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Inflation – Economic Growth Nexus: Evidence from OECD Countries

Enflasyon – Büyüme İlişkisi: OECD Ülkeleri Örneği

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ÖZ

Bu makale, 1972-2021 yılları arasında 38 Ekonomik İşbirliği ve Kalkınma Örgütü (OECD) ülkesinde enflasyonun ekonomik büyüme üzerindeki etkisini incelemektedir. İçsellik ve ters nedensellik sorunlarının üstesinden gelmek için sistem genelleştirilmiş momentler yöntemini (GMM) kullanarak elde edilen sonuçlara göre, enflasyonun ekonomik büyüme üzerinde negatif etkisi bulunmaktadır. Enflasyondaki yüzde birlik artış, modele bağlı olmak koşuluyla büyümeyi yüzde 0.03 ile 0.15 oranında azaltmaktadır. Sonuçlar çok sayıda kontrol değişkeni ile de desteklenmiştir. Sonuçları daha fazla test etmek amacıyla, fark momentler yöntemi ve sabit etki regresyonları kullanılmıştır ve elde edilen bulgular sistem genelleştirilmiş momentler yöntemini doğrulamıştır. Bu nedenle politika yapıcılar, kısa, orta ve uzun vadede enflasyonun yayılmasını önlemek için belirli politikalar uygulamalıdır.

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ABSTRACT

This paper investigates the impact of inflation on economic growth in 38 Organization for Economic Cooperation and Development (OECD) countries from 1972-2021. The results confirm that inflation harms economic growth with various specifications using the generalized method of moments (GMM) to overcome endogeneity and reverse causality issues. One percent increase in inflation reduces growth by 0.03-0.15 percent depending on the model. The results are robust with numerous control variables. For further robustness, difference GMM and fixed effect (FE) regressions are utilized, and they verify the system GMM results that inflation has adverse effects on growth. Thus, policymakers should implement specific policies to prevent the spread of inflation in the long run.

1. Introduction

Inflation is an important determinant of economic growth. Central banks use necessary monetary policy tools to have price stability and achieve sustainable growth in the long run. Although studies find positive impacts of inflation on economic growth, the overwhelming majority consider higher inflation harmful to further development and growth. Nonetheless, it has not been easy to alleviate the repercussions of inflation due to various reasons (e.g., exogenous shocks). For example, following the 1973 oil crisis, the world struggled with high inflation. Between 1973-1984, average inflation hit double digits in OECD countries (Andrés and Ignacio, 1999). After that, central banks fought against overheated economies by increasing the interest rates to have persistent levels of price stability. Starting from Paul Volcker of the US, central banks battled against inflation by raising interest rates, further reducing economic growth (Goodfriend, 2004).

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After successfully lowering the inflation rates, central banks started implementing inflation-targeting policies in the 1990s. Even though there were implicit attempts before this date, most countries have implemented inflation targeting. However, developing and developed countries have struggled with inflation again following the COVID-19 pandemic, which made it a hot topic after almost four decades. Major developed countries such as the US, the UK, Canada, and Germany are now wrestling with high inflation. On top of that, the Russian invasion of Ukraine and the ongoing high number of COVID cases in China amplified the supply shocks, which further accelerated inflation pressures.

For inflation economic growth nexus, there is extensive research in the literature. Since inflation is considered a factor affecting productivity growth, scholars implemented various econometric methodologies to investigate the impact of inflation on economic growth or vice versa. Some argue that inflation has short-term adverse effects on growth, while others claim that the relationship occurs only in the long run. Some claim no linear relationship exists between the two variables, whereas others say the impact is one-way and consistently negative (Dornbusch and Frenkel, 1973; Fischer, 1983; Barro, 1996; Faria and Carneiro, 2001; Khan and Senhadji, 2001). However, it can be said that there is a consensus on the harmful effects of inflation, but the magnitude of the impact depends on the income level of countries or econometric specifications.

In that regard, this paper examines the impact of inflation on economic growth in 38 OECD countries between 1972-2021(Costa Rica has recently become an OECD member). These countries are tested due to the fact they carry similar institutional characteristics but different inflation paths (Andrés and Ignacio, 1999). The main finding of the paper is that inflation negatively affects economic growth, which is a robust result with various control variables and econometric specifications. The subsections of the article are as follows; the next section reviews the literature. The following section provides the model, data, and econometric methodology. Section 4 discusses the results, section 5 implements robustness checks, and lastly section 6 concludes.

2-Literature Review

The literature has three strands on the relationship between inflation and economic growth. The first group is scholars who find a positive relationship between the two variables. For example, Tobin (1965) considers moderate inflation spurs economic growth, but too much of it hampers growth. He finds an equilibrium with money growth by following Solow's growth model with an additional variable of government debt. In another study, Mallik and Chowdhury (2001) reach the same conclusion for Bangladesh, India, Pakistan, and Sri Lanka. Majumder (2016) works on the Bangladeshi data set and finds a long-run positive relationship between inflation and economic growth. The author utilizes Vector Error Correction Model (VECM) and Granger causality tests. Lastly, Kryeziu and Durguti (2019) find that inflation positively affects economic growth in Eurozone. They run least square regressions and check for serial correlation and heteroscedasticity.

Another strand in the literature finds a mostly negative impact of inflation on economic growth. In this vein, De Gregorio (1992a) works on Latin American countries and finds a negative relationship. The author uses the endogenous growth model to show how inflation harms resource allocation and economic growth. He thinks eliminating inflation is necessary but not sufficient to have sustainable growth. In another study on 12 Latin American countries, De Gregorio (1992b) concludes that inflation and its variability adversely affect economic growth. He reaches this conclusion with the growth accounting model. In his prominent piece, Fischer (1993) uses the growth accounting model and verifies the negative relationship with cross-sectional and panel data settings. Inflation negatively affects economic growth through investment and productivity growth.

In contrast to the studies mentioned above, Valdovinos (2003) distinguishes between inflation's short and long-run effects. This study is based on Lucas (1980) in terms of its methodology and uses an approximate band-pass filter developed by King and Baxter (1995). Without filtering the data, the original plot shows an unclear and weak relationship, but after filtering, there is a clear negative relationship between inflation and growth. Thus, a short-term connection is weak, but a robust relationship lies in the long run.

Andrés and Ignacio (1999) utilize instrumental variable (IV) and fixed effect (FE) regressions. They find that by reducing inflation by one percentage point, the steady-state level of per capita income will increase by 0.5 to 2%. They also find that even low and moderate inflation levels have adverse effects on economic growth, and causality runs from inflation to growth which never becomes positive. In a similar work, Barro (2013) finds a negative relation between inflation and growth in his seminal work. Using data from 1960-1990 on 100 countries, the main finding is ten percentage point increase in inflation lowers economic growth by 0.2-0.3 percentage points per year. Although it seems low, it has a substantial long-run impact. When life expectancy is not considered in the regressions, the coefficients become larger, as in Mankiw, Romer, and Weil (1992). The instrumental variable (IV) approach is used to overcome the endogeneity problem, and the results are robust.

Jayathileke and Rathnayake (2013) examine the relationship between inflation and growth in Sri Lanka, China, and India with VECM and Granger causality tests. The results indicate a negative and significant relationship between the two variables in Sri Lanka. However, there is no significant relationship in China and India, but there is a negative and significant relationship for China in the short run. Besides

the aforementioned studies, Kormendi and Meguire (1985), Alexander (1997), Barro (2001), Gillman, Harris, and Matyas (2004), Saaed (2007), and Emek and Düşünceli (2021) find a negative relationship between inflation and growth.

Finally, the third group of the literature concentrates on the nonlinearity between inflation and economic growth. That is, inflation fosters growth until a threshold, and it averts growth at any level after that point. Numerous studies show that and one of the pioneer pieces demonstrating non-monotonicity is Sarel (1996), who shows the threshold is 8% for all countries. This pioneer work estimates with OLS and panel data on 87 countries. The finding of an 8% inflation rate is just one structural break of the paper. Thus, it clusters all nations that might be affected by the 8% inflation level. However, the rest of the other studies find that there is no specific threshold that works for all developing and developed countries.

In this regard, Burdekin et al. (2004) categorize developed and developing countries and find different thresholds for both groups. They find that inflation has a negative but insignificant impact on industrialized countries until 8%. Between 8-25%, it has a negative and significant impact. They also find the third structural break, but since this is not a significant threshold, it is not incorporated in the regressions. For developing countries, the structural breaks are 3% and 50%. The results indicate that inflation has a positive and significant impact on growth until 3% but an adverse and considerable effect between 3-50%. The third structural breaks are not significant for this group either. Lastly, this study neither advocates nor rejects the inflation targeting between 0-3%. Pollin and Zhu (2006) find a 15-18% threshold level for all countries; however, their findings diverge when countries are grouped with income levels.

Moreover, Bick (2010) extends the work of Hansen (1999) on the panel threshold model by accounting for regime types. If regime types are not incorporated into the regressions, that affects the relationship between inflation and growth. However, after adding regime types, a significant relationship between inflation and economic growth occurs. According to Bick (2010), the absence of regime types might mislead the interpretation of the relationship between two variables. Ayyoub, Chaudhry, and Farooq (2011) find 7% for Pakistan, and Hwang and Wu (2011) find a 2.5% threshold level for China. Vinayagathasan (2013) works on 32 Asian countries between 1980-2009 and finds a nonlinearity between inflation and growth. The author finds a threshold level of 5.43%, below which inflation positively affects economic growth, and above which negatively affects. Similarly, Eggoh and Khan (2014) find different threshold levels for rich and poor countries by employing panel smooth transition regression (PSTR) and dynamic system GMM regressions for 102 developed and developing countries between 1960-2009. Lastly, Sweidan (2014) finds a 2% threshold for Jordan.

In contrast to all studies above, Sepehri and Moshiri (2004) find no precise threshold levels for all counties. They run OLS regressions for 92 countries between 1960-1996 with four types of countries (OECD, upper-middle, lower-middle, lower income). Although there is no clear-cut answer for a threshold, they find high inflation is harmful, especially for lower-middle-income countries. Therefore, some literature finds positive and negative effects of inflation on economic growth, but many others find a non-monotonic relationship between the two. The following section investigates which strand is valid for OECD countries.

3-Data, Model, and Econometric Specification

3.1-Data

All macroeconomic variables, including inflation Consumer Price Index (CPI) (According to Sarel (1996) inflation CPI is better than GDP deflator because changes in GDP deflator is negatively correlated with growth by construction), GDP per capita annual growth (%) –henceforth growth–, log of GDP per capita (constant 2015$), trade of GDP (Trade is used to overcome the negative correlation between inflation and growth due to supply shocks (Sarel 1996)), annual growth rate of population, gross domestic savings (as a % of GDP), life expectancy, total unemployment rates from national estimates (% of the total labor force), oil-rents (as % of GDP), education (primary school gross) and general consumption expenditure (as % of GDP) are obtained from World Development Indicators. International Country Risk Guide (ICRG) corruption index data is used for corruption control. Tables 1 and 2 below provide descriptive summary statistics and correlation matrix of variables used in the study.

Table 1 illustrates that the study is conducted between 1982-2021 on 38 OECD members. Thus, there is a 1900 maximum number of observations. However, some variables have missing observations, which lowers the total number of observations with which the regressions are run. Among all the variables, corruption has the lowest number of observations, and this is because the corruption scores of some countries were not calculated. This could be due to several reasons, but corruption is one of the control variables, and adding it to the regressions does not alter the results.

In Table 2, growth has negatively significantly correlated with inflation. This is helpful to see the negative relationship between two variables before running the regressions. Most variables are correlated with each other, which may indicate the correct choice of control variables for the purpose of this study.

Table 1: Summary Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Year	1900			1972	2021
Growth (%)	1636	2.186	3.322	-14.464	23.999
Log (GDP)	1649	9.998	0.79	7.721	11.63
Inflation CPI (%)	1789	12.724	55.852	-4.478	1281.443
Trade (% of GDP)	1696	77.303	48.573	9.1	388.848
Population (%)	1899	0.701	0.801	-2.574	6.017
Savings (% of GDP)	1696	24.919	6.99	6.057	63.718
Life Expectancy	1862	75.698	4.56	53.492	84.616
Unemployment (% of Labor Force)	1554	7.405	4.174	0.2	27.47
Oil Rents (% of GDP)	1663	0.539	1.373	0	11.077
Education (Primary Gross)	1668	102.743	6.718	77.746	130.029
Gen. Cons. Exp. (% of GDP)	1696	18.221	4.298	7.515	30.324
Corruption	1251	-4.262	1.232	-6	-1.5

The corruption score is rescaled to make higher scores represent "higher corruption." Inflation is Consumer Price Index (CPI).

Table 2: Correlation Matrix

Variables	Growth (%)	Log (GDP)	Inflation CPI (%)	Trade (% of GDP)	Pop (%)	Savings (% of GDP)	Life Expectancy	Unemployment (% of Labor Force)	Oil Rents (% of GDP)	Education (Primary Gross)	Gen. Cons. Exp. (% of GDP)	Corruption
Growth (%)	1											
log (GDP)	-0.156*	1										
Inflation CPI (%)	-0.114*	-0.337*	1									
Trade (% of GDP)	0.079	0.304*	-0.159*	1								
Population (%)	-0.093*	-0.147*	0.029	-0.163*	1							
Savings (% of GDP)	0.150*	0.410*	-0.124*	0.508*	0.122*	1						
Life Expectancy	-0.238*	0.720*	-0.232*	0.230*	-0.092*	0.171*	1					
Unemployment (% of Labor Force)	-0.060	-0.339*	0.026	-0.055	-0.207*	-0.437*	-0.071	1				
Oil Rents (% of GDP)	-0.054	-0.105*	0.084*	-0.197*	0.243*	0.046	-0.116*	-0.071	1			
Education (Primary Gross)	-0.062	-0.357*	0.011	-0.233*	0.287*	-0.256*	-0.139*	0.140*	0.230*	1		
Gen. Cons. Exp. (% of GDP)	-0.199*	0.420*	-0.226*	0.156*	-0.407*	-0.189*	0.403*	0.170*	-0.162*	-0.212*	1	
Corruption	0.101*	-0.586*	0.053	-0.007	-0.081	-0.194*	-0.235*	0.259*	0.055	0.220*	-0.355*	1

* p<0.01

3.2-Model and Econometric Specification

Following the empirical literature, the following model is employed in this study:

$$Growth\ (\%)_{it} = \alpha_0 + \beta I_{it} + \delta X_{it} + \gamma Z_{it} + \theta_i + \lambda_t + \varepsilon_{it} \quad (1)$$

$$\theta_i = \beta_0 + \alpha Z_i$$

In this model, Growth (%) is the GDP per capita growth for country i in time t. I is the measure of CPI for country i in time t. β is the coefficient of interest. If β is positive, then inflation positively affects economic growth for OECD countries, and if it is negative, then inflation negatively affects growth. X_it and Z_it are the vector of controls for observable variables which vary across country and time. As mentioned in the data section, this study controls variables

such as unemployment, life expectancy, trade, and corruption. θ_i is an individual country effect that does not vary across time. Lastly, λ_t captures time fixed effects and ε_it is the idiosyncratic error term. β_0 is the intercept and Z_i is unobserved explanatory variables that vary across countries but not time.

However, in this estimation, fixed effect regressions do not capture all time-variant characteristics that affect the outcome of interest and create omitted variable bias. Also, since growth is persistent over time, meaning growth at time t-1 is the predictor of growth in time t, adding lag of dependent variable causes an endogeneity problem because outcome and treatment are persistently affected by the error term (Blundell and Bond, 1998). Since we incorporate lag values into the model, fixed effects regressions are not ideal for the study. However, as seen in the following sections, fixed effect regressions are still used for robustness checks. Besides the potential endogeneity issue, there is a reverse causality problem where inflation may cause growth, and growth may further accelerate inflation in return. However, the Generalized Method of Moments (GMM) specification eliminates reverse causality and endogeneity issues (Li, Murshed, and Tanna, 2017). Also, GMM bypasses the biases caused by pooled OLS and standard GMM. Standard GMM suffers from small-sample bias and does not consider country-specific fixed effects (Baltagi, 2021). Thus, The following difference GMM model of Arellano and Bond (1991) is presented:

$$Y_{it} = \sum_{j=1}^{p} \alpha_j Y_{i,t-j} + X_{it}\beta_1 + z_{it}\beta_2 + \theta_i + \epsilon_{it} \quad i = 1,\dots,N,\ t = 1,\dots,T \qquad (2)$$

In the equation above, α_j and p are parameters that are to be estimated. X_it is a 1 × k_1 vector of strictly exogenous covariates, β_1 is a k_1 x 1 vector of parameters that is to be estimated, z_it is a 1 × k_2 vector of endogenous covariates, β_2 is a k_(2) x 1 vector of parameters to be estimated, θ_i are the panel-level effects and ϵ_it is error term over the whole sample with variance σ_ϵ^2. According to Blundell and Bond (1998), adding lags of dependent variable violates the strict exogeneity assumption and makes the fixed effect estimator inconsistent. In addition to that, Arellano-Bond estimation becomes weak as the autoregressive process becomes persistent with lagged-level instruments. Since growth depends on lags, there would be autocorrelation and heteroscedasticity within countries, and independent variables would not be strictly exogenous, which means they are correlated with past and possible realizations of the error term.

To eliminate these issues, using a system GMM, Arellano-Bond/Blundell-Bond, the extension of Arellano-Bond, is plausible. System GMM uses Arellano-Bond conditions with additional moment conditions, which make the results more efficient (Engblom and Oikarinen, 2015). System GMM allows adding lag variables of growth without causing any bias in the specification. However, it is not known how many lags need to be added to the regressions. To overcome this uncertainty, lags of growth are added one by one until it ceases to be significant, meaning growth is not affected by the lagged of growth anymore. Starting with one lag, regressions are run until growth is not persistent. We find that growth is statistically significant and persistent until the second lag. The following sections provide robust results with system GMM, difference GMM, and fixed effect regressions.

Table 3: System GMM Regressions

Dept. Var.: Growth	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Inflation CPI (%)	-0.0299*	-0.0331*	-0.0431***	-0.0432***	-0.0435***	-0.046***	-0.149***
	(0.0158)	(0.0172)	(0.00838)	(0.00843)	(0.00851)	(0.0105)	(0.0180)
log (GDP)	-2.459***	-0.170	-0.747	-0.700	-0.788	0.580	-0.834
	(0.666)	(0.649)	(0.644)	(0.661)	(0.784)	(1.104)	(1.149)
Trade (% of GDP)	-0.00724	-0.00288	0.00150	0.00182	0.00690	0.00717	0.00842
	(0.00583)	(0.00684)	(0.00672)	(0.00682)	(0.00774)	(0.00757)	(0.00827)
Population (%)	-1.460***	-1.086***	-1.237***	-1.228***	-1.222**	-1.320***	-0.870*
	(0.358)	(0.360)	(0.423)	(0.421)	(0.478)	(0.460)	(0.486)
Savings (% of GDP)	0.258***	0.198***	0.217***	0.214***	0.256***	0.115	0.0794
	(0.0457)	(0.0502)	(0.0508)	(0.0524)	(0.0581)	(0.0775)	(0.0795)
Life Expectancy		-0.279***	-0.411***	-0.415***	-0.388***	-0.353***	-0.309***
		(0.0700)	(0.0636)	(0.0652)	(0.0851)	(0.0795)	(0.0760)
Unemployment (% of Labor Force)			-0.154**	-0.154**	-0.179**	-0.107	-0.163**
			(0.0724)	(0.0725)	(0.0764)	(0.0739)	(0.0734)
Oil Rents (% of GDP)				0.105	-0.130	-0.186	-0.268**
				(0.208)	(0.167)	(0.150)	(0.121)
Education (Primary Gross)					0.0188	0.0173	-0.00610
					(0.0289)	(0.0290)	(0.0301)
Gen. Cons. Exp. (% of GDP)						-0.486***	-0.702***
						(0.114)	(0.138)
Corruption							-0.325

							(0.208)
GDP (%) $_{t-1}$	0.145***	0.255***	0.197***	0.197***	0.169***	0.160**	0.132*
	(0.0396)	(0.0417)	(0.0562)	(0.0563)	(0.0633)	(0.0651)	(0.0764)
GDP (%) $_{t-2}$	-0.116***	-0.149***	-0.200***	-0.198***	-0.199***	-0.199***	-0.204***
	(0.0286)	(0.0341)	(0.0386)	(0.0387)	(0.0414)	(0.0377)	(0.0401)
Constant	22.08***	21.18***	37.92***	37.79***	33.62***	29.38***	47.03***
	(5.979)	(5.638)	(6.090)	(6.147)	(7.328)	(8.533)	(8.402)
Observations	1,554	1,519	1,398	1,395	1,281	1,281	1,077
Number of Country	38	38	38	38	38	38	38

Notes: Robust standard errors in parentheses. Standard errors are clustered. *** p < 0.01, ** p < 0.05, * p < 0.1. OECD Countries: Austria, Australia, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

4-Results and Discussion

Table 3 below shows the results of regressions with system GMM. As can be seen, the coefficient of interest, inflation CPI, is negative and significant in the preferred specification of the first column. The coefficient continues to be significant when life expectancy, unemployment, oil rents, education, general consumption expenditure, and corruption are controlled for. Depending on the model choice, a one percent increase in inflation reduces growth by 0.03-0.15 percent, and the results are significant at a 5% level in the first two columns and a 1% level in the rest of the columns.

In the first column, all coefficients are significant except the coefficient of trade. When life expectancy is added in the second column, log (GDP) and trade coefficients become insignificant. Coefficients of log (GDP) and trade never turn out to be significant rest of the regressions. When unemployment is added, log (GDP) and trade coefficients remain insignificant. In the fourth column, when oil rent is added to the regression, its coefficient also becomes insignificant. In the fifth column, with the inclusion of education control, oil rent and education coefficients are insignificant. In the sixth column, the savings, unemployment, oil rent, and education coefficients become insignificant with general consumption expenditure control. The coefficient of general consumption expenditure control is significant in the last two models. Lastly, its coefficient is not significant when corruption is controlled for.

System GMM regressions demonstrate that inflation negatively affects economic growth in OECD countries and these results are consistent with the literature. It is important to note that system GMM regressions overcome endogeneity and reverse causality issues. Thus, the results clearly indicate that in order to achieve higher growth rates or sustainable growth in the long run, inflation needs to be controlled and maintained at a certain threshold. However, this threshold depends on the country. The literature review mentions that threshold levels are different among developed and developing nations, and even each emerging market is likely to have different inflation targets. Since OECD has advanced and developing nation members, several other regressions are run to check the validity of the results.

Although each dynamic panel regression loses a greater number of regressions due to instruments, the results are consistent with different controls. Also, results might have been affected by the outliers in the dataset. To see the results of a specific inflation range, values more than 20 are dropped, and results continue to be negative and significant in the overwhelming majority of the regressions (Results are available upon request). The supply shock period of the oil crises might have affected the coefficients. When 1972-1984 time dropped from regressions, the results were still negative and significant in most of the regressions (Results are available upon request). The nonlinearity hypothesis of inflation is checked using the structural break values of Fischer (1993). Regressions are run for inflation less than 15, between 15 and 40, and more than 40. In all regressions, the inflation coefficient continues to be negative and significant, indicating no nonlinearity of inflation (Results are available upon request).

Lastly, countries whose population is less than 2 million are dropped from the regressions to understand how particular idiosyncrasies are large enough to affect the country's economic patterns. It is difficult to assess those distinct features with populations of less than 2 million (Pollin and Zhu, 2006). After dropping those countries, the coefficients of inflation CPI are still negative and significant (Results are available upon request).

5-Robustness Checks

After getting consistent results with system GMM, the ideal specification strategy to be carried out for this study to the best of our knowledge, it is better to test the results in alternative ways. This section provides regression results for difference GMM and year and country fixed effect regressions. Even though difference GMM and fixed effect regressions do not control time-variant heterogeneity as much as system GMM and difference GMM uses more instruments than system GMM, difference GMM and fixed effects regressions are still helpful in checking for

robustness. Table 4 below demonstrates the difference GMM results.

Table 4: Difference GMM Regressions

Dept. Var.: Growth	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Inflation CPI (%)	-0.0349*	-0.0393*	-0.0610***	-0.0612***	-0.0641***	-0.0617***	-0.176***
	(0.0187)	(0.0209)	(0.0149)	(0.0150)	(0.0193)	(0.0194)	(0.0393)
log (GDP)	-2.544***	0.0356	-0.560	-0.500	-0.683	-0.644	-2.748*
	(0.701)	(1.077)	(1.028)	(1.022)	(1.222)	(1.400)	(1.582)
Trade (% of GDP)	-0.0112	-0.00777	0.000103	0.000137	0.00358	-0.00284	-0.000437
	(0.00770)	(0.00830)	(0.00818)	(0.00810)	(0.00929)	(0.00903)	(0.00932)
Population (%)	-1.437***	-1.153***	-1.200***	-1.179***	-1.349***	-1.163***	-1.013**
	(0.338)	(0.306)	(0.393)	(0.391)	(0.453)	(0.410)	(0.464)
Savings (% of GDP)	0.292***	0.228***	0.253***	0.250***	0.279***	0.149**	0.180***
	(0.0408)	(0.0457)	(0.0491)	(0.0489)	(0.0572)	(0.0747)	(0.0695)
Life Expectancy		-0.268***	-0.437***	-0.442***	-0.404***	-0.245**	-0.225*
		(0.0992)	(0.0814)	(0.0813)	(0.102)	(0.101)	(0.117)
Unemployment (% of Labor Force)			-0.123*	-0.122*	-0.143**	-0.0992	-0.159**
			(0.0690)	(0.0691)	(0.0719)	(0.0747)	(0.0686)
Oil Rents (% of GDP)				0.0892	-0.0914	-0.0795	-0.283**
				(0.214)	(0.155)	(0.170)	(0.122)
Education (Primary Gross)					0.00120	0.0157	-0.00710
					(0.0297)	(0.0281)	(0.0369)
Gen. Cons. Exp. (% of GDP)						-0.512***	-0.531***
						(0.130)	(0.125)
Corruption							-0.0145
							(0.131)
GDP (%) $_{t-1}$	0.172***	0.275***	0.221***	0.221***	0.193***	0.180***	0.215***
	(0.0391)	(0.0392)	(0.0567)	(0.0567)	(0.0635)	(0.0660)	(0.0682)
GDP (%) $_{t-2}$	-0.0834***	-0.131***	-0.181***	-0.179***	-0.178***	-0.180***	-0.212***
	(0.0277)	(0.0337)	(0.0345)	(0.0347)	(0.0385)	(0.0367)	(0.0367)
Constant	22.27***	17.87***	37.02***	36.77***	35.18***	33.75***	56.24***
	(6.445)	(6.862)	(6.155)	(6.154)	(8.775)	(8.867)	(11.27)
Observations	1,515	1,480	1,337	1,333	1,193	1,193	989
Number of Country	38	38	38	38	38	38	38

Notes: Robust standard errors in parentheses. Standard errors are clustered. *** p < 0.01, ** p < 0.05, * p < 0.1. OECD Countries: Austria, Australia, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

Table 5: Fixed Effect Regressions

Dept. Var.: Growth	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Inflation CPI (%)	-0.0278***	-0.0287***	-0.0417***	-0.0413***	-0.0425***	-0.0409***	-0.0905***
	(0.00892)	(0.00883)	(0.0108)	(0.0108)	(0.0111)	(0.0113)	(0.0151)
log (GDP)	-2.064	-1.511	-3.158***	-3.157***	-3.571***	-3.567***	-3.450***
	(1.329)	(1.130)	(0.690)	(0.688)	(0.677)	(0.785)	(1.120)
Trade (% of GDP)	0.00255	0.00418	0.00658	0.00543	0.00805	0.00647	0.00138
	(0.00750)	(0.00726)	(0.00754)	(0.00711)	(0.00742)	(0.00657)	(0.00691)
Population (%)	-0.810***	-0.822***	-1.212***	-1.211***	-1.306***	-1.265***	-1.109**
	(0.285)	(0.288)	(0.323)	(0.325)	(0.331)	(0.321)	(0.417)
Savings (% of GDP)	0.160***	0.153***	0.172***	0.177***	0.180***	0.132***	0.130**
	(0.0427)	(0.0422)	(0.0403)	(0.0400)	(0.0416)	(0.0419)	(0.0562)
Life Expectancy		-0.136	-0.210	-0.216	-0.229*	-0.145	-0.192
		(0.195)	(0.131)	(0.132)	(0.130)	(0.135)	(0.120)

Unemployment (% of Labor Force)			-0.170***	-0.167***	-0.180***	-0.152***	-0.184***
			(0.0388)	(0.0397)	(0.0426)	(0.0435)	(0.0506)
Oil Rents (% of GDP)				-0.0919	-0.0889	-0.0491	-0.0743
				(0.132)	(0.117)	(0.124)	(0.163)
Education (Primary Gross)					0.00696	0.00835	0.00267
					(0.0198)	(0.0196)	(0.0227)
Gen. Cons. Exp. (% of GDP)						-0.205***	-0.349***
						(0.0670)	(0.0836)
Corruption							-0.0582
							(0.157)
Constant	21.21*	25.51	46.70***	47.07***	51.00***	49.16***	56.59***
	(11.65)	(15.54)	(9.275)	(9.354)	(9.881)	(9.670)	(12.96)
Observations	1,627	1,592	1,444	1,441	1,326	1,326	1,086
R-squared	0.482	0.476	0.527	0.527	0.469	0.475	0.486
Number of Country	38	38	38	38	38	38	38
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. Standard errors are clustered. *** p < 0.01, ** p < 0.05, * p < 0.1. OECD Countries: Austria, Australia, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

Inflation negatively affects economic growth in all regressions. One percent increase in inflation CPI reduces economic growth by 0.03-0.17 percent depending on the model, and these magnitudes are quite similar to system GMM regressions. The difference GMM results are significant at 5% in the first two columns and significant at the 1% level in the rest of the columns. Along with the coefficient of inflation, population, savings, and life expectancy coefficients are significant in all regressions, and the coefficient of unemployment is significant in all columns except one. The coefficients of population, savings, and life expectancy are significant mostly at the 1% level, whereas the coefficient of unemployment is significant at 5 and 10% levels. Log (GDP) is significant only in the first and last regressions, and oil rent is significant only in the last regression. The coefficient of primary school education is insignificant, and the coefficient of general consumption expenditure is significant in two added columns. Lastly, the coefficient of corruption is not significant in the last regression. With the corruption control, more than 50% of the sample size is lost, but the regression result is in line with the rest of the regressions; therefore, keeping it in the model could be better.

In the following, Table 5 is presented where the results are tested with year and country fixed year effects after the Hausman test favors fixed effects over random effects ($p<0.000$). Although it has already been mentioned that fixed effects regressions cause omitted variable bias, they still capture most of the time-invariant country-specific heterogeneity. With fixed effect regressions, a one percent increase in inflation, economic growth decreases by 0.03-0.1 percent. The coefficient of inflation is significant at a 1% level throughout all regressions. Moreover, the coefficients of population, savings, unemployment, and general government expenditure are significant, mostly at the 1% level. The coefficient of log (GDP) is negative and significant at the 1% level in all regressions except the first two columns. On the other hand, trade, oil rent, education, and corruption coefficients are not significant, whereas the coefficients of life expectancy are significant in only one column (Model 5). Lastly, the number of observations in fixed effects regressions is higher than the difference and system GMM as fixed effects do not use instruments.

6-Conclusion

This paper investigates the impact of inflation on economic growth in OECD countries. Inflation has recently become a hot issue as it has reached double digits in the developed and developing world post-COVID era. Central banks have been trying to cool it off with rate hikes, which lowers economic productivity and potentially increases unemployment. This study examines the relationship between inflation and growth and finds an adverse and significant effect of inflation on growth with several control variables. The results are robust with alternative econometric specifications (i.e., difference GMM and fixed effect regressions). One of the prominent arguments of inflation being nonlinear is also tested in this study, but the results do not verify this hypothesis. The negative impact of inflation on economic growth is persistent with two lags and negative regardless of the number of observations and methodologies. There is a consensus in the literature that keeping inflation at lower levels, mainly between 2-3% for the developed nations, is essential to foster development and sustain economic growth. In that regard, central banks can utilize their

monetary tools to alleviate the repercussions of inflation on growth in the short, medium, and long run.

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