CORRUPTION AND GROWTH: EVIDENCE FROM THE ITALIAN REGIONS

NADIA FIORINO, EMMA GALLI, ILARIA PETRARCA

Corruption and Growth: Evidence from the Italian Regions

Nadia Fiorino
Università dell'Aquila
nadia.fiorino@univaq.it

Emma Galli
Università di Roma "La Sapienza"
emma.galli@uniroma1.it

Ilaria Petrarca
Università di Verona
ilaria.petrarca@univr.it

ABSTRACT

Our paper addresses the impact of corruption on economic development in the Italian regions for the period 1980-2004 by using a panel dataset which collects economic, socio-demographic, institutional, political and electoral information and estimating a dynamic growth model with include corruption as our interest variable. After solving the endogeneity problem and controlling for the standard economic and political variables, we find strong evidence of a negative relation between corruption and economic growth. We further investigate the role of public expenditures on economic growth in the Italian Regions, since government intervention has been traditionally the major policy followed to reduce income differentials between the North and the South of the country. Total expenditure as well as its main components never turn out significant by suggesting that the presence of corruption undermine the positive impact that public expenditures generally have, if productive, on the economic growth.

JEL classification: H11; O40; O38
Keywords: Corruption; associative crimes; economic growth; panel, endogeneity

1. Introduction and brief review of the literature

The impact of bureaucratic corruption on the level of economic development of different countries has been a topic of debate over the last decades. Sometimes a strong interaction between politicians, bureaucrats and businessmen aimed to reap illegal economic rents from public activities has characterized the decision making process for private and public investments by affecting the economic growth. If corruption had promoted investments that would have been otherwise stalled by regulations and bureaucratic procedures or reduced the incentive to invest in productive activities by including in the decision making process distorting elements is a theoretical and empirical matter. Does corruption 'sands' or 'greases the wheels' of the economic development? While both the World Bank and the IMF claim that corruption negatively affects growth, the literature on this issue yields mixed results.

Many economists view corruption as a major obstacle to economic growth (see, among others, Myrdal, 1989; Andvig and Moene, 1990; Shleifer and Vishny, 1993; Blackburn et al., 2006). They argue that, by controlling the supply of an individually-demanded service, a government official may use his arbitrary power to restrict it; in other words, he may create barriers, deny permission or delay its release. Bribes are then the extra-price charged by bureaucrats to private agents and represent a disincentive to invest. The firms engaged in rent-seeking activities rather than in more productive activities realize also a sub-optimal use of human capital that damage growth. Mauro (1995), Keefer and Knack (1997), Hall and Jones (1999), La Porta et al. (1999), Li et al. (2000) and Gyimah-Brempong (2002) empirically investigates the impact of corruption on growth for a wide cross-section of countries. They find that higher levels of corruption significantly reduce both investment and economic growth. Corruption may also contribute to a misallocation of public resources. Mauro (1998), Tanzi and Davoodi (1998) and Gupta et al. (2001) empirically show that corruption distorts the composition of government expenditure towards less productive activities and therefore results detrimental for growth. In addition, it could inefficiently create large public sectors where resources that should have been used productively are wasted through rent seeking (Baldacci et al., 2004).

Some scholars instead argue that corruption 'greases the wheels' of development by counteracting government failures of various sorts and promoting efficiency and economic growth in the short run (Leff , 1964; Huntinghton, 1968). This hypothesis, however, does not suppose that corruption is beneficial everywhere. It only presumes that corruption is growth-enhancing in situations where other aspects of governance are lacking and/or economic policy is inefficient. The view of corruption as a rational market response to pre-existing government failures is formalized for example in the 'queue model' proposed by Lui (1985). In this model the most efficient firms tend to value more the time they would waste in the queue and therefore are willing to pay highest bribes to bureaucrats who will give them priority. Along this line of research Shleifer and Vishny (1994) develop a model of bargaining between politicians and enterprises and show that corruption can facilitate an efficient allocation of resources. This because bribes are a way to distribute wealth between politicians and agents in the private sector while, in their absence, the politicians would extract rents in a politically motivated ways. In other words, corruption increases efficiency by allowing private sector agents to buy their way out of the inefficiencies that would otherwise be introduced by the politicians. In this perspective, the existence of a negative linear relationship between corruption and growth is challenged in favor of a non-linear one, with a positive growth effect at low levels of incidence (see, among others, Klitgaard, 1988 and Acemoglu and Verdier, 1998).

The 'greasing the wheels hypothesis' implies that the relationship between corruption and economic growth can be affected by the quality of the institutions and by the size of the public sector. Ehrlich and Lui (1999) for example develop an endogenous growth model that analyzes the effect of corruption on economic growth in different politico-institutional settings. They predict that the balanced growth in a democracy (or competitive regime) and in an autocracy (or monopolistic regime) is the outcome of interaction between accumulation of human capital (socially productive) which engenders growth, and accumulation of political capital (socially unproductive) which mainly assures bureaucratic power and potential corruption. A non-linear relationship between corruption and growth is empirically found only in democratic regimes.

Méndez and Sepulveda (2006) investigate the existence of a positive growth-maximizing level of corruption by distinguishing between 'free' and 'not-free' countries and including a measure of government expenditures to capture its interaction with corruption. Their findings show that in 'free' countries corruption results beneficial for economic growth at low levels of incidence and detrimental at high levels of incidence. This relationship is not modified by the size of government.

In our paper we have used time series data of the 20 Italian Regions to verify whether corruption played a role in the differentiated growth path of Southern Italy. Italy is an interesting case in this perspective because regional inequalities still persist although different kinds of public policies have tried to reduce the per capita income differentials between Northern and Southern regions since the post-War World II. As Putnam (1993) has already emphasized, the quality of regional institutions played a role in determining those income differentials. The distribution of corruption and of social capital across the country is not homogeneous and this may contribute to explain the differences in the economic growth rates of the Italian regions. To our knowledge there is only one theoretical and empirical contribution by Del Monte and Papagni (2001) that investigates this issue in the Italian Regions for the period 1963-1991. They show that corruption has a relevant adverse impact on the efficiency of the public sector, measured by investments in infrastructures. In other words, the efficiency of public expenditure is lower in Regions where corruption is higher and the latter in turn has a negative effect on their economic growth. The major shortcoming of Del Monte and Papagni (2001) is the data set which is a mix of national and regional measures of the relevant variables.

In our paper we re-address this issue for a more recent period of the Italian history (1980-2004) characterized by high variability in both growth rates and corruption crimes. We use a newly assembled dataset which has the advantage of collecting economic, socio-demographic, institutional, political and electoral information at regional level.

The rest of the paper is organized as follows. Section 2 describes the institutional context of the Italian regions and shows the time dynamics of our key variables, namely economic growth and corruption. In Section 3 we formulate our empirical strategy and model specification; in Section 4 we discuss the results of our empirical analysis. The last section provides some concluding remarks.

2. Economic growth and corruption in the Italian Regions: some stylized facts

2.1 The institutional context. Italy is divided in 20 Regions. Five of them, the first to be established between 1948 and 1963, enjoy a special statute (*Regioni a Statuto Speciale*, or RSS), because of their multilingual status and peculiar geographical and economic position. The remaining 15 Regions characterized by an ordinary statute (*Regioni a Statuto Ordinario*, or RSO) were established in 1970. Until the beginning of the 1990's, intergovernmental relations were based on a system of derivate finance without effective tax autonomy. Sub-national governments obtained resources from national taxes and transfers, but could not directly modify these amounts. According to the Title V of the Italian Constitution, recently revised in 2001, which disciplines the organization of financial intergovernmental, regional Governments have the major responsibility of health care, plus certain aspects of social services, education, environment, local transportation, housing culture and tourism and differences in competences between the RSO and RSS have been reduced.

Regions got tax autonomy through the introduction of a regional tax on production activities (IRAP *Imposta regionale sulle attività produttive*) that substituted social contributions and other national taxes charged to companies. They were also entitled to surtax the tax on personal income (IRPEF *imposta sul reddito delle persone fisiche*) with a minimum and maximum tax rate allowed (Giardina et al, 2009). Sub-national governments have their own taxes as well as shares of national taxes. Regions with a lower per capita fiscal capacity obtain redistributive transfers without destination constraint to allow the financing of all their functions.

2.3. Economic growth, corruption and associative crimes in the Italian Regions. In our sample period, overall economic growth decreased in Italy, with a significant fall in the early 90s. The growth rates always was under 5% after 1997 (see Figure 1) and in particular the growth rate of the Southern regions dropped severely compared with the performance of the rest of the country. Recently Daniele and Malanima (2007) describe the Mezzogiorno gap in GDP per capita between 1861 and 2004. While uniformity characterizes the pre-industrial period, since the 1880s a long divergence phase starts between the industrial areas and those which were not able to create the manufacturing industry. This phase ends in 1951 when the GDP per capita in the Southern Regions is only 47% of that of the rest of Italy, then the convergence process continues until the first half of the 70s when the GDP per capita reaches about 66%. During the 80s a new phase of a divergence process begins until 2002. Within the South an important difference between the Regions characterized by a pervasive presence of organized crimes and the others emerges, which seems to account for 10%, but even Southern Regions where organized crime is not a problem, are far behind the rest of the country. Also dispersion in the South is declined over time making it a more homogeneous area than the Center-North (Paci and Pigliaru, 1999; Pigliaru, 2009). As Figure 2 suggests, the level of GDP growth is quite homogeneous among the observations, and shows a pattern of decrease during the period 1980-1995 that is attenuated in the last decade only in Sicily.

The crimes we classified as 'corruption' include both crimes on corrupt activities against public administration and associative crimes, depending on the size of the agent, *i.e.* if more or less than three individuals were involved in the same criminal event, as depicted in the Italian Criminal Law. Corruption crimes in the country follows a cyclical pattern by increasing steadily between the mid-1970s and the first half of the 1990s, especially in the Southern regions, and slightly decreasing after 1993 as a consequence of the so-called *Mani Pulite* (*Clean Hands*) campaign undertaken by the judiciary system (Del Monte and Papagni, 2001). Focusing more specifically on our sample period, the number of reported crimes decreases from 1981 until 1987, then decreases until 1989; a significant increase is registered from 1991 to 1998, where the number of reported crimes jumps from around 600 to around 2400; finally, after a decrease in 2000, the number of reported crimes restarted increasing (see Figure 1). Despite these different evolution patterns described by the two curves, however, an opposite trend in GDP growth and reported crimes is evident in the periods 1984-1988, 1989-1995, 1997-2004.

If we look at the pattern of reported associative crimes in Figure 3, during the decade 1995-2004 Sicily appears as the Region that experienced the largest reduction in corruption. In the Regions of the central Italy and the other Regions of the South, contrariwise, a constant increase of the phenomenon is observed. The number of reported crimes is, as expected, larger in those Regions traditionally associated to organized criminal associations as Sicilia, Campania and Calabria; the magnitude of the phenomenon in Calabria, however, is half than in the other two Regions. Associative crimes in the north, on the contrary, are relatively less diffused but slowly increase in time. Individual crimes, on the other hand, are more frequent than associative crimes, and they are more spread in the country. According to Figure 5, Sicilia and Campania still appear as the most corrupted Regions of Italy, followed respectively by the northern, the central and the southern ones. The time pattern is similar across the observations, describing a decrease during the period 1986-1990 followed by a significant increase until 2000; after that year, the number of reported crimes decreases in central Italy and Sicilia, but it increases or remains constant in the other Regions.

Figure 2, 3 and 4 about here

In the poorest Regions such as Calabria, Campania, Puglia, Basilicata and Sicilia, more associative crimes are reported, on average, during the period 1980-2004; Calabria and Sicily are also characterized by the largest number of reported individual crimes. One interesting exception is however represented by Valle d’Aosta, one of the SSR in the North of the country, which is one of the richest and of the most corrupted in terms of individual crimes.

Table 1 about here

All in all, this section illustrates how GDP growth and corruption change both over time and across Regions. This characteristics of the phenomenon under observation, therefore, suggests the presence of unobserved heterogeneity such as cultural factors, social rules and other fixed effects that determine economic growth within each observation. The regression analyses in the empirical section of this paper addresses this issue, disregarded by part of the literature (Mauro, 1998; Li et al., 2000; Treisman, 2009), using a panel model that exploits the whole variation in the data.

3. *Empirics*

3.1. Empirical strategy and model specification. The existing literature on corruption and growth generally estimate cross sectional regressions by averaging the effect of temporary shocks and smoothing the cycling pattern of GDP. Although apparently straightforward, cross country analyses make the implicit assumptions that countries are positioned on their steady state equilibria values for both the level of corruption and growth rate. Hence, averaging out data into a single observation for each region involves a loss of information and may also distort the analysis of the relationship between the two. Thus, we implement a dynamic panel that allows for fully exploiting the time dimension of the data set in order to have more efficient estimates of the effect of corruption on growth. As we highlighted in the previous Section, the GDP growth rate as well as the corruption rate show a relevant time variability crosswise the Italian regions. Figures 2 and 3 show that these variables are not homogeneously distributed across regions and change over time. Therefore our approach estimates a set of panel regressions which captures the dynamics of the relationship (as already in Del Monte and Papagni, 2001).

Two are the major problems in testing whether corruption may decrease (or increase) economic growth. The first is related to prosecutions data that we use as a measure of corruption. Indeed, such a measure hits against the circumstance that in corrupt Regions the judicial system may be itself corrupt and consequently fewer people would be charged with corruption crimes. To take into account this problem we include in the empirical analysis the degree of civicness or social capital which captures the existence of regional differences in people's general attitude towards corruption. Another concern consists in the potential endogeneity between corruption and growth. Indeed, the incidence of corruption may be directly affected by the rate of economic growth as it could be the case that rich, fast-growing regions have more resources to combat and control corruption. In this case, corruption would be correlated with the error term in the OLS regression and the estimates would be biased. To control for the problem of a two-way causality between corruption and growth, we estimate an equation of determinants of corruption through OLS and insert the estimated fitted values of the parameters of interest in our dynamic growth equation (Kelejian, 1971; Petterson-Lidblom and Dahlberg, 2003)[1].

3.2. Sample data and description of variables. Our dataset collects information on economic, socio-demographic, institutional, political, electoral and judicial status of the 20 Italian Regions during the period 1980-2004. The longitudinal dimension is constrained by data availability: the Regions have been established in 1980 and data on the diffusion of corruption-related activities last until 2004. The data set thus consists of 500 observations.

Our first step consists in estimating the panel growth equation (Equation [1]) that includes a lists of standard economic growth models variables adding a vector of variables that measure corruption.

$$GDPgrowth_{it} = \alpha_0 + \alpha_1 \boldsymbol{EC}_{i,t} + \alpha_2 \boldsymbol{DEMO}_{i,t} + \alpha 3\, \boldsymbol{CORRUPTION}_{i,t} + f_i + u_{i,t} \quad [1]$$

for $i=1,...,20$ and $t=1980,...,2004$

The variables can be described as follows:

1) *GDPgrowth*, the dependent variable, is the annual growth of GDP per capita, calculated starting from the yearly GDP data released by CRENOS. The growth is defined as the ratio between the first

[1] Many authors have also worked with five-year averages for similar purposes. The use of five-year averages reduces short run fluctuations and allows to concentrate on the relationships between corruption and growth. See, for example, Li et al. (2000), Paldam (2002), Glaser and Saks (2006), Méndez and Sepulveda (2006).

difference and the lagged GDP, representing the percentage of shift from the previous year's aggregate output. Thus, $GDPgrowth_{it} = (GDP_{i,t} - GDP_{i,t-1}) / GDP_{i,t-1}$.

2) ***ECO*** is a vector which includes a number of socio-economic variables. According to the literature (Barro and Sala-y-Martin, 2003), the economic growth is expected to be faster in poorest Regions, therefore a measure of the initial level of GDP is usually introduced. Being the initial level a constant value in time, we replace it with the lagged growth level (the variable $GDPgrowth_{i,t-1}$), introducing time dynamics in the regression and requiring the use of a dynamic panel regressions model (Arellano and Bond, 1990; Blundell and Bond, 1998). The coefficient of this variable indicates the average regional trend of growth, and we do not have any prior on it.

The variable *INV* measures the fixed gross public and private investments. To avoid reverse causality, we introduce this variable with a one year lag and expect a positive correlation with the GDP. The variables *CPP* and *CPR* measure respectively public and private consumption and are expected to be negatively correlated with economic growth. Finally, the vector includes *EXP* that measures the ratio between total public expenditure and GDP and is expected to be positively correlated with economic growth, if productive. All these data come from the Italian Institute of Statistics (ISTAT).

The variable *GINI* is the Gini index, built using micro-data on the households' disposable income coming from the *Survey of Household Income and Wealth* (*SHIW*), conducted by the Bank of Italy (several years). We argue that an unequal distribution of income is a barrier to growth because it generates a pressure to adopt redistributive policies that have an adverse effect on investment (Persson and Tabellini, 1994); present wealth, moreover, may depend on past wealth. Therefore, the more unequal a Region is, the lower its growth rate. We use the first difference of the Gini index in the estimates to capture the effect of a variation of inequality on growth.

3) ***DEMO*** is a vector which takes into account a series of socio-demographic variables. *SCH* is a proxy for the level of human capital in the Regions. It is measured as share of high school

enrolment over labor force, and the ratio has been computed on ISTAT data. The variable *LAB* is the size of the labor force, that is the share of units of labor over the regional population (ISTAT). The coefficient of *LAB* is an indicator of the efficiency of the input labor, while *SCH* is a proxy for the quality of the input. We expect a positive sign associated to both these coefficients.

4) ***CORRUPTION*** is a vector of three different variables where the pivotal variable is *COR* measured as the number of regional government officials prosecuted for corrupt practices relative to the population. The crimes that we consider are based on the Libro II, titolo II (crimes against the Public Administration) of the Italian Criminal Law as reported in the *Annali di Statistiche Giudiziarie* of the ISTAT (various issues).

The most important criminal trials against corruption in Italy (the so-called *Mani Pulite* and *Maxi Trial* to the Sicilian *mafia*) have confirmed that corrupt activities may emerge also in the form of other typologies of crimes like the associative crimes (crimes *ex* art. 416 and 416 *bis* of the Italian Criminal Law) that cannot be considered *stricto sensu* as crimes of corruption. To take into account this possible source of hidden corruption and avoid potential bias between official statistics and 'true' data, we consider the existing link between corruption and associative crimes and we construct a composite index annually computed per each region as the sum of per capita prosecutions and per capita associative crimes (*COR+ASCR*). The source of *ASCR* is also the ISTAT *Annuario di Statistiche Giudiziarie*. We expect a negative sign associated to all of these coefficients.

A problem of reverse causality between corruption and growth emerges since corruption may hamper growth, but growth-oriented policies may minimize inefficiencies, among them corruption. To control for possible endogeneity we substitute the variables on corruption with the fitted values from an equation of corruption, *COR_F* and *COR+ASCR_F*. They are obtained estimating an equation that considers a set of demographic, socio-economic, politico-institutional and cultural determinants of corruption. The equation is defined as follows:

$$CORRUPTION_{it} = f(POP, GDPgrowth, SCH, GINI, CXP, KXP, NLEX, FRAG, VO, NEWS, REF)$$

[2]

The variables can be described as follows:

1) *POP* is population in millions of inhabitants. The variable acts as a control for the size of the Region. If highly-populated Regions exploit economies of scale in supplying of public goods (Alesina and Wacziarg, 1997) and have a low ratio of public service outlets per population, individuals might revert to bribes "to get ahead of the queue".

2) *GDPgrowth* is the annual growth of GDP per capita as already defined. This variable, as well as education, is included to investigate the so-called Lipset hypothesis: voters with higher income (and education) are expected to be both more willing and capable to monitor public employees and to take action when the latter violate the law.

3) *SCH* is a proxy for the level of education in the Regions. As in the Equation [1], this variable is measured as the share of high school enrolment on the labor force. Again, *SCH* allows for taking in account the so-called Lipset hypothesis. Education is a way to lead individuals towards having a higher value of staying politically involved and closer monitoring (Putnam, 1993).

4) *GINI* is the level of inequality measured by calculating the Gini index on the basis of data on family income per regions. Italian regions show relevant income differentials between the North and the South. Then, as voters become more diverse along the income line, they will focus on the redistribution rather than on the honesty of government officials (Mauro, 1995; Alesina *et al.*, 2002). We expect that an increase in income inequality will positively affect the degree of corruption.

5) *CXP* and *KXP* are respectively current and capital expenditure in percentage of GDP. These variables attempt to capture the role of government size (government expenditure) on corruption (and indirectly on growth). Greater government size may generate a potential for corruption by producing more resources to be stolen and more rules to be exploited or subverted. This can be the case for the Italian regions where the public sector plays a quite relevant role in the economy.

Corruption alters the composition of government expenditures towards less productive activities and thus the greater the government expenditures the greater the negative effects of corruption (Mauro, 1998, Tanzi and Davoodi, 1998; Gupta et al., 2001).

6) *NLEX* is the number of enacted regional laws and represents an alternative way to capture the impact of government size on corruption (McCormick and Tollison, 1981; Weingast et al., 1981).

7) *FRAG* is a measure of Regional government fragmentation. When governments consist of large coalitions characterized by a certain number of parties with conflicting interests, the members of the coalition face a prisoner's dilemma with respect to expenditures decisions. Each of the partners within the coalition has different distributional objectives and consequently an incentive to protect the budget share which may favor their own clientele (Roubini and Sachs, 1989a; 1989b; Alesina and Drazen, 1991). Political fragmentation may then increase the distribution of rents among politicians and possibly engenders a higher level of corruption that hinders economic growth. The use of this variable is also suggested by a recent change of the Regional electoral system occurred in 1995. The mechanism by which the members of the regional Council are elected switched from a pure proportional representation to a mixed one. A top-up number of seats for the winning coalition is also introduced, so that the absolute majority of the legislators will be held by the coalition linked to the regional list that has obtained the relative majority of the votes. Furthermore, the law reduced the tenure length of the Council from five to two years if the relationship of confidence between the Council and the Cabinet breaks down during the first two years. This reform was completed in 1999 when it was established that the President of the regional Cabinet is elected by universal and direct suffrage.

We measure government fragmentation with the Herfindahl index for concentration. The index is built by using the seats of the majority supporting the regional government with respect to the overall legislature and ranges from 0 (a legislature in which each legislator belongs to a different party) to 1 (when all members belong to the same party). To calculate this index, we sum the seats of each party *i* of the majority, calculate the percentage *s* that these represent on the total number of seats of the Council and compute the Herfindahl index: $Fragmentation = \sum_{i=1}^{N} s^2$, where N is the total number of seats of the Council. We then use the normalized Herfindahl index that ranges from 0 to 1 and is computed as follows: H*= (H-1/N)/(1-1/N), where again, N is the total number of seats of the Council and H is the usual Herfindahl index, as above. On this variable we expect a negative coefficient.

8) Social and cultural factors may be different in the various Regions even though the institutions as well as the legal system are the same (Putnam, 1993)[2]. The variables *VO, NEWS* and *REF* capture the degree of civicness of Italian regions in its meaning of propensity of citizens to be politically involved and of general attitude towards corrupt practices. These three variables control for the degree of corruption generally 'accepted and tolerated' in each Regional environment, since in corrupt Regions the judicial system may be itself corrupt and fewer people would be charged with corruption crimes. Specifically, *VO* is the share of voluntary organizations over the population, *NEWS* is the local diffusion of newspapers indicating the monitoring powers of citizens, *REF* is a measure of electoral participation to the referenda (the share of voters that participate to referenda on the total of voters).

Equation [2] is estimated through OLS. Kelejian (1971) and Petterson-Lidblom and Dahlberg (2003) show in fact that the use of the OLS estimates in the first stage allows to obtain consistent estimates of the parameters of interest without the need to resort to the full blown functional form of the first stage.

[table 2 about here]

3.3 <u>Results</u>

[table 3 about here]

[table 4 about here]

[table 5 about here]

[2] Though he does not specifically deal with corruption, Putnam (1993) shows that the effectiveness of regional governments in Italy is lower where the degree of trust and civicness are lower.

Before presenting the results of the analyses, we first discuss the choice of the estimator to fit Equation [1]. The specification, in fact, is a dynamic panel regression. A popular estimator suggested by econometricians is the system GMM developed by Blundell e Bond (1998). This estimator is based on the Arellano and Bond (1991) GMM estimator for dynamic panel data, but it adds to the equation in levels instrumented with differences a second equation in differences, instrumented with the variables in levels. When the GMM estimators are applied on small samples size as the Italian one, the number of instruments may be very large with respect to the number of observations, and they may overfit the endogenous variables. This issue, defined as 'instrument proliferation' (Roodman, 2008), is usually signaled by a *p*-value of the Hansen test of over-identification that is close to 1. The implication of instrument proliferation is the risk of generating false positive results, that is observing significant coefficients that are not truly significant. Roodman (2008) proposes to solve this problem by collapsing the matrix of instruments, a procedure that reduces the size of the matrix and retains only the necessary lags of the instrument. This option decreases the number of instruments and possibly also the *p*-value of the Hansen test. A rule of the thumb, however, suggests to use a number of instruments not larger than the number of groups in the dataset to obtain robust test statistics. The estimation of Equation [1] with GMM does not satisfy the rule of thumb, as in the most parsimonious specification we use 23 instruments for 19 groups. We therefore follow the econometric literature and apply a Least Squares Dummy Variables Corrected model (LSDVC, Kiviet, 1995). This estimator corrects the LSDV dynamic estimator for the small size of the sample and provides a significant reduction of the bias, performing as good as the GMM estimator properly identified (Bruno, 2005). A limitation of this methodology is the requirement of exogenous right hand side variables, that we assure by introducing the variable measuring investment with a one period lag. We suspect that also our variables of interest are endogenous because of reverse causality with growth: corruption hampers growth, but growth-oriented policies minimize inefficiencies, among them corruption. Therefore, we substitute the variables on corruption with the fitted values (*COR_F* and *COR+ASCR_F*) from the corruption Equation which use only the exogenous information on corruption.

Table 4 presents the results of the estimation of Equation [1] by using the LSDVC estimator. The estimates include the fitted values of the estimation of the corruption Equation, whose coefficients are reported in Table 2. The LSDVC estimates are robust to the application of the System GMM estimator, that we do not present here because they fail to satisfy the rule of thumb (number of groups: 19; number of instruments without the collapse option: 232; number of instruments with the collapse option: 23). We estimated also a set of first difference IV regressions, instrumenting the lagged dependent variables with the lagged independent variables, assuming corruption to be exogenous. Once again, the results are consistent with the estimation that we present in this section.

The six models differ with respect to the covariates included: models 1-4 include the lagged value of investments, while models 5-6 include also the amount of public expenditure as a share of the GDP. Models 3-4 interact the proxies for corruption with public expenditure to control for their combined effect on growth that turns out to be negative and significant by suggesting that the presence of corruption nullify the positive impact that generally public expenditures, when productive, have on the economic growth.

The coefficients indicate a pattern of positive growth that is robust across the estimations. The coefficient on investments is never significant, but the lack of disaggregated data on public and private investment may hide large inefficiencies in public investment that generate this unexpected result. Similarly, public expenditure are never statistically significant but shows the expected positive sign; the disaggregated series of data on infrastructure expenditure, that better proxies public investment expenditure, is available only until 1991, therefore it has not been included in the analyses. Public consumption show a negative impact on growth, but the coefficient is significant only in the models excluding the interaction between expenditures and corruption. The first difference of the Gini coefficient is not significant and changes the sign across the models. Interestingly, the *SCH* variable is positive and the *LAB* variable, on the other hand, is negative; both these covariates, however, are significant when lagged investments are included in the specification. The sign of these coefficients may be motivated by a larger importance given to the quality of the labor force with respect to its size.

The corruption variables, finally, are negative and significant as expected. In particular, *COR* and *COR +ASCR* indicate the elasticity of growth to crime. The figures indicate that a marginal variation of reported crime per million of population, in fact, is associated to an opposite variation of growth of about 8%. for individual crime, 2.2% for the sum of the two type of crime. The decrease of the coefficient determined by the consideration of associative crimes suggests us that they interact with the economic environment in a way that is complementary and not substitute to the economy, and mitigates the impact of corruption on growth. The non-linearity hypothesis does not show the expected inverted *U* relation and rather describes a stable negative impact of corruption on crime whose magnitude decreases for the highest levels of crime. This result can be explained with the peculiarity of the phenomenon in Italy where corruption is an endemic phenomenon that generates relevant inefficiencies at any level of incidence.

In Table 5 we further investigate the role of public expenditures on economic growth in the Italian Regions, since government intervention has been the major policy to reduce income differentials between the North and the South of the country. We therefore disaggregate total expenditure in its main components, *i.e.* current and capital expenditure, and exclude lagged investments (which include also public investments) from the specification. The effects of the control variables are consistent with the results of Table 4 discussed above. Total expenditure is never significant and also its disaggregation is not robustly determinant for growth. In particular, capital expenditure fosters growth when controlling for individual corruption (Model 3), but it is not significant when controlling also for associative crimes (Model 4). This result is unexpected but can be explained by the possibility that the presence of criminal associations in some Regions. Since local government has a certain degree of discretion to direct public investments, the efficiency of capital expenditure reasonably changes according to the environment. As matter of fact, the composition of crimes varies across observations and some Regional economies are more affected by criminal infiltrations than others. Current expenditure, on the other hand, is usually more rigid as it includes mainly personnel, transfers to Municipalities and Local Health Units (ASL). These items are not expected to stimulate growth, therefore the negative but not significant signs that we find in Model 3 and 4 do not contradict any theoretical prediction in the literature. In Models 5-8, where we use the lagged values of expenditure to overcome an eventual simultaneity of expenditure and growth, this pattern is confirmed.

The variables of interest in Table 5, *i.e.* the proxies for corruption *COR_F* and *COR+ASCR_F*, give us robust results consistent with the theory. They are significantly negative across all the models, and show similar coefficients. In particular, as in Table 4, the effect of individual crimes

(Models 1, 3, 5 and 7) is always larger than the effect of all crimes (Models 2, 4, 6 and 8). Furthermore, the non-linear terms $(COR\_F)^2$ and $(COR{+}ASCR\_F)^2$ remain negative and significant as well, and smaller than the linear ones.

All in all, the regression estimations indicate a clear negative effect of corruption on growth, robust to different specifications of the model. The results do not confirm the inverted *U* pattern of corruption on growth, describing in fact a constantly negative effect that is decreasing as the number of crimes increases.

4. *Concluding remarks*

This paper has used a newly assembled data set for the Italian regions to investigate the effects of corruption on economic growth, robust to different specifications of the model. The non-linearity hypothesis is not verified; the relation between corruption and growth rather describes a stable negative impact of corruption on crime whose magnitude decreases for the highest levels of crime. This result can be explained with the peculiarity of the phenomenon in Italy where corruption is an endemic phenomenon that generates relevant inefficiencies at any level of incidence.

We further investigate the role of public expenditures on economic growth in the Italian Regions, since government intervention has been traditionally the major policy followed to reduce income differentials between the North and the South of the country. Total expenditure as well as its main components never turn out significant by suggesting that the presence of corruption undermine the positive impact that public expenditures generally have, if productive, on the economic growth.

References

Acemoglu, D., Verdier, T. (1998). Property rights, corruption and the allocation of talent: a general equilibrium approach. *Economic Journal*, 108: 1381–1403.

Alesina, A., Wacziarg, R. (1998). Openness, Country Size and Government, Journal of Public Economics 69: 305-21.

Alesina, A., Roubini, N., Ozler, S., Swagel, P. (1996). Political instability and economic growth. *Journal of Economic Growth 1*: 189– 212.

ADS (Accertamenti Diffusione Stampa) (various years). Estratto delle dichiarazioni degli editori. Ripartizione media territoriale della diffusione (ADS).

AGCOM (1980-2009). Relazione annuale sull'attività svolta e sul programma di lavoro.

Andvig, J. C. and Moene, K.O. (1990). How corruption may corrupt, *Journal of Economic Behaviour and Organization*, 13(1): 63–76.

Baldacci, E., Hillman, A. L., and Kojo, N. (2004). Growth, Governance, and Fiscal-policy Transmission Channels in Low-income Countries, *European Journal of Political Economy*, 20, 517–49.

Blackburn, K., Bose, N., and Haque, E.M. (2006), The Incidence and Persistence of Corruption in Economic Development', *Journal of Economic Dynamics and Control,* 30, 2447–67.

Banca d'Italia (various years). Survey of Household Income and Wealth (SHIW).

Blackburn, K., Bose, N., and Haque, E.M. (2006), The Incidence and Persistence of Corruption in Economic Development', *Journal of Economic Dynamics and Control*, 30, 2447–67.

Blundell, R., S. Bond (1998). Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics, 87, 115–143

Bruno, G. S. F. 2005a. Approximating the bias of the LSDV estimator for dynamic unbalanced panel data models. *Economics Letters* 87: 361-366.

Bruno, G. S. F. 2005b. Estimation and inference in dynamic unbalanced panel data models with a small number of individuals. *CESPRI WP n.165.* Università Bocconi-CESPRI, Milan.

Camera dei deputati, NLEX

Crenos (2004). *Regio-It 1970-2002. Data-base on the Italian regions*, University of Cagliari.

Daniele, V., Malanima, P. (2007). Il prodotto delle Regioni e il divario Nord-Sud in Italia (1861-2004). *Rivista di Politica Economica*, III-IV, pp.267-315.

Del Monte, A., Papagni, E. (2001). Public Expenditure, Corruption and Economic Growth. The case of Italy. *European Journal of Political Economy*, 17: 1-16.

Del Monte, A. Papagni, E. (2007), The determinants of corruption in Italy: Regional panel data analysis. *European Journal of Political Economy* 23(2): 379-396.

Elrich, I., Lui, F. (1999). Bureaucratic corruption and endogenous economic growth. *Journal of Political Economy*, 107: s270– s293.

FIVOL, Italian Federation of Voluntary Organizations, various years.

Giardina, E., Cavalieri, M., Guccio, C., Mazza I. (2009), Federalism, Part Competition and Budget Outcome: Empirical Findings on Regional Health Expenditure in Italy. *MPRA Paper No. 16437*.

Glaeser, E., Saks, R. E. (2006) Corruption in America. *Journal of Public Economics*. 90: 1053-1072.

Guiso, L., Sapienza, P, Zingales, L. (2008). Social capital as good culture. *Journal of the European Economic Association*, 6, 2-3: 295-320.

Gupta, S., de Mello, L., Sharan, R. (2001). Corruption and military spending. *European Journal of Political Economy*, 17: 749– 777; (Reprinted in). Abed, G.T., Gupta, S. (Eds.), 2002. Governance, *Corruption, and Economic Performance*. International Monetary Fund, Washington, DC: 300– 332.

Hall, R.E., Jones, C. (1999). Why do some countries produce so much more output per worker than others? *Quarterly Journal of Economics*,114: 83–116.

Huntington, S.P. (1968). *Political Order in Changing Societies*. Yale University Press, New Haven, CT.

Klitgaard, R. (1988). *Controlling Corruption*. University of California Press, Berkeley.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W. (1999). The quality of government. *Journal of Economics, Law and Organization* 15, 1: 222-279.

Leff, N. (1964). Economic development through bureaucratic corruption, *American*

Behavioral Scientist, 8(2):8–14.

Li, H., Xu, C.L., Zou, H. (2000). Corruption, income distribution and growth. *Economics and Politics*, 12: 155– 182.

Mauro, P. (1995). Corruption and growth. *Quarterly Journal of Economics* 110: 681–712 (August).

Mauro, P., (1998). Corruption and the composition of government expenditure. *Journal of Public Economics* 69: 263– 279; reprinted in Abed, G.T., Gupta, S. (Eds.), 2002. *Governance, Corruption, and Economic Performance*. International Monetary Fund, Washington DC: 225–244.

Méndez, F., Sepulveda, F. (2006). Corruption, growth and political regimes: Cross country evidence. *European Journal of Political Economy*, 22: 82-98.

Istat (1990) per Herfindhal, labor force

Istat, Statistiche giudiziarie

Ministero dell'Interno (various years) per Herfindhal e turn out

Myrdal, G. (1989). *Corruption: its causes and effects. Political Corruption: A Handbook*. Transaction Books, New Brunswick N.J.

Paci, R., Pigliaru, F. (1999). Growth and sector dynamics in the Italian regions. In Adams, J. and Pigliaru, F. (eds), *Economic growth and change. National and regional patterns of convergence and divergence.* Cheltenham, Edward Elgar ?????

Paldam, M. (2002). The cross-country pattern of corruption: economics, culture and the seesaw dynamics. *European Journal of Political Economy*, 18: 215– 240.

Persson, T., Tabellini, G., Trebbi, F. (2003). Electoral rules and corruption. *Journal of European Economic Association*, 1: 958-989.

Pigliaru, F. (2009). Persistent regional Gaps and the Role of Social Capital: Hints from the Italian Mezzogiorno's Case. CRENos, Working Papers n. 4, pp. 1-25.

Putnam R. (1993). Making Democracy Work: Civic Traditions in Modern Italy, Princeton, N.J.: Princeton University Press.

Rose-Ackerman, S. (1975). The economics of corruption. *Journal of Public Economics* 4: 187–203 (February).

Roubini, N. and Sachs, J. (1989a). Political and economic determinants of budget deficits in the industrial democracies. *European Economic Review* 33: 903-933.

Roubini, N. and Sachs, J. (1989b). Government spending and budget budget deficits in the industrialized countries. *Economic Policy* 8: 99-132.

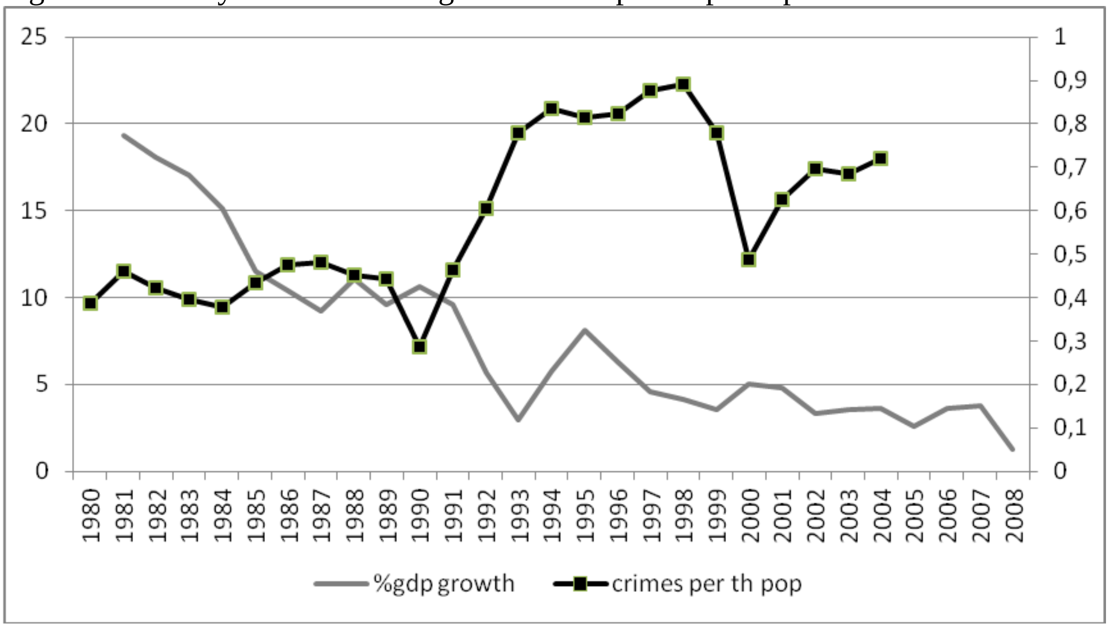
Shleifer A., Vishny R.W. (1993). Corruption. *The Quarterly Journal of Economics*, 108: 599-617.

Soto-Torres, M.D., Fernandez-Lechon R. and Fernandez-Soto P. R. (). A system dynamics model about public corruption: the influence of bribes on economic growth

Tabellini, G. (2009). Institutions and culture. *Journal of the European Economic Association*, 6, 2-3: 255-294.

Tanzi, V., Davoodi, H. (1998). Corruption, Public Investment and Growth. In: Shibata, H., Ihiro, T. (Eds.), *The Welfare State, Public Investment and Growth*. Springer-Verlag, Tokyo: 41– 60; Reprinted in Abed, G.T., Gupta, S. (Eds.), 2002. *Governance, Corruption, and Economic Performance*. International Monetary Fund, Washington DC: 280–299.

Figure 1. Time dynamics of GDP growth and reported per capita crimes



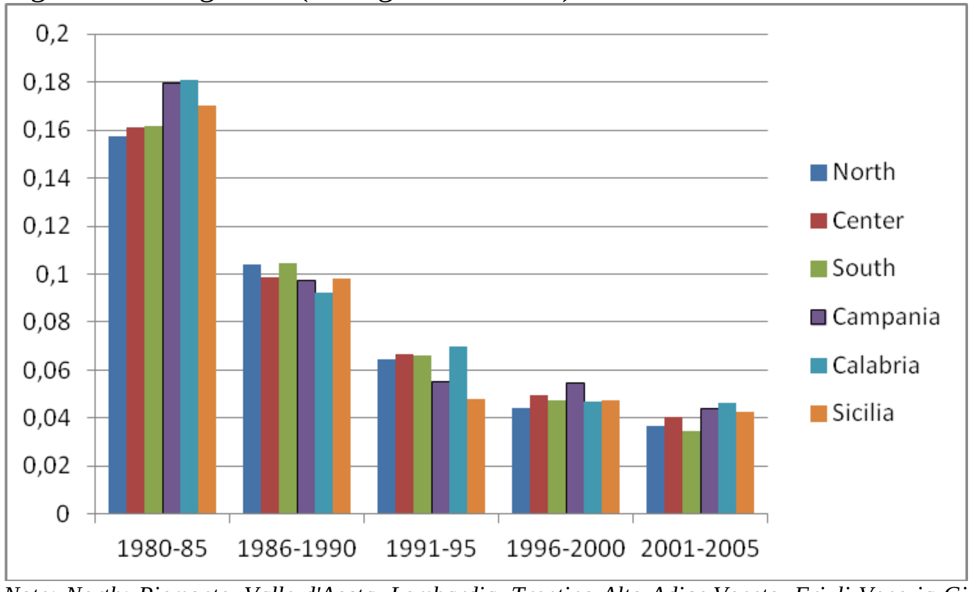
Note: yearly data are averaged over the full sample. GDP growth is measured as the percentage shift from the past years' GDP growth; crimes are measures as the per capita sum of associative and individual crimes. Source: ISTAT.

Table 1. GDP and prosecutions per capita (1980-2004) in Italian Regions (average annual data)

Region	GDP pc	Region	ASCR	Region	COR
Valle d'Aosta	21.147	Sicilia	42.1	Lazio	961
Trentino-Alto Adige	20.159	Calabria	31.1	Molise	901.3
Lombardia	19.715	Campania	30.6	Valle d'Aosta	787.9
Emilia-Romagna	19.030	Puglia	21.4	Liguria	775.1
Piemonte	17.53	Basilicata	18	Calabria	699.8
Veneto	17.22	Liguria	15.6	Sicilia	622
Toscana	16.54	Lazio	15.2	Sardegna	617.2
Friuli-Venezia Giulia	16.1875	Abruzzo	13.2	Friuli-Venezia Giulia	607.7
Lazio	16.07	Friuli-Venezia Giulia	13.1	Abruzzo	601.2
Liguria	15.79	Emilia-Romagna	12.7	Campania	558.2
Umbria	14.79	Umbria	12.6	Basilicata	494
Marche	14.47	Trentino-Alto Adige	11.7	Toscana	494
Abruzzo	12.54	Lombardia	11.6	Puglia	483.6
Sardegna	11.44	Valle d'Aosta	11.4	Trentino-Alto Adige	459.8
Molise	11.001	Molise	11.1	Umbria	456.7
Sicilia	10.42	Veneto	10.9	Piemonte	426.3
Basilicata	9.68	Toscana	10.8	Marche	393.8
Puglia	9.61	Piemonte	10	Lombardia	375.3
Campania	9.56	Marche	8	Veneto	374.6
Calabria	8.71	Sardegna	6.8	Emilia-Romagna	349.5

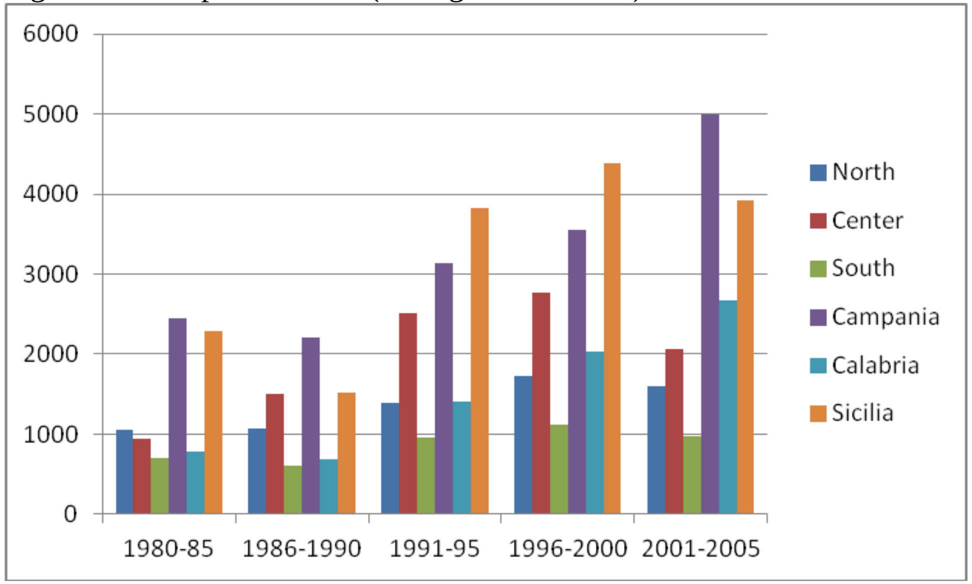
Note: data are reported by descending order; per capita GDP is measured in thousands of euro; per capita crimes are measured per million of inhabitants. Source: ISTAT.

Figure 2. GDP growth (average annual data)



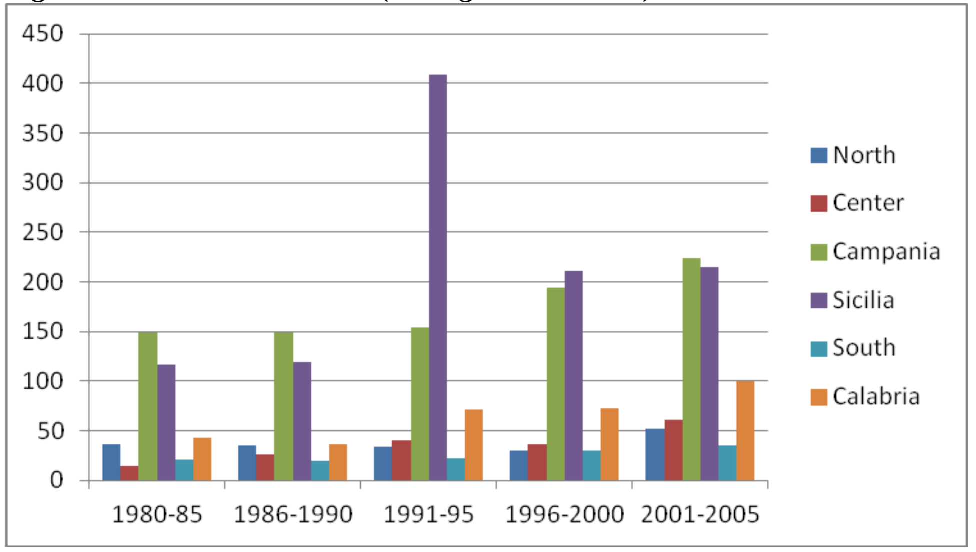
Note: North: Piemonte, Valle d'Aosta, Lombardia, Trentino-Alto Adige,Veneto, Friuli-Venezia Giulia, Liguria and Emilia Romagna; Centre: Toscana, Umbria, Marche, Lazio; South: Abruzzo, Molise, Puglia, Basilicata, Sardegna.

Figure 3. Corruption crimes (average annual data)



Note: North: Piemonte, Valle d'Aosta, Lombardia, Trentino-Alto Adige,Veneto, Friuli-Venezia Giulia, Liguria and Emilia Romagna; Centre: Toscana, Umbria, Marche, Lazio; South: Abruzzo, Molise, Puglia, Basilicata, Sardegna.

Figure 4. Associative crimes (average annual data)



Note: North: Piemonte, Valle d'Aosta, Lombardia, Trentino-Alto Adige,Veneto, Friuli-Venezia Giulia, Liguria and Emilia Romagna; Centre: Toscana, Umbria, Marche, Lazio; South: Abruzzo, Molise, Puglia, Basilicata, Sardegna.

Table 2. First stage – Equation [2]

Dep.Var.	*COR*	*COR+ASCR*
POP	-0.05***	-0.017
GDPgrowth	-0.28***	-0.31***
SCH	0.3*	0.35**
GINI	-0.09	0.46
CXP	-0.04	0.16
KXP	0.08	0.053
NLEX	0.13**	0.12**
FRAG	0.58***	0.63***
VO	-0.11**	-0.13***
NEWS	-0.33***	-0.36***
REF	-0.06	-0.07
ASCR	0.17***	
lag NEWS	0.45***	0.48***
Constant	2.88**	3.35***
Observations	396	399
R^2	0.485	0.413

*Note: OLS regression, robust option specified. Continuous variables in natural log. Significance level: * p<0.05; ** p<0.01; *** p<0.001*

Table 3. Estimates of Equation [1] with fixed effects

	Model 1		Model 2		Model 3		Model 4	
COR_F	-1,565	***	-9,337	***				
$(COR\_F)^2$			-0,508	***				
COR+ASCR_F					-1,726	***	-2,442	***
$(COR+ASCR\_F)^2$							-0,512	***
Constant	-14,505	***	-44,182	***	-3,758	***	-3,956	***
Obs	396		396		399		399	
R^2								
within	0,6062		0,6261		0,663		0,6792	
between	0,1956		0,1952		0,127		0,1308	
overall	0,4913		0,4961		0,534		0,5378	

Note: Dependent variable: ln GDP growth. Significance level: * p<0.05; ** p<0.01; *** p<0.001

Table 4. Estimates of Equation [1] with fitted values

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
GDPgrowth lag	0.386***	0.313***	0.665***	0.599***	0.391***	0.335***
EXP					0.002	0.107
INV lag	0.05	0.138	0.577	0.131	0.036	0.136
CPP	-1.22**	-1.009**	0.007	-0.830	-1.235*	-0.991*
DGINI	-0.28	-0.009	0.512	0.496	-0.199	0.160
SCH	0.59**	0.75***	0.065	0.749	0.679	0.886*
LAB	-2.33**	-2.48**	-1.979	-2.481	-2.32*	-2.462**
COR_F	-8.87***				-8.36***	
COR_F^2	-0.50				-0.47***	
(COR+ASCR_F)		-2.3				-2.20***
$(COR+ASCR\_F)^2$		-0.64***				-0.58***
*EXP *COR_F*			-0.254			
EXP(COR+ASCR_F)*				-4.51***		

*Note: Dependent variable: ln GDP growth. LSDVC estimation initialized with AB estimator, 50 bootstrap repetitions. 396 observations. Continuous variables in natural log. Significance level: * $p<0.05$; ** $p<0.01$; *** $p<0.001$*

Table 5. Estimates of Equation [1] with fitted values

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
GDPgrowth lag	0.397***	0.352***	0.352***	0.307***	0.374***	0.327***	0.377***	0.316***
EXP	0.002	0.110						
CXP			-0.412	-0.253				
KXP			0.130*	0.093				
EXP lag					-0.104	0.012		
CXP lag							-0.040	-0.013
KXP lag							0.115	0.118*
CPP	-1.231**	-0.960*	-0.942	-0.818	-1.329**	-1.026*	-1.263**	-1.048*
DGINI	-0.186	0.185	-0.376	-0.059	-0.304	0.023	-0.196	0.103
SCH	0.691	0.906**	0.567**	0.748***	0.633	0.849**	0.593**	0.765***
LAB	-2.258**	-2.286**	-2.231**	-2.31***	-2.037*	-2.22**	-2.329**	-2.40***
COR_F	-8.56***		-8.55***		-9.4***		-8.39***	
$(COR\_F)^2$	-0.48***		-0.48***		-0.53***		-0.47***	
COR+ASCR_F		-2.22***		-2.26***		-2.32***		-2.26***
$(COR+ASCR\_F)^2$		-0.58***		-0.62***		-0.63***		-0.61***

*Note: Dependent variable: ln GDP growth. LSDVC estimation initialized with AB estimator, 50 bootstrap repetitions. 396 observations. Continuous variables in natural log. Significance level: * p<0.05; ** p<0.01; *** p<0.001*