

Eva Kotlánová, Igor Kotlán

Silesian University in Opava, School
of Business Administration in Karvina,
Univerzitní náměstí 1934/3,
733 40 Karviná, Czech Republic
email: kotlanova@opf.slu.cz

VŠB-Technical University of Ostrava,
Faculty of Economics, Department
of National Economy, Sokolská 33,
701 21 Ostrava, Czech Republic
email: igor.kotlan@vsb.cz

Influence of Corruption on Economic Growth: A Dynamic Panel Analysis for OECD Countries

Abstract

Corruption and its reduction is one of the constant topics we encounter not only at the level of debates among political and economic authorities, but thanks to its expansion it has become part of everyday life of today's society. The issue of corruption is a major issue in almost every country, including the Czech Republic. We are constantly discovering new cases and the media report on their development. With a certain amount of optimism we can say that in the fight against corruption, the Czech Republic has experienced a positive shift with regard to punishing the culprits of corruption cases, with first convictions currently emerging. Why is corruption so dangerous? Corruption not only undermines macroeconomic and fiscal stability, causing inefficient use of public funds, but if not timely addressed, it causes growing distrust in the legal system and in the state as such. Despite the work of authors who have come to the conclusion that corruption can have a positive impact on economic growth, the dominant view (supported by a much larger number of studies) is that corruption has a negative effect on growth variables and in turn on economic growth. The aim of this paper is to use dynamic panel regression model to verify the hypothesis of the impact of corruption on economic growth on a sample of OECD countries. To express the perceived level of corruption, we used the index of corruption of PRS Group, which has the advantage of having a much longer history and being more consistent in terms of methodology than compared to the much better known the Corruption Perception Index (CPI) drawn up by Transparency International. Its other advantage is that in case of follow-up studies, it will be able to be used in the future, which in the case of CPI will not be possible due to major changes in its methodology.

Key Words

corruption, economic growth, dynamic panel data estimation, OECD countries

JEL Classification: C23, E60, K40, O11

Introduction

The concept of corruption has been increasingly present in our society in recent years, both in the media, politicians' statements and public presentations of the results of various surveys. It is regarded as one of the major global challenges that must be addressed. Corruption in many forms and mankind have gone hand in hand since time immemorial and understanding of corruption and its severity is significantly influenced

by the culture, the environment in which people live and the values that they profess. These factors and especially the time factors mean that corruption is seen differently.

One of the problems related to corruption is its definition. Neither the international organizations dealing with this phenomenon and the fight against it, have no unifying definition¹. Also, social sciences perceive corruption in different ways. This obviously has a negative impact on determining the methodology of measuring corruption and subsequent comparison of the results of this measurement. However, we can say that scientists, politicians and economic authorities agree on the negative influence of corruption. At this point it should be noted that, although rarely there are studies highlighting the fact that corruption can have a positive impact on economic indicators [4, 7, 14, 16, 17], they were opposed by the opponents of these theories [5, 25, 26, 30] and, more or less, disproved. Most analysts [5, 6, 20, 21, 25, 30, 33] dealing with this phenomenon concluded that corruption has a negative impact on growth variables, the tax system and its effectiveness [12] and through them also on economic growth.

Increasingly, it appears that the previously somewhat neglected and underrated quality of institutions now plays a major role in the fight against corruption. This article builds on previous studies of its authors dealing with the influence of the institutional environment on the scope of corruption and its determinants [13]. Results confirmed that it is very important to monitor not only the macroeconomic indicators, but also their stability and institutional framework, see Kotlán [9].

The aim of this paper is verify the hypotheses of the negative impact of corruption on economic growth by using dynamic panel regression model. From the point of methodological view the ontological approach will be used, e. g. in Kotlán [10].

The advantage of this analysis, as compared with previous studies, is an extension of the studied period. Empirical work of the authors who analyzed the relationship between corruption and economic growth is mainly dated to the 2nd half of the 1990s, when the issue of corruption was very popular. In this paper the studied period was extended by about 10 – 12 years (i.e. until 2009). Another indisputable advantage is the analysis of a homogeneous sample of countries. Compared to the existing studies, which included in the analysis as many countries as possible, this econometric analysis will analyze a relatively homogeneous group of countries. The analysis will be carried out on a sample of 30 OECD countries due to the relative homogeneity of these countries in terms of their level of development, which ensures good comparability of data obtained. The advantage of the study is the use of dynamic panel regression which, compared to standard cross-country regression, allows capturing all links between the countries in a matrix.

¹ For purpose of this paper, we choose definition of Transparency International (TI), which says that corruption is *"the abuse of entrusted power for private gain"* [31, p. 12]

1. Corruption in growth theories

The theory of long-term economic growth is mainly based on the original neoclassical Solow model [29] and its further extension toward endogenisation of technological progress [18, 27].

The production function usually has the form of Cobb-Douglas function, see, e.g. [23]:

$$Y_t = A(v_t K_t)^\alpha (w_t H_t)^{1-\alpha}, \quad (1)$$

where Y_t is the total output of the economy; v or w represent the part of the physical (K) or human (H) capital, respectively, which is intended for production; A represents the level of technology and coefficient α represents level of diminishing returns to physical capital. The sum ($\alpha + (1 - \alpha) = 1$) then expresses the constant returns to scale, which form the basic assumption of the model.

Growth rate of the economy can then be commonly expressed as follows [22, 23]:

$$\gamma = \frac{1}{\sigma} \left(\left[D(1-\tau^K)^{\alpha\beta} (1-\tau^H)^{\beta(1-\alpha)} (u+z)^{1-\alpha} \right]^{\frac{1}{1-\alpha+\beta}} - \rho - \delta \right), \quad (2)$$

where $D = f(\alpha, \beta, A, B)$.

In the growth equation, τ^K , τ^H represent tax rates on capital and labour, respectively; δ is the capital depreciation rate, coefficient β describes the degree of diminishing returns of physical capital, ρ is the rate of time preference, u is the utility function of households, and z is the part of physical or human capital, which is dedicated to the accumulation of human capital. B also represents the technological coefficient.

Corruption is integrated in the above equation through its effect on individual growth variables, in particular on human capital, technological progress and investment.

Pro-growth factors that play a major role in the growth theories include technological progress and human capital. How can they be affected by corruption? Generally, it can be argued that corruption has a negative impact on these variables, through reducing government expenditure on education, science and research and healthcare.

These issues were specifically addressed by Mauro [21], who dealt with the impact of corruption on government spending on education in his work, concluded that corruption has a significant impact on the size of education spending, the efficiency of its utilization, and hence on human capital, which is usually approximated by the ratio of workforce with at least secondary education. He specifically argues that the deterioration in the perception of corruption by one point (on a scale of 0 – 10) will lead to a reduction in government expenditure on education relative to GDP by 0.7 to 0.9 percentage points.

In their work, Gupta, Davoodi and Tiongson [6] also focused on the impact of corruption on health care and education. Their analysis concluded that corruption affects the productive population, human capital and technological progress through the effect on infant mortality rate and "failure rate" of primary and secondary school pupils. If the perception of corruption drops by one point, it will result in an increase in infant mortality by 1.1 to 2.7 per 1000 live births. In education (training), worsening perception of corruption will lead to an increase in the number of students who will fail to complete the study by about 1.4 to 4.8 percentage points.

The technological advances are also affected by investments. In their work, Murphy, Shleifer and Vishny [25] say that if experts increasingly move from productive sectors to rent-seeking, there is a decline in productive investment. Romer [28] concluded that corruption may affect investment in new products and technologies, especially if these are necessary in the initial stages of development.

Tanzi and Davoodi [31] used the indicator of public investment as a share of GDP, to confirm or refute the hypothesis that higher corruption is associated with higher public investment. Based on the above analysis, they concluded that higher corruption increases the size of public investment while reducing their efficiency, leading to lower economic growth.

As for time preference, no studies have yet been presented that would confirm the exact impact of corruption on this variable; however, we believe that in countries where corruption is high, consumption and investment spending will be postponed due to the need to use funding for corruption practices.

The above suggests that corruption has a negative impact on growth variables, so it is obvious that it will have a negative effect on economic growth as such.

The first empirical works in this area include the study by Mauro [20]; here, based on regression analysis, whose basis is the neoclassical growth model, he concludes that improving the perception of corruption by 1 point (on a scale of 0 – 10) will lead to the growth of gross domestic product per capita by 0.8 – 1.3 percentage points. He subsequently developed this theory in other analyzes, also focusing on other pro-growth variables [21].

In his study of the relations of economic growth and corruption, Mo [24] states that if the perception of corruption drops by one point (on a scale of 0 – 10), in other words, if it deteriorates, it will result in reduced economic growth by 0.545 percentage points. The main factor that affects perception of corruption is political instability, which makes up 53 % of the entire effect.

2. Methodology and data

From a methodological perspective, the work is based on a dynamic panel regression model. Compared to the cross-sectional analyses, the panel regression has multiple

degrees of freedom, with a very important option of including individual effects (i.e. the existence of heterogeneity across cross-sectional units). This makes the presented statistics more credible, given the relatively small number of countries and short time series. The software used was E-Views, version (7). Dynamic panel was used, and generalized method of moments (GMM) was used for estimation, specifically the Arellan-Bond estimator [2]. The below model includes a lag of one period, as is usual in this type of studies [1, 3]. Alternatively, other phases of delay were tested.

Real GDP per capita in USD adjusted for purchasing power parity (RGDP) was therefore the dependent variable. Delayed value of the dependent variable and also the level of corruption measured by the index of corruption of PRS Group (CORRUPTION) were the independent variables. Other variables used in the models include the real investment rate relative to real GDP (RINVESTMENT) and the variable approximating the level of human capital. This is the number of students enrolled in tertiary education in relation to the total population (HUMAN), for more about approximation of technological progress in economic growth theory, see e.g. [4, 7].

In terms of methodology, stationarity tests using the panel unit root according to Levin, Lin and Chu [15], Im, Pesaran and Shin [8] or Maddala and Wu [19] were performed first. Only the level of GDP was found to be non-stationary. Its stochastic instability was removed in subsequent analyses by using first differences, or rather logarithmic differences – $d(\log \text{RGDP})$. The estimates employed the model with fixed effects, which is, according to Wooldridge [32], more suitable in the case of macroeconomic data as well in a situation where cross-sectional units are countries.

Much of the data was taken from the OECD database; an additional source was the PRS Group database from which the data on the perception of corruption was also taken. Due to the longer time series, PRS Corruption Index was chosen, as the well-known Corruption Perception Index (CPI) of Transparency International was first published in 1995. Its other advantage is that in case of follow-up studies, it will be able to be used in the future, which in the case of CPI will not be possible due to major changes in methodology.

PRS corruption index is an index of political risk, whose aim is to assess the degree of political stability of a country, which is done by scoring the various factors that may affect this stability. The minimum which can be assigned to each factor is zero, while the maximum value is determined by the fixed weight that is assigned to the given factor within the group. The rule that the higher the score, the lower the political risk they represent, applies to all components (factors). To ensure score consistency, both between countries and over time, points are awarded based on a series of preset questions. The PRS corruption index can reach a maximum value of 6 points, estimating the level of corruption across the political spectrum. Corruption is a threat to foreign investment for several reasons: it distorts the economic and financial environment of the country, e.g. through increasing tax quota (Kotlán, Machová [11]), reduces the efficiency of government and business, by allowing persons to have influential positions not on the basis of ability, but on the basis of cronyism; and ultimately it causes inherent instability of the political process and system. Although this index takes into account

bribes which investors can experience in government offices, when granting export or import licenses, during calculation of taxes, lending, etc., it focuses much more on recent or potential corruption in the form of cronyism, nepotism, exclusive employment, secret funding of political parties or suspiciously close relationship between politicians and businessmen. This is because these forms of corruption are considered to be potentially much higher risk for foreign investors and may lead to a general dissatisfaction, inefficient control of state finances and support the development of the black market. The authors see the greatest risk of corruption, however, in the fact that its ubiquity can lead to the overthrow or collapse of the government and subsequently to a general reorganization or restructuring of political institutions or change in the political system.

The period covered includes the years 1985 – 2009 (credible data is not available for a longer period) across 30 OECD countries (i.e. without the new members who joined in 2010)¹.

3. Dynamic panel model for OECD countries

This section describes the estimation of dynamic panel model. For completeness, it should be noted that several variants of models with different lag length of the dependent variables have been examined, and the model with the most convincing results (statistical significance of the model, statistical significance of coefficients and other characteristics).

Tab. 1 Dynamic panel model of GDP for OECD countries (30), 1985 – 2009

Dependent variable	d(log RGDP) ²
Number of observations	611
RINVESTMENT	0.01(3.92)***
HUMAN (-1)	0.02 (0.54)
d(log RGDP(-1))	0.30(1.74)***
CORRUPTION(-1)	-0.01(-1.64)**
Adj. R ²	0.36
F-statistics	25.1***
J-statistics	9.11

Note: Included in parentheses are t-statistics that are adjusted for heteroskedasticity and autocorrelation; standard deviations are calculated using robust estimates, *, **, *** stand for significance levels of 10 %, 5 % and 1 %, respectively; fixed effects method.

Source: own calculations

GMM – Generalized Method of Moments is the method used to estimate the dynamic panel. The Adj. values R² and F-statistics are not studied in the software used for dynamic panels (in case of using generalized method of moments); however, these were

¹ These are Estonia, Chile, Israel and Slovenia.

² The table shows, in accordance with the definition of the d(log RGDP), individual independent variables, construed as impacting GDP growth rate if they change by one (after being multiplied by a hundred in percentage points).

alternatively estimated in the same model using OLS, which returns inconsistent parameter estimates on the one hand, but on the other hand the relevant coefficient of determination can be taken as a relatively reliable informative indicator of the model's consistency with the data. The validity of the instruments was validated using standard Sargan test (as indicated in the table as J-statistics).

The table shows that the effect of corruption is consistent with economic theory, proving to be negative. Corruption therefore significantly harms economic growth. Other independent variables result with the expected signs, although the statistical significance of human capital was not confirmed.

Conclusion

Exposing corruption, its punishment and precautions preventing its occurrence and effects are a constant topic not only for national governments, but largely also international and non-governmental organizations through the development of various analyzes, monitoring reports, recommendations and designing new tools. The main reason for this activity is the belief that the effects of this phenomenon are the harmful.

Even though some authors argue in their studies that corruption can have a positive effect on economic growth, the opposite view prevails. This is supported by a number of empirical studies that have examined the impact of corruption on investment and other growth-related variables (technological progress, human capital, the size of public expenditure, etc.) and concluded that the economic growth of countries is negatively influenced through these channels.

The present paper builds on previous studies of its authors [13], which dealt with the quality of the institutional environment and the determinants of corruption. This paper aimed to verify these hypotheses concerning the impact of corruption on economic growth. Compared to previously published studies, it is characterized by extending the analysed period by about 10 – 12 years, using dynamic panel regression featuring more degrees of freedom than cross-sectional analyses, including individual factors (i.e. the existence of heterogeneity across cross-sectional units). Another advantage of this analysis is that the sample of countries surveyed, which is characterized by a certain degree of homogeneity in terms of maturity, guarantees good comparability of the data obtained.

The results of the analysis show that the hypothesis of the negative effect of corruption on economic growth has been confirmed and that corruption significantly harms economic growth. All the variables used resulted the expected signs, showing that they acts as foreseen by theory.

The above analysis only confirms the opinions of international and non-governmental organizations that corruption must be fought and that the anti-corruption costs are not a waste of money. If we manage to eliminate corruption, we can expect that this will be reflected not only in certain macroeconomic indicators, better international reputation

of the country, increased attractiveness for potential investors, but also in a better mood in the society.

References

- [1] ACOSTA-ORMAECHEA, S., YOO, J. Tax Composition and Growth: A Broad Cross-Country Perspective. *IMF Working Paper*, 2012, no. WP/12/257. ISSN 2227-8885.
- [2] ARELLANO, M., BOND, S. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies*, 1991, **58**(2): 277 – 297. ISSN 1467-937X.
- [3] ARNOLD, J. et al. Tax Policy For Economic Recovery and Growth. *Economic Journal*, 2011, **121**(550): F59 – F80. ISSN 1468-0297.
- [4] BARRO, R. J., SALA-I-MARTIN, X. *Economic Growth*. 2nd ed. Cambridge: The MIT Press, 2004. 673 pgs. ISBN 0-262-02553-1.
- [5] BECK, P. J., MAHLER, M. W. A Comparison of Bribery and Bidding in Thin Markets. *Economics Letters*, 1986, **20**(1): 1 – 5. ISSN 0165-1765.
- [6] BOYCKO, M. A., SHLEIFER, A., VISHNY, R. W. *Privatizing Russia*. Cambridge, MA: MIT Press, 1995. 176 pgs. ISBN 978-0262023894.
- [7] CHAMLEY, C. The Last Shall Be First: Efficient Constraints on Foreign Borrowing in a Model of Endogenous Growth. *Journal of Economic Theory*, 1992, **58**(2): 335 – 354. ISSN 0022-0531.
- [8] GUPTA, S., DAVOODI, H., TIONGSON, E. Corruption and the Provision of Health Care and Education Services. *IMF Working Paper*, 2000, no. WP/00/116. ISSN 2227-8885.
- [9] HUNTINGTON, S. P. *Political Order in Changing Societies*. New Haven: Yale University Press, 1968. 500 pgs. ISBN 0-300-01171-7.
- [10] IM, K. S., PESARAN M., SHIN, Y. Testing for Unit Roots in Heterogeneous Panels. *Journal of Econometrics*, 2003, **115**(1): 53 – 74. ISSN 0304-4076.
- [11] KOTLÁN, I. Alternativy stabilizační politiky. *Politická ekonomie*, 2001, **49**(4): 514 – 521. ISSN 0032-3233.
- [12] KOTLÁN, I. Gnoseologické přístupy k daňové reformě v ČR. *Politická ekonomie*, 2008, **56**(4): 505 – 519. ISSN 0032-3233.
- [13] KOTLÁN, I., MACHOVÁ, Z. Vliv zdanění korporací na ekonomický růst: selhání daňové kvóty? *Politická ekonomie*, 2012, **60**(5): 743 – 763. ISSN 0032-3233.
- [14] KOTLÁN, I., MACHOVÁ, Z., JANÍČKOVÁ, L. Vliv zdanění na dlouhodobý ekonomický růst. *Politická ekonomie*, 2011, **59**(5): 638 – 658. ISSN 0032-3233.
- [15] KOTLÁNOVÁ, E., KOTLÁN, I. Vliv institucionálního prostředí na velikost korupce: empirická analýza. *Politická ekonomie*, 2012, **60**(2): 167 – 186. ISSN 0032-3233.
- [16] LEFF, N. H. Economic Development through Bureaucratic Corruption. In *Political Corruption – A Handbook*. New Brunswick: Transaction Publisher, 1989. ISBN 0-88738-163-4.
- [17] LEVIN, A., LIN, C. F., CHU, C. Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics*, 2002, **108**(1): 1 – 24. ISSN 0304-4076.
- [18] LIEN, D. H. D. A Note on Competitive Bribery Games. *Economics Letters*, 1987, **22**(4): 337 – 341. ISSN 0165-1765.
- [19] LIU, F. T. An Equilibrium Queueing Model of Bribery. *Journal of Political Economy*, 1985, **93**(4): 760 – 781. ISSN 0022-3808.

- [20] LUCAS, R. E. On the Mechanics of Economic Development. *Journal of Monetary Economics*, 1988, **22**(1): 3 – 39. ISSN 0304-3932.
- [21] MENDOZA, E. G., MILESI-FERRETTI, G. M., ASEA, P. On the Ineffectiveness of Tax Policy in Altering Long-Run Growth: Harberger's Superneutrality Conjecture. *Journal of Public Economics*, 1997, **66**(1): 99 – 126. ISSN 0047-2727.
- [22] MILESI-FERRETTI, G. M., ROUBINI, N. Growth Effects of Income and Consumption Taxes. *Journal of Money, Credit and Banking*, 1998, **30**(4): 721 – 744. ISSN 0022-2879.
- [23] MO, P. H. Corruption and Economic Growth. *Journal of Comparative Economics*, 2001, **29**(1): 66 – 79. ISSN 0147-5967.
- [24] MURPHY, K. M., SHLEIFER, A., VISHNY, R. W. Why Is Rent-Seeking So Costly to Growth? *American Economic Review*, 1993, **83**(2): 409 – 414. ISSN 0002-8282.
- [25] MYRDAL, G. *Asian Drama: An Inquiry into the Poverty of the Nations*. New York: Twentieth Century, 1968. 2284 pgs. ISBN 978-0527027766.
- [26] ROMER, P. M. Increasing Returns and Long-Run Growth. *Journal of Political Economy*, 1986, **94**(5): 1002 – 1037. ISSN 0022-3808.
- [27] ROMER, P. Endogenous technological change. *Journal of Political Economy*, 1990, **98**(5): 71 – 102. ISSN 0022-3808.
- [28] SOLOW, R. A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, 1956, **70**(1): 65 – 94. ISSN 0033-5533.
- [29] TANZI, V. Corruption Around the World: Causes, Consequences, Scope and Cures. *IMF Working Paper*, 1998, no. WP/98/63. ISSN 2227-8885.
- [30] TANZI, V., DAVOODI, H. Corruption, Public Investment, and Growth. *IMF Working Paper*, 1997, no. WP/97/139. ISSN 2227-8885.
- [31] TRANSPARENCY INTERNATIONAL. *Kniha protikorupčních strategií*. Praha: Transparency International, 2001. 12 pgs.
- [32] WOOLDRIDGE, J. M. *Introductory Econometric: A Modern Approach*. Mason: South-Western Cengage Learning, 2009. ISBN 978-0324113648.
- [33] ŽÁK, M., LABOUTKOVÁ, Š. Lobbování v Evropské unii a České republice. *Politická ekonomie*, 2010, **58**(5): 579 – 594. ISSN 0032-3233.