 (2)	1994	-5.65 (2)	1994
LINV	-4.653 (4)	1998	-4.22 (3)	1999	-5.67 (3)	1992
LCPS	-4.873 (3)	1989	-5.04 (2)	1990	-4.94 (1)	1989
LCor	-4.126 (1)	2002	-5.56 (1)	1998	-5.39(1)	2001

Note. Critical values for rejection of null hypothesis of a unit root with a structural break for the three models). *Denotes significance at the 10 percent level. Lag order is shown in parenthesis.

Overall our results report that all the series have same level of integration i.e. I(1).

According to Engle and Granger (1987), variables with the same order of integration can be tested for cointegration. In this way, the result from the unit root test facilitated us in proceeding to the cointegration test for the variables under study.

4.2.2. Cointegration and Granger causality analysis

The purpose of the cointegration test is to identify whether it exists a long run relationship between the *LGDPpc*. *FDI*, *LCPS, LINV* and LCor Table 5 presents the results of the trace and the maximum-eigenvalue tests from the Johansen (1980) and Johansen and Juselius (1990) maximum Likelihood analysis. The results suggest the existence of one cointegrating vectors at 5% of significance.

Table 3. Results for Johansen test cointegration

Hypothesized	Trace Statistic	Max-Eigen Statistic
None *	103.7594	52.71273
At most 1 *	51.04665	21.95184
At most 2	29.09481	14.68254
At most 3	14.41227	8.703758
At most 4	5.708512	5.708512

Trace and Max-eigenvalue test indicates1cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

The results of the long-run equilibrium relationship are presented in Table 4 below. The most important variable in the model, which is corruption, acts positively and significantly at the level of 1% to economic growth[7]. The coefficient of corruption reported estimates is 0.423. This

[7] It is worth recalling that a decrease in the corruption index means an increase in corruption and *vice versa.*

should be interpreted as follows: a one-unit increase in perceived corruption (index) is associated with a decrease in per capita GDP growth rate of 0.42.percentage points. Indubitably, corruption weighted immensely on growth and our results suggest that improvement in corruption engenders economic growth. This result is in line with most of the studies on corruption and growth nexus.

The coefficient of credit to the private sector (*CPS*) is positive and significant at a level of1%. This conclusion indicates that credit to private sector is an important engine of economic growth. Facilitating credit conditions, by reducing for example constraints to access to finance, would improve the well-being of Tunisian households (Hamdi et *al* 2013). If we consider CPS as a proxy of financial development, then we can conclude that this result is in line with the traditional literature on finance and growth (Aghion et al., 2005; Levine, 2005; Levine et al., 2000). The coefficient of foreign direct investment (*FDI*) is positive and significant at 1% level of significance. This is a very important conclusion that shows that the massive reforms implemented in late 80s and early 90s have been fruitful for economic growth in the long term as they were aimed at attracting massive foreign investment. From this result we can conclude that FDI led to growth in Tunisia in the long run and this result confirm the recent study by Hamdi *et al* (2013).

The ratio of investment to GDP is negative and significant at the 1 percent level. The magnitude of the coefficient implies that a 1 percent decrease in investment to GDP ratio increases real GDP by 3.35 percent. According to Mauro (1995) corruption affect growth through reducing the investment activities. Our result is in line with the findings by Hamdi *et al.* (2013) for the Tunisian context.

Table 3. Long-run elasticities

Dependent Variable: LGDPpc

Regressors	Coefficients	T-Value
LCOR	0.423827	-3.63023***
LINV	-3.354228	15.0807***
LFDI	0.428948	-10.0858***
LCPS	0.484617	-1.51672**
C	15.48598	

Note: ***, **and * indicate the rejection of null-hypothesis at 1%, 5% and10% significance levels, respectively.

The results of the short-run estimations are presented in table 4. In fact, since the optimal lag length was two, the short-run results are also presented for two lags of each variable. These results seem interesting in the sense that corruption has a positive impact on growth in the short run and the coefficient is significant at 5% level of significance. This means that in the short-run, corruption hampered significantly per capita GDP and an improvement of the corruption index would improve GDPpc. FDI have a negative impact on Tunisian economy.

In the same line of analysis, investment contributed positively and significantly at the level of 5% to economic growth. This result could surprise but it is not surprising that multiplying investment activities and projects, especially public, encourage high level officials to get bribes (Tanzi and Davoodi 1997). Therefore, public investment is the best way to get dirty money.
It is also evident from table 4 that error correction term is statistically significant and has the expected sign. The coefficient -0.069 indicates that when GDP per capita is above or below its equilibrium level, it adjusts by 6.9% within the first year. Therefore, the pace of adjustment toward the equilibrium is low in case of any shock to GDP.

Table 4. ECM results based on Johansen cointegration

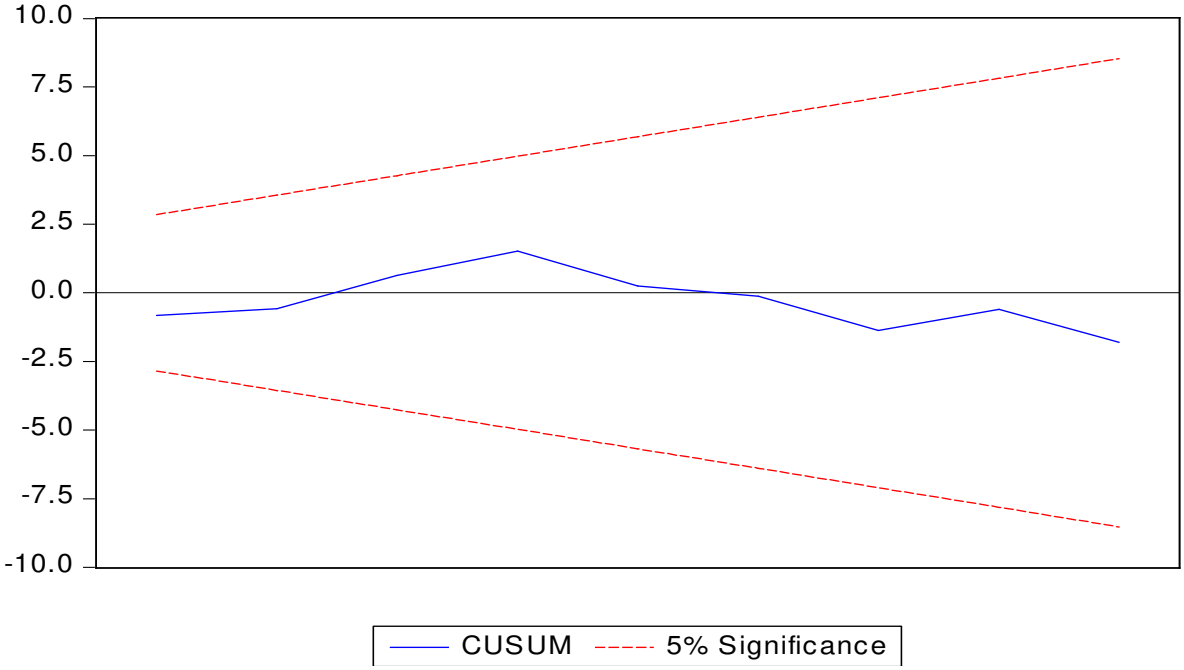
Error Correction:	**Coefficient**	**t-value**
Δ LINV(1)	0.141323	1.64559**
Δ LINV(2)	0.065054	1.68489*
Δ LFDI(1)	-0.014447	-1.80548**
Δ LFDI(2)	-0.007695	-0.90783
Δ LCPS(1)	0.074559	0.75025
Δ LCPS(2)	0.052798	0.59114
Δ LCOR(1)	0.096514	-2.86070**
Δ LCOR(2)	0.038727	-0.8914
C	0.018458	1.8486
ECT	-0.069934	-3.35559***
Diagnostic tests	**t-stats**	**p-value**
White Test	1.5696	0.2112
Normality	1.4535	0.4834
Serial Correlation LM Test	0.1137	0.8934
ARCH	0.8554	0.4519
Breusch-Pagan-Godfrey	1.6522	0.1865
R2	0.677	

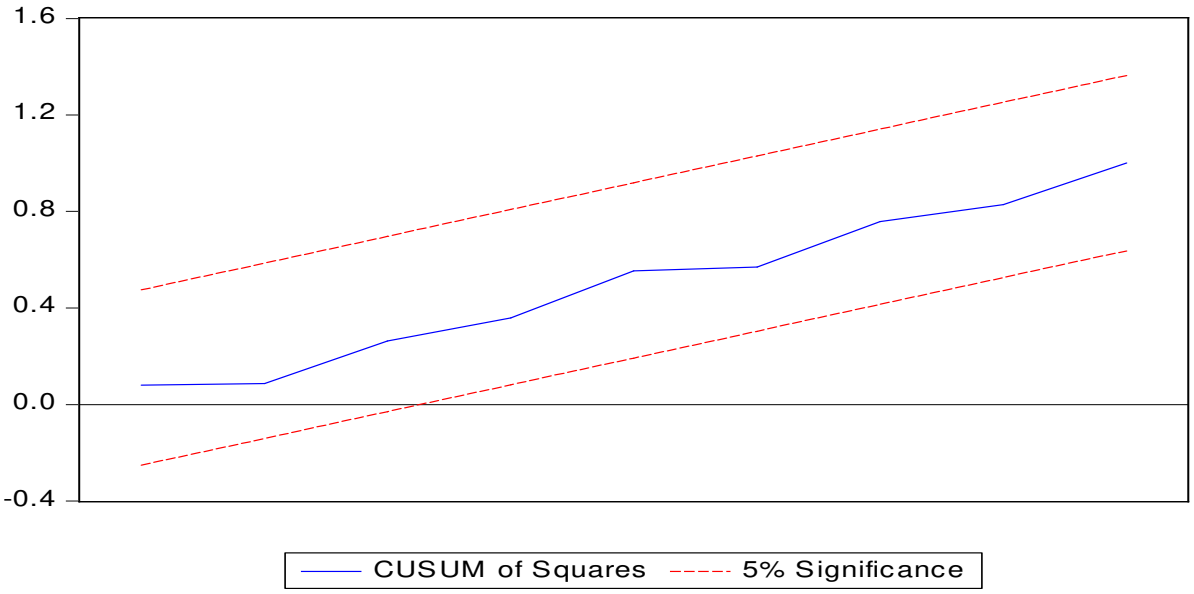
Note: ***, **and * indicate the rejection of null-hypothesis at 1%, 5% and10% significance levels, respectively.

For a stability purpose, we have conducted several diagnostic tests to the ECM model. The results are reported in the lower part of Table 4. They confirm the absence of serial correlation (Breusch-Godfrey Serial Correlation LM Test), heteroskedasticity (White Test) and autoregressive conditional heteroskedasticity (ARCH) in the model. The underlying model also passes diagnostic test for normality (Jacque-Bera).

The stability of the model was also checked by applying cumulative sum of recursive residual (CUSUM) and cumulative sum of squares of recursive residual (CUSUMQ) techniques based on ECM of Eq.(5). They show that the model is stable. We did not provide the CUSUM and CSUMSQ figures to save space, but they are available from the authors upon request

Figure1. CUSUM and CUSUM SQ





After examining the dynamics of long and short-run estimations, we turn to investigate the direction of causality between the variables of the model. This is done by the use of three Granger causality tests: short-run causality, long-run causality and the joint short and long run. The results are reported in table 5.

Table 5. Direction of Granger causality tests

Variable	***Short run (F-stats)***					***ECT*** *(t-stat*	***Joint short and long run (F-stats)***				
	ΔLGDP	*ΔLFDI*	*ΔLCPS*	*ΔLINV*	*ΔLCor*		*ΔLGDP & ECT*	*ΔLFDI & ECT*	*ΔLCPS & ECT*	*ΔLInv & ECT*	*ΔLCor & ECT*
ΔLGDP	-	0.163***	3.113***	0.661	3.202***	-3.118***	-	0.312	2.912*	0.689	1.749
ΔLFDI	1.616	-	2.839**	1.019	- 1.4556	1.242	0.979	-	3.148**	1.749	1.09
ΔLCPS	0.49**	4.756**	-	0.209*	- 0.588	2.314	2.975**	5.277***	-	2.711*	1.110
ΔLInv	1.249	1.073	0.157	-	-1.810**	-1.517**	1.979*	1.131	0.135	-	2.225**
ΔLCor	no	1.749	1.749	1.749	-	-0.129*	10225	0.529	1.92*	2.002*	-

The results of VECM Granger causality approach provide long-and short run relationships between the variables.

In long run, the feedback hypothesis exists between corruption and economic growth. The bidirectional causal relationship is found between Credit to private sector and foreign direct investment and the same is true for economic growth and CPS. Therefore, it can be concluded that corruption exerts significant control on growth and investment in the short-run and this implies that corruption has overbearing and predictive power in the Tunisia economy.

For short span of time, bidirectional causality is found between economic growth and corruption. The feedback hypothesis also exists between corruption and financial development. Trade openness and corruption are not interdependent. Finally, unidirectional causality is found running from financial development to economic growth. The joint long-and-short run analysis confirms the long run and short run causality relationships between the variables such as economic growth, corruption, financial development and FDI.

4.3.3. Impulse response functions

We use impulse response functions (IRFs), which outline the dynamic response of a one-standard-deviation shock in a variable on current and future values of the variables, in order to capture the short-run dynamics of the model. It can also provide information on the period by which variables go back to the equilibrium following a shock in the long run relationship.
Since the IRFs based on a Cholesky decomposition is influenced by the ordering of the variables, we applied generalized impulse response functions (GIRFs) proposed by Pesaran and Shin (1998). The impulse response functions (IFRs) is presented in Figure 2 below.

The chart illustrates the response of each variable of the VAR and the impact of other variables. It shows that the response of GDPpc to corruption is negative for almost all the coming ten periods. Once again, this reveals the harmful impact of corruption on growth and development.

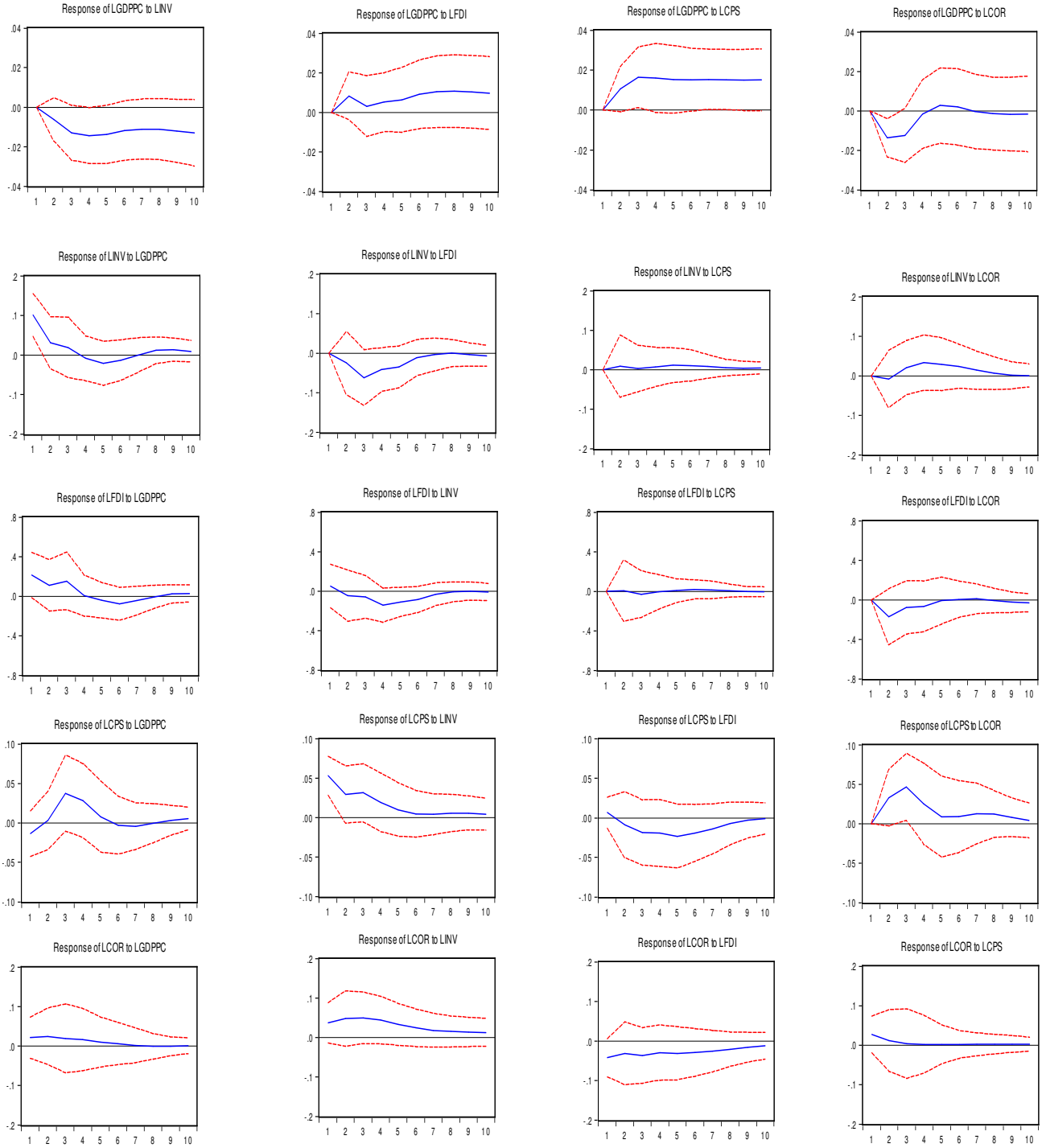
The impulse response functions also reveals the positive feedback of gdp following a shock from credit to private sector and this support our previous finding regarding the positive association between financial deepening and economic growth if we consider CPS as a proxy of financial

development. Similarly, FDI appears to impact positively economic growth as its sharp remains positive during all the coming years. Finally, it also appears from the shocks that the relation of investment with the other variables is not clear and cannot justify a positive feedback. In this case, one could confirm the one of the channel through which corruption affect growth is investment activities as all projects are public and high officers request a bribe to get the license.

Overall, from Fig. 2, we conclude that the responses are significant and the short run equilibrium adjustment process is fairly fast.

Figure2. Impulse response functions

Response to Cholesky One S.D. Innovations ± 2 S.E.



V. Conclusion and policy implications

The main purpose of this paper is to investigate the dynamic relationship between corruption and economic growth for the case of Tunisia by incorporating credit to the private sector, investment to GDP ratio and foreign direct investment inflow to GDP. The study covers the data period of 1976 to 2013. In the empirical model, we have firstly used a unit root test with structural break to test the stationary properties of the series and the cointegration for long-run is investigated by applying the vector error correction procedure. The study makes several important findings. First, the results reveal that a one-unit increase in corruption retards economic growth by roughly 0.423 percent for the period under consideration. The finding that corruption has negative influence on economic growth is consistent with almost all the available studies. The results suggest that improvement in corruption engenders economic growth. The second important conclusion is the negative association between investment and growth suggesting that investment is an important channel through which corruption could be transmitted. This result is in line with the one found by Mauro (1995).

The paper reveals two other important results. The first one is the positive association between credit to the private sector and GDPpc suggesting a validation of finance-led-growth for the case of Tunisia if we take CPS as a proxy for growth. The second important conclusion is the positive association between FDI with GDPpc in the short-run and long-run as well. This result confirms the previous studies on FDI-led-growth for the case of Tunisia (Hamdi *et al* 2013, Belloumi 2014). The third important conclusion is that unfortunately, corruption gets worsened in the period that follows the social turmoil. Hence, the three post-revolution governments did not successfully limit corruption rife.

Based on the findings of this study it is obvious that corruption appears to be one of the serious obstacles to economic growth and social development in Tunisia. Hence, efforts should be made to curtail all kind of corruption. The current and forthcoming Tunisian governments have to do more efforts to fight corruption by implementing new rules and laws which aim at reducing corruption and encourage transparency.

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