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Abstract

In the literature, the nexus between economic growth and corruption is well covered, but there are only few studies on cyclical variations of corruption. For example, Galbraith (1997) claims that embezzlement flourishes in business booms and withers in recessions, and Gokcekus and Suzuki (2011) support the claim by finding a positive correlation between transitory income and corruption. This paper retests the argument and produces conflicting results. It is found that corruption shrinks as transitory income increases meaning that economic booms foster integrity rather than corruption. Moreover, the negative correlation is strong in high-income countries and in those with sound rule of law which points to developed countries, whereas the effect remains relatively weak in countries with low income or poor rule of law which points to developing countries. The finding is relevant also from the perspective of the European Union.

KEYWORDS: business cycles; embezzlement; permanent income; transitory income; rule of law.

Introduction

The economic literature on corruption includes lots of studies on the correlation between economic development and corruption. A common finding is that corruption tends to diminish as national income rises (e.g. Mauro, 1995; La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1999; Treisman, 2000; Mo, 2001; Pande, 2008; Mallik and Saha, 2016). Still, only few empirical studies have tackled the question of the short-term correlation between business cycles and corruption. This viewpoint is an emerging one due to the growing understanding that cycles and human psychology are organically intertwined. This idea was originated by Keynes (1936) and developed by Minsky (1975). Akerlof and Shiller (2009) provided a more recent contribution to the discussion on "animal spirits".

Behavioral analyses emphasize that individuals' rational calculus often leads to unwanted outcomes. A warning example of that is the financial crash in 2008 with its aftermath. The crash was prepared by investment bankers' wretched rent-seeking and amplified by exuberant market players, and the result was a global economic disaster. Quiggin (2010), Varoufakis (2011), Blyth (2013) and Cooray and Schneider (2018), among others, have analyzed the origins of business cycles and their occasional bursting into manias and panics.

Galbraith (1997) provided an intuitively appealing explanation to the linkage between business cycles and devious activities. He argued that there always exists a considerable amount of undiscovered embezzlement in business life, and that it varies with economic cycles. In good times, people are not only greedy but also courageous, which promotes rent-seeking and makes the "bezzle" grow. In downturns, people become cautious and suspicious and money is audited meticulously. Rigid business discipline makes the bezzle shrink.

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Gokcekus and Suzuki (2011) performed an empirical study on the nexus between business cycles and corruption. They took the proposition of Galbraith (1997) under scrutiny and provided an econometric test on the theory. The results indicated that corruption and long-term economic growth are negatively correlated, but that the correlation between corruption and short-term cycles is positive. In other words, the findings supported Galbraith's argument that corruption elevates in economic booms and shrinks during economic downturns.

This paper aims to provide another empirical test on the hypothesis that the extent of corruption is positively correlated with economic cycles. This is done simply by following the study of Gokcekus and Suzuki (2011) with more extensive data and an alternative indicator of corruption. Applying the original framework, both economic growth (namely changes in permanent income) and business cycles (namely changes in transitory income) are tested as possible determinants of corruption.

After securing the robustness and comparability of the results, the main finding is that the postulated positive relationship between corruption and business cycles does not hold in general. Moreover, it is found that the negative correlation between business cycles and corruption is stronger in developed countries than in developing countries.

The rest of the paper is organized as follows. Section 2 specifies the model and the data used. Section 3 presents the estimations with various techniques and reports the results. Section 4 discusses the findings and maps paths for further investigations.

Modelling and Data

The paper considers the effects of long-term and short-term evolution in gross domestic product (GDP) on corruption. The long-term evolution means economic growth measured by changes in permanent income, and the short-term evolution means business cycles measured by changes in transitory income. The focus is on the short-term effects that is on the connection between business cycles and corruption.

The modelling technique follows that of Gokcekus and Suzuki (2011), who in turn applied the original formulation of Mélitz and Zumer (2002). In the modelling, all country variables are expressed relative to the whole sample of countries. The basic regression model reads:

$$Cor_{i,t} = \gamma_0 + \gamma_1 PI_i + \gamma_2 TI_{i.t} + \mu_{i,t}. \tag{1}$$

On the left-hand side of Equation (1), $Cor_{i,t}$ stands for the level of corruption in country i ($i = 1,\dots, N$) in period t ($t = 1,\dots,T$) relative to the average level of corruption over all the countries in the sample. Thus, $Cor_{i,t}$ is derived by dividing the value of the corruption indicator for country i in period t by the average corruption indicator value in the sample $1,\dots, N$ over the timespan $1,\dots,T$.

On the right-hand side of Equation (1), PI_i denotes country i's permanent income and $TI_{i,t}$ denotes its transitory income at t. Both are measured in terms of GDP per capita and relative to the whole sample. Permanent income PI_i is derived by dividing country i's GDP per capita value at period t by the average GDP per capita value over $t = 1,\dots, T$ in the sample $i = 1,\dots, N$. Thus, PI_i is the average of country i's income shares over time. Transitory income $TI_{i,t}$ captures temporary deviations from permanent income PI_i so that $TI_{i,t}$ measures the difference between PI_i and country i's income share over $t = 1,\dots,T$.

The parameters γ denote the coefficients to be estimated, and μ is the disturbance term. The parameter γ_0 is the intercept, and γ_1 reflects the response of corruption to the development of long-run average income PI_i thus capturing permanent changes in the variable $Cor_{i,t}$. The parameter γ_2 reflects the response of corruption to variations in transitory income thus capturing short-term cyclical changes in $Cor_{i,t}$. These two income effects can be separated, since the permanent effect remains even when there are no deviations in the time series, whereas the transitory impact hinges on such deviations. Decomposing Equation (1) yields:

$$Cor_i = \gamma_0 + \gamma_1 PI_i + \eta_i. \tag{2}$$

$$Cor_{i,t} - Cor_i = \gamma_2 TI_{i,t} + \varepsilon_{i,t}, \tag{3}$$

where Cor_i is the average of country i's $Cor_{i,t}$ over the time span $t = 1,...,T$, and $\eta_{i,t}$ and $\varepsilon_{i,t}$ are the new disturbance terms. Because Equations (2) and (3) add up to Equation (1), it follows that $\eta_{i,t} + \varepsilon_{i,t} = \mu_{i,t}$. Since it is quite plausible that the effects of changes in transitory income on corruption are not instant, possible lags in these influences should be considered. To accomplish this, Equation (3) can be re-written as follows:

$$Cor_{i,t} - Cor_i = \sum_{j=0}^{K} \gamma_{2,t-j} TI_{i,t} + \nu_{i,t}, \tag{4}$$

where $j = 0, ..., K$ denotes the number of lags, the cumulative sum of the time-specific coefficients $\gamma_{2,t-j}$ captures the cyclical behaviour of corruption, and $\nu_{i,t}$ is the error term. Note that in panel data econometrics, the estimates of γ_1 and γ_2 in Equations (2) and (3) are identical to those resulting from the estimation of Equation (1). The parameters γ_1 and γ_2 are referred to as “between” and “within” coefficients, respectively, and they can be interpreted as different estimators of a single parameter γ. For this reason, Equations (2) and (3) are usually estimated separately.

The data used by Gokcekus and Suzuki (2011) consisted of 39 countries over the time span 1995-2007. For the economic variables permanent and transitory income, they collected GDP per capita information from the World Bank’s World Development Indicators databases (in constant US dollars). As the corruption variable, they adopted the Corruption Perception Index (CPI) from Transparency International.

Our data used in the estimations of Equations (2), (3) and (4) are somewhat different. We use balanced panel data from 110 countries (listed in Appendix) around the world over the time span 1984–2011. The economic variables are calculated from country-wise time series of GDP per capita at constant prices (purchasing power parity in 2011 international dollars). The data are collected from the World Economic Outlook 2014, IMF website.

As the corruption variable, we use the International Country Risk Guide (ICRG) index which takes a bit broader view on corruption than the CPI index. While both indices consider mainly political corruption (like patronage, partisan finance and nepotism), the ICRG index pays more attention to the linkage between politics and business (like side payments and bribes connected with applications for licenses and permits). Thus, it is somewhat more closely related to business life than the CPI index. The original ICRG index values vary from 0 to 6, where 0 indicates utmost risk of corruption and 6 indicates perfect integrity. For interpretational ease, we rescale the data so that $Cor = 7 - \text{ICRG}$. Thus, Cor varies from 1 to 7 with 1 indicating minimum and 7 maximum risk of corruption.

For example Shleifer and Vishny (1993) and Mauro (1995) showed that corruption makes GDP and incomes shrink, while a common observation also is that low incomes cause corrupt behavior (e.g. Mauro, 1995; Knack and Keefer, 1995; Mo, 2000; Swaleheen, 2011). Therefore, instrumental variables are needed to correct possible endogeneity or bidirectional causality between corruption and income. Gokcekus and Suzuki (2011) used absolute geographic distance from the equator (latitude) to instrument GDP per capita based on the presumed correlation between corruption and countries' proximity to the equator. However, the exogeneity of this instrument may be questionable because latitude may correlate with incomes, say, due to colonial history. (See also Chowdhury, 2004; Keefer, 2007.)

We instrument permanent and transitory income by the share of gross savings from GDP, denoted by *Savings*. The data come from the World Economic Outlook 2014. We are aware that *Savings* may not be a perfect instrument for incomes because of exogeneity problems: savings facilitate investments which affect incomes. Corruption is usually uncommon in high-income countries, where the capacity to save and invest is high, and *vice versa*. Thus, the correlation between savings and income is not necessarily zero.

As another instrument, we use the variation of precipitation (*Rainfall*) from one year to the next. We follow Miguel, Satyanath and Sergenti (2004), who use *Rainfall* to instrument GDP growth when studying the impact of economic conditions on the probability of civil conflict in 41 African countries. The data come from the monthly estimates of the Global Precipitation Climatology Centre (GPCC). The variable for country *i* in year *t* is denoted $Rainfall_{i,t}$ and proportional variations in rainfall are denoted $\Delta Rainfall_{i,t} = (Rainfall_{i,t} - Rainfall_{i,t-1})/Rainfall_{i,t-1}$. Yet, the exogeneity problem may again exist since precipitation conditions agriculture, which contributes substantially to GDP and incomes in many of the sample countries. Moreover, rainfall depends on geography since the biggest accruals are recorded near the equator, which leads to the issue with the latitude instrument commented above.

In any case, diagnostic tests must be made to validate our choices of the instrument variables. The results of the first-stage Ordinary Least Squares (OLS) estimations of the income variables against the chosen instruments are presented in Table 1.

Table 1

First-stage regressions

Dependent variables:	Permanent income			Transitory income		
	First-st. 1	First-st. 2	First-st. 3	First-st. 4	First-st. 5	First-st. 6
Constant	8.208[a] (0.042)	9.096[a] (0.022)	8.205[a] (0.042)	0.053[a] (0.007)	0.007[a] (0.007)	0.101[a] (0.018)
$Savings_{i,t}$	0.042[a] (0.001)		0.042[a] (0.001)	0.002[a] (0.0003)		0.001[a] (0.0006)
$\Delta Rainfalli,_{t}$		0.005[b] (0.0007)	0.000[b] (0.0000)		0.001[b] (0.0001)	0.001[c] (0.0001)
Adjusted-R^2	0.1589	0.0811	0.1591	0.0494	0.065	0.0594
F-test (*p*-value)	6.22e-08[a]	7.36e-12[a]	<2e-16[a]	2.09e-12[a]	<2e-16[a]	<2e-16[a]
Number of obs.	3080	3080	3080	3080	3080	3080

Notes. Estimations are based on OLS

a. Statistical significance at 0.1 percent level; b. Statistical significance at 1 percent level; c. Statistical significance at 5 percent level; d. Statistical significance at 10 percent level

Table 1 shows that the estimated coefficients of the instrument variables are positive and statistically significant in all versions 1-6. Thus, the instrument variables provide sound information about both permanent and transitory income variables. The statistical significance of $\Delta Rainfall_{i,t}$ seems much weaker than that of $Savings_{i,t}$ but the effects are not comparable: by the F-test, the null hypothesis that the former effect is weaker than the latter is rejected (the *p*-value is throughout less than 5 %). The robustness of the results was also verified (but not reported here) by Fixed

Effects estimations. The second-stage instrument estimations are shown in Table 2.

Table 2 shows that the coefficients of the first-stage residuals 1, 2 and 4 (included as independent variables in the basic models) are statistically significant so that the exogeneity hypothesis is rejected. The *p*-value in the Wu-Hausman test is less than 5 %. Due to existing endogeneity, OLS is biased towards consistent Instrumental Variables (IV) estimators. The first-stage residuals 3, 5 and 6 show statistically insignificant coefficients which suggest exogeneity. The Wu-Hausman *p*-value is greater than 5 %.

Table 2
Exogeneity test

	Equation (2)	*Equation (2)*	*Equation (2)*	*Equation (3)*	*Equation (3)*	*Equation (3)*
Constant	0.596[a] (0.149)	3.500[a] (3.869)	0.602[a] (0.148)	0.653[a] (0.009)	0.346[a] (0.009)	0.523[a] (0.009)
Permanent income	0.1747[a] (0.016)	0.494 (0.425)	0.175[a] (0.016)			
Transitory income				0.613[c] (0.324)	1.921[c] (1.696)	0.515[b] (0.317)
Residuals (First-st. 1)	0.047[b] (0.017)					
Residuals (First-st. 2)		0.279[a] (0.4254)				
Residuals (First-st. 3)			0.046 (0.017)			
Residuals (First-st.4)				0.295[a] (0.327)		
Residuals (First-st. 5)					1.559 (1.696)	
Residuals (First-st. 6)						0.896 (0.437)
Adjusted-R^2	0.6607	0.6591	0.5802	0.4824	0.3997	0.3219
Wu-Hausman (*p*-v.)	0.0478[c]	0.0348[b]	0.439	0.0012[b]	0.112	0.125
Conclusion	IV	IV	OLS/IV	IV	OLS/IV	OLS/IV
Observations.	3080	3080	3080	3080	3080	3080

Notes. Estimations are based on OLS

a. Statistical significance at 0.1 percent level; b. Statistical significance at 1 percent level; c. Statistical significance at 5 percent level; d. Statistical significance at 10 percent level

Yet, endogeneity does not appear a big problem, since the OLS and IV estimates are similar. With two instruments on a single endogenous variable, the Sargan test necessitates simultaneous use of both instruments. For Equation (2), the test gives probability lower than 5 % (*p*-value = 4.79e-05), which rejects the exogeneity hypothesis of instruments. This invalidates at least one of the instruments used. More importantly, for Equation (3), the probability is greater than 5 % (*p*-value = 0.288) meaning that the instruments are exogenous and therefore valid.

Results

We test whether permanent and temporary changes in GDP per capita have statistically significant effects on corruption. In the estimations, all data are log-transformed to make them conform more closely to normal distribution and to correct possible skewedness. Consistent with the above tests on the instruments, Equations (2), (3) and (4) are estimated with appropriate techniques. The estimations results concerning the full sample are reported in Table 3.

Table 3

Full sample estimations

Column	Equation (2)		Equation (3)		Equation (4)		
	1	2	3	4	5	6	7
	OLS	IV-2SLS	IV-2SLS	2SGMM	2SGMM	2SGMM	2SGMM
Constant (γ_0)	0.959[a] (0.060)	0.596[a] (0.169)	1.115[a] (0.004)				
Permanent income (γ_1)	-0.214[a] (0.006)	-0.174[a] (0.018)					
Transitory income (γ_2)			-0.362[a] (0.054)	-0.452a (0.401)	-0.456	-0.521	-0.553
Transitory income ($\gamma_{2,t}$)					-0.398[a] (0.464)	-0.410[b] (0.325)	-0.263[b] (0.421)
Transitory income ($\gamma_{(2,t-1)}$)					0.058[b] (0.351)	-0.27[c] (0.320)	0.122 (0.293)
Transitory income ($\gamma_{(2,t-2)}$)						0.160[c] (0.312)	-0.442[c] (0.257)
Transitory income ($\gamma_{(2,t-3)}$)							0.030 (0.203)
Year 2006				0.018c (0.053)	0.026[d] (0.063)	0.015 (0.026)	0.035 (0.033)
Year 2008				0.031 (0.058)	0.042 (0.052)[d]	0.025 (0.041)	0.046 (0.050)
Year 2010				0.036d (0.042)	0.047 (0.058)	0.018 (0.072)	0.057 (0.085)
Year 2012				0.021 (0.062)	0.020 (0.037)	0.036d (0.046)	0.024 (0.092)
Year 2014				0.062 (0.003)	0.053 (0.030)	0.022 (0.052)	0.065[d] (0.036)
Number of observations	110	110	110	5830	5830	5521	5384
Adjusted-R^2	0.4592	0.4358	0.0627				
Wald test[e]		90.5[a]	102.43[a]	164.465[a]	174.47[a]	159.27[a]	143.14[a]
Sargan test[f] (*p*-value)				0.438	0.274	0.762	0.348

Notes. The robust standard deviations are in parentheses below the estimated coefficients of the explanatory variables. OLS = ordinary least squares; IV-2SLS = instrumental variables - two-stage least squares; 2SGMM = two-stage generalized method of moments.

a. Statistical significance at 0.1 percent level; b. Statistical significance at 1 percent level; c. Statistical significance at 5 percent level; d. Statistical significance at 10 percent level; e. The null hypothesis of the Wald test checks whether permanent income (PI_i) = 0 for *Equation* (2) is rejected; f. The over-identifying test (Sargan test) shows that the instruments are not correlated with residuals. The test is robust to autocorrelation (*p*-value > 0.05) saying that the instruments are valid.

In Table 3, columns 1 and 2 present the estimation results concerning the effect of long-run income changes on corruption. Column 1 shows the results from Ordinary Least Squares (OLS) estimations and column 2 shows the results from the Instrumental Variable - Two-Stage Least Squares (IV-2SLS) estimation methods. Recalling Table 1, the Wu-Hausman test verifies that both methods are equally applicable.

Table 3 shows that both estimation techniques yield the expected result that there is a statistically significant negative correlation between permanent income and corruption. In other words, integrity improves with economic growth. The finding is consistent with Gokcekus and Suzuki (2011) as well as with the voluminous literature on the relationship between economic growth and corruption (e.g. Shleifer and Vishny, 1993; Mauro, 1995; Knack and Keefer, 1995; Mo, 2001).

The estimation results of Equations (3) and (4) presented in columns 3–7 of Table 3 concern the effects of short-term income fluctuations that is business cycles on corruption. As the Wu-Hausman test implies that endogeneity does not constitute a big problem and OLS and IV-2SLS methods are equally applicable, the estimations reported in column 3 are produced by the IV-2SLS method. The estimation results in columns 4-7 are produced by the Two-Stage Generalized Method of Moments (2SGMM) system proposed by Blundell and Bond (1998). In both IV-2SLS and 2SGMM estimations, the instruments are used simultaneously but added to the automatically generated instruments in the latter case.

The IV-2SLS and 2SGMM estimation results suggest a negative link between transitory income and corruption. The clearly negative coefficient estimates for Equation (3) (-0.362 with IV-2SLS in column 3 and -0.452 with 2SGMM in column 4) are statistically highly significant indicating that an increase in transitory income unambiguously dampens corruption. In other words, business booms seem to reduce rather than increase corruption. This confronts the original argument of Galbraith (1997) and its empirical support by Gokcekus and Suzuki (2011) that booms should stimulate rent-seeking and pump up corruption.

In Table 3, the estimations of Equation (4) test whether the lagged effects of changes in transitory income predict variations in corruption. Gokcekus and Suzuki (2011) made the test with one period lag (*K=1*), but here Equation (4) is estimated separately with one, two and three period lags. The results from the 2SGMM estimations are presented in column 5 (*K=1*), column 6 (*K=2*) and column 7 (*K=3*). Recall that the effect of transitory deviations in income on corruption is appraised through the cumulative sum of the estimates of the coefficient γ_2 in Equation (4).

In column 5, the estimated coefficient of transitory income at period *t* is $\gamma_{2,t}$ = -0.398, and that in period *t-1* reads $\gamma_{2,t-1}$ = -0.058. Both are statistically significant (at 0.1 % and 1 % levels, respectively). It follows that the aggregate effect of transitory income (the cumulative sum of the two estimates) is -0.456. Likewise, in column 6 with $K = 2$, the coefficient estimates of transitory income are statistically significant, and the cumulative effect is -0.521. With $K = 3$ in column 7, the coefficients are less significant, and the cumulative impact is -0.553. Overall, the findings are in line with the estimation results of Equation (3) thus supporting the conclusion that economic booms reduce corruption, and *vice versa*.

At this point, it is reasonable to test the robustness of our findings. As the first robustness test, we make a closer comparison to the estimations of Gokcekus and Suzuki (2011). To accomplish that, we focus on the 39 countries investigated in their paper (the countries are marked by ® in Appendix). If our main results still hold within that sample, they should be reasonably robust thus indicating that our conflicting findings are not solely based on the differences in the sample of countries under scrutiny. Our estimation results concerning the select 39 countries over the time span 1984–2011 are reported in Table 4.

In Table 4, the estimates of the coefficients of the variables of interest are consistent with the conclusions of the regressions on the total sample in Table 3. More specifically, the estimation results of Equation (3) show that the estimated coefficients of transitory income are all negative and statistically significant at 0.1 % level. The aggregate effects of transitory income on corruption also remain negative for all the three *K* values in the estimations of Equation (4).

Table 4

Estimations based on select 39 countries

Column	Equation (2)		Equation (3)		Equation (4)		
	1	2	3	4	5	6	7
	OLS	IV-2SLS	IV-2SLS	2SGMM	2SGMM	2SGMM	2SGMM
Constant (γ_0)	0.264^a (0.072)	0.947^a (0.274)	0.837^a (0.291)				
Permanent income (γ_1)	-0.538^a (0.004)	-0.283^a (0.016)					
Transitory income (γ_2)			-0.904^a (0.563)	-0.743^a (0.249)	-0.759	-0.783	-0.801
Transitory income ($\gamma_{2,t}$)					-0.452^a (0.103)	-0.529^b (0.231)	-0.402^b (0.135)
Transitory income ($\gamma_{(2,t-1)}$)					-0.307^c (0.391)	0.328 (0.214)	-0.635 (0.246)
Transitory income ($\gamma_{(2,t-2)}$)						-0.582^c (0.632)	0.197^c (0.134)
Transitory income ($\gamma_{(2,t-3)}$)							0.039 (0.259)
Number of observations	39	39	39	3821	3821	3570	2350
Adjusted-R^2	0.4247	0.3970	0.0968				
Wald test[e]		24.721^a	38.034^a	42.515^a	35.26^a	41.781^a	56.429^a
Sargan test[f] (*p*-value)				0.133	0.473	0.284	0.425

Notes. The robust standard deviations are in parentheses below the estimated coefficients of the explanatory variables. OLS = ordinary least squares; IV-2SLS = instrumental variables - two-stage least squares; 2SGMM = two-stage generalized method of moments.

a. Statistical significance at 0.1 percent level; b. Statistical significance at 1 percent level; c. Statistical significance at 5 percent level; d. Statistical significance at 10 percent level; e. The null hypothesis of the Wald test checks whether permanent income (PI_i) = 0 for *Equation* (2) is rejected; f. The over-identifying restrictions test (Sargan test) postulates in its null hypothesis that instruments are not correlated with residuals. Since the test is robust to autocorrelation (*p*-value > 0.05), the instruments are valid.

The general finding from Table 4 is that business booms make corruption diminish and recessions make it bloom. So, in spite of the selection of the sample countries, the contradiction between our results and those of Gokcekus and Suzuki (2011) still remains. This suggests that the reason for the difference in results must be simply due to the different time coverage, which was 1995-2007 (13 years) in their study and considerably longer 1984–2011 (28 years) in ours.

We make a final robustness test by using still another measure of corruption, namely the Control of Corruption (CC) statistics from the Worldwide Governance Indicators (WGI) set provided by The World Bank. The index is commonly used and similar to Transparency International's CPI since it is also constructed as a hybrid index from surveys of perceived corruption. Due to the availability of data, the estimations include 94 countries (marked by * in the list of countries in Appendix) and the study period covers years 1984–2011. The estimation results of the first robustness test are reported in Table 5.

Table 5

Robustness test using the Control of Corruption (CC) index

Column	Equation (2)		Equation (3)		Equation (4)		
	1	2	3	4	5	6	7
	OLS	IV-2SLS	IV-2SLS	2SGMM	2SGMM	2SGMM	2SGMM
Constant (γ_0)	0.115[a] (0.314)	0.763[a] (0.147)	0.621[a] (0.138)				
Permanent income (γ_1)	-0.225[a] (0.002)	-0.164[a] (0.029)					
Transitory income (γ_2)			-0.644[a] (0.306)	-0.592[a] (0.302)	-0.614	-0.637	-0.671
Transitory income ($\gamma_{2,t}$)					-0.371[a] (0.214)	-0.477[a] (0.205)	-0.521[b] (0.126)
Transitory income ($\gamma_{(2,t-1)}$)					-0.243[b] (0.158)	0.175 (0.186)	0.249 (0.164)
Transitory income ($\gamma_{(2,t-2)}$)						-0.335[c] (0.412)	-0.376[c] (0.128)
Transitory income ($\gamma_{(2,t-3)}$)							-0.023 (0.259)
Number of observations	94	94	94	1222	1222	984	927
Adjusted-R^2	0.4473	0.4106	0.1034				
Wald test[e]		52.85[a]	46.479[a]	39.248[a]	43.71a	47.25a	61.253[a]
Sargan test[f] (*p*-value)				0.211	0.395	0.138	0.213

Notes. The robust standard deviations are in parentheses below the estimated coefficients of the explanatory variables. OLS = ordinary least squares; IV-2SLS = instrumental variables - two-stage least squares; 2SGMM = two-stage generalised method of moments.

a. Statistical significance at 0.1 percent level; b. Statistical significance at 1 percent level; c. Statistical significance at 5 percent level; d. Statistical significance at 10 percent level; e. The null hypothesis of the Wald test checks whether permanent income (PI_i) = 0 for *Equation* (2) is rejected; f. The over-identifying restrictions test (Sargan test) postulates in its null hypothesis that instruments are not correlated with residuals. Since the test is robust to autocorrelation (*p*-value > 0.05), the instruments are valid.

Table 5 shows that our previous results remain mainly unaltered with high statistical significance. Thus, the final robustness test confirms our findings which challenge the original argument of Galbraith (1997) and especially its empirical verification by Gokcekus and Suzuki (2011).

A further question of interest is to study the occurrence of corruption in a comparative context. For example, Li and Wu (2007), Mallik and Saha (2016) and Fisman and Golden (2017) point out that corruption is a country specific phenomenon. We concentrate on cyclical fluctuations in income and differentiate the countries with respect to income level, and rule of law. We suppose that these characteristics make a rough demarcation between developed and developing countries with different expectations concerning the effect of business cycles on corruption.

In developed countries with high income and strong rule of law, it is expectable that the negative effect of a change in transitory income on corruption exposed by our analyses above stays negative. The intuition is that, since economic booms generate profits, labor income and tax revenue, the institutional anti-corruption and auditing mechanisms as well as public concern should be enforced thus fostering integrity and *vice versa*. On the other hand, in developing countries with low income and weak rule of law, corruption may respond differently to economic fluctuations. If corruption is long-lived, persistent, and embedded in public mentality, any short-term fluctuations in income should not cause notable changes in the corruption rate (see e.g. Reinikka and Svensson, 2005; Asongu, 2013; Rosenbaum, Billinger and Stiglitz, 2013).

We split our sample of countries to *High-Income* and *Low-Income* countries according to the average GDP per capita figures from IMF's World Economic Outlook 2014. Concerning rule of law (RL), we use average country-wise indices calculated from the World Bank's Worldwide Governance Indicators (WGI) dataset to construct *Strong RL* and *Weak RL* countries. The time span is now 1996–2014. The countries are sorted according to the two factors so that the estimations are based on four sub-samples, each including 39 countries.

The *High-Income* sub-sam ple includes the 39 wealthiest countries in the whole sample and the *Low-Income* sub-sample includes the 39 poorest countries. Likewise, the *Strong RL* sub-sample includes the top 39 countries in the index ranking and the *Weak RL* sub-sample includes the bottom 39 countries in the ranking. The findings regarding the estimations with respect to the demarcation according to rule of law and income are summarized in Table 6. To save space, only the 2SGMM estimations of corruption against *Transitory income* $\gamma_{2,t}$ are reported.

Table 6

Estimations according to the levels of rule of law and income

Equation (3), 2SGMM	RL		Income	
	Strong	Weak	High	Low
Transitory income ($\gamma_{2,t}$)	-0.662[a] (0.301)	-0.008[c] (0.138)	-0.340[a] (0.164)	-0.012[c] (0.024)
Number of observations	39	1092	39	1092
Wald test[e]	42.54[a]	41.18[a]	57.41[a]	41.18[a]
Sargan test[f] (*p*-value)	0.486	0.240	0.193	0.152

Notes. The robust standard deviations are in parentheses below the estimated coefficients of the explanatory variables.

a. Statistical significance at 0.1 percent level; b. Statistical significance at 1 percent level; c. Statistical significance at 5 percent level: d. Statistical significance at 10 percent level; e. The over-identifying restrictions test (Sargan test) postulates that instruments are not correlated with residuals. Since the test is robust to autocorrelation (*p*-value > 0.05), the instruments are valid.

Strong RL countries: Finland, Norway, Denmark, Sweden, Switzerland, New Zealand, Austria, Iceland, Luxembourg, Netherlands, Canada, United Kingdom, Germany, Ireland, Singapore, United States, Australia, Malta, France, Hong Kong, Japan, Chile, Spain, Portugal, Belgium, Cyprus, Israel, Republic of Korea, Taiwan, Hungary, Greece, Qatar, Botswana, Kuwait, Italy, Poland, Argentina, Morocco, Ghana.

Weak RL countries: Uganda, Zambia, Mexico, Colombia, Dominican Republic, Mozambique, Peru, El Salvador, Niger, Bolivia, Indonesia, Islamic Republic of Iran, Albania, Pakistan, Bangladesh, Togo, Honduras, Gabon, Kenya, Paraguay, Guatemala, Senegal, Sierra Leone, Nicaragua, Cameroon, Republic of Congo, Venezuela, Cote d'Ivoire, Madagascar, Sudan, Guinea, Vietnam, Jamaica, Guinea Bissau, Guyana, Ecuador, Democratic Republic of the Congo, Angola, Haiti.

High-income countries: Qatar, United Arab Emirates, Luxembourg, Kuwait, Norway, Switzerland, Singapore, Saudi Arabia, Bahrain, United States, Denmark, Oman, Netherlands, Austria, Germany, Canada, Sweden, Belgium, Australia, France, Italy, Iceland, Hong Kong SAR, Japan, Finland, United Kingdom, The Bahamas, Ireland, Cyprus, Spain, New Zealand, Greece, Israel, Malta, Taiwan Province of China, Portugal, Gabon, Hungary, Trinidad and Tobago.

Low-income countries: Mozambique, Ethiopia, Democratic Republic of the Congo, Malawi, Niger, Burkina Faso, Sierra Leone, Uganda, Guinea Bissau, Togo, Guinea, Mali, Madagascar, The Gambia, Tanzania, Bangladesh, Haiti, Senegal, Ghana, Vietnam, India, Kenya, Zambia, Cameroon, China, Cote d'Ivoire, Sudan, Nicaragua, Pakistan, Angola, Honduras, Guyana, Bolivia, Philippines, Morocco, Sri Lanka, Republic of Congo, Syria, Albania.

Table 6 shows that the finding of the negative effect of transitory income on corruption remains negative and statistically significant in all the four sub-samples characterized by income and rule of law. Thus, the main correlation seems to be independent of the differences in these characteristics. However, the results also show that in countries with high income and/or strong rule of law, corruption is more sensitive to business cycles than in the countries with low income and/or weak rule of law. This aligns with our expectation of somewhat different responses. (See also Khan, 2004; Davigo and Mannozi, 2007.) To put it more generally, economic booms tend to reduce corrupt practices notably in wealthy and properly institutionalized surroundings (like in developed countries). This somewhat contradicts the argument of Galbraith (1997). Meanwhile, the negative effect is much weaker in surroundings described by low income and weak institutions (like in developing countries). This is reasonable since, in many developing countries, corruption is so established that any business cycles are quite irrelevant to it. (See also Fisman and Golden, 2017.)

Conclusions

The paper presented an econometric study on the effects of changes in national income on the risk of corruption in a worldwide balanced panel sample over 1984–2011. The study was inspired by the studies of Galbraith (1997) and Gokcekus and Suzuki (2011), which suggest that long-term economic growth reduces corruption while short-term economic booms trigger it, and *vice versa*.

The analyses of the paper verified the former argument that permanent income and corruption are negatively correlated but contradicted the latter argument that the correlation between transitory income and corruption should be positive. The results clearly showed that also business cycles are negatively correlated with corruption. In other words, business booms dampen rather than trigger corruption. The conclusions remained valid after thorough robustness tests.

The paper also investigated if the short-term effects differ between countries. The countries were classified according to income level and the state of rule of law. The main conclusion about the negative effects on corruption remained unchanged, but its sensitivity to business cycles was found to be higher in high-income and/or strong rule of law countries than in these with low income and/or weak rule of law. Since former characteristics are typical for developed countries, our findings challenged the original insight of Galbraith (1997), which reflects mainly developed business practices.

A possible explanation for different sensitivities of corruption to business cycles is that, in developed countries, short-term changes in incomes have a stronger institutional effect than in developing countries. Economic booms yield more resources to the existing anti-corruption machinery and activism, and *vice versa*. On the other hand, in many developing countries, corruption is so deeply rooted in the socioeconomic system that any transitory economic fluctuations don't have much influence on the common practice.

However, there are some caveats in the present study. First, the results seem to be data dependent. Compared to Gokcekus and Suzuki (2011), we derived differing results merely by using more extensive data and alternative corruption indices. Second, even our data is not sufficient for a strict testing of the proposition of Galbraith (1997). Business embezzlement is only one character of corruption, and it is not properly monitored by any of the applied corruption indices. Third, the joint framework originated by Mélitz and Zumer (2002) may be questionable. The framework is reasonable when investigating regional redistribution but maybe less so in the present context. Finally, sometimes it is disruptive behavior (particularly in the financial sector) that causes business cycles, and not the other way around.

In further studies, the gaps mentioned above should be filled. First, more exhaustive data on firms' and banks' corrupt behavior should be used because the general indices on perceived corruption focus mostly on political corruption. The World Bank Enterprise Survey of Business Managers provides more accurate Bribe Incidence and Bribe Depth indices, but only for select countries from 2002 on. Second, the basic framework should be elaborated to fit more aptly to the context. And third, the direction of causality between business cycles and corruption should be examined. The behavioral patterns highlighted by Galbraith (1997) and Akerlof and Shiller (2009) are certainly worth of closer scrutiny.

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Appendix

List of countries/ territories in the sample

Albania*	Ethiopia	Lebanon	Sierra Leone*
Algeria	Finland*®	Luxembourg*	Singapore *®
Angola	France*®	Madagascar	South Africa*®
Argentina*®	Gabon*	Malawi*	South Korea®
Australia®	Germany*®	Malaysia*®	Spain*®
Austria*®	Ghana*	Mali*	Sri Lanka*
Bahrain*	Greece*®	Malta*	Sudan*
Bangladesh*	Guatemala*	Mexico*®	Sweden*®
Belgium*®	Guinea	Morocco*	Switzerland*®
Bolivia*	Guinea Bissau	Mozambique*	Syrian Arab Rep.*
Botswana*	Guyana	Netherlands*®	Taiwan (Chinese province)*
Brazil*®	Haiti	New Zealand*®	Tanzania*
Bulgaria*	Honduras*	Nicaragua	Thailand*®
Burkina Faso	Hong Kong SAR*®	Niger*	The Bahamas
Cameroon*	Hungary*®	Norway*®	The Gambia*
Canada*®	Iceland*	Oman	Togo*
Chile*®	India*®	Pakistan*	Trinidad and Tobago*
China*®	Indonesia*®	Panama*	Tunisia*
Colombia*®	Iran*	Paraguay*	Turkey*®
Costa Rica*	Ireland*®	Peru*	Uganda*
Cote d'Ivoire*	Israel*	Philippines*®	United Arab Emirates
Cyprus*	Italy*®	Poland*	United Kingdom*®
Democratic Rep. of Congo*	Jamaica*	Portugal*®	United States*®
Denmark*®	Japan*®	Qatar*	Uruguay*
Dominican Republic*	Jordan*	Republic of Congo*	Venezuela*®
Ecuador	Kenya*	Romania*	Vietnam*
Egypt*	Korea, Republic of*	Saudi Arabia*	Zambia*
El Salvador	Kuwait*	Senegal*	

Notes. The full sample of 110 countries (excluding South Korea).

*Countries (94 in total) covered by robustness tests with alternative 'Control of Corruption' (CC) index from the WB.
® Countries (39 in total) included in the sample of Gokcecus and Suzuki (2011)

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