

# 3. HETEROGENOUS EFFECTS OF THE DETERMINANTS OF PRO-MARKET REFORMS: PANEL QUANTILE ESTIMATION FOR OECD COUNTRIES<sup>1</sup>

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## Abstract

*In empirical studies on what determines reform policies, the average effect of the main determinants of reforms on reform policies is explained; however, the issue of what determines the reform policies has not been addressed in the entire distribution. Therefore, we know very little about what triggered reforms at different levels of liberalization. In order to clarify this issue, the causes of reforms are estimated for OECD countries between 1996 and 2017 using the panel quantile method with non-additive fixed effects developed by Powell (2016) and the moment quantile regression method (MMQR) developed by Machado and Silva (2019). The results of both methods confirm that the reasons for the reforms have heterogeneous and asymmetrical effects on pro-market reforms. Contrary to the prediction of the famous crisis hypothesis, high inflation negatively affects reform policies in all quantiles. The impact of strong governments on reforms is significant and positive across the distribution. The contribution of right-wing governments to the implementation of pro-market regulations is especially evident in high quantiles where market interventions are high. There is weaker evidence for the output gap, unemployment level, and the impact of public debt on reforms.*

**Keywords:** reforms, panel quantile method, OECD, crises hypothesis, market interventions.

**JEL classification:** C33, O57, P11, P16.

## 1. Introduction

Structural reform policies aim to increase productivity, investment and growth (Bekaert et al., 2005). However, structural reforms cause great economic and political costs, especially in the first

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periods of implementation of reform policies (Duval and Furceri, 2018). Since reform policies cause policy makers to bear certain economic and political costs, they could only be implemented in some special cases (Winiński, 1993; Williamson, 1994). In cases where economic and political events are in favor of reform policies, these policies can be implemented (Abiad and Moddy, 2005; Cukierman and Tomassi, 1998; Fidrmuc, 2003). A deep economic crisis, a strong government composed of parties with similar ideologies, situations where opposition groups are weak, IMF involvement stand out as the determining factors in taking the reform decision. There are different explanations for the situations in which pro-market reform policies emerge, and they fall short of explaining the determinants of reforms (Hoj et al., 2006; Mahmalat and Curran, 2018).

When the empirical findings regarding the main reasons of reform policies are examined, it has been shown that a common conclusion is valid for all countries. For this reason, it has been considered that the factors affecting reform policies are the same for each country in terms of quantity and quality. Although tests for heterogeneity of parameters across units in econometric models have shown that the variance of error terms is not constant across the distribution, heterogeneity between countries is neglected. However, it is quite clear that there are different motives for each country in the determination of reform policies. Therefore, different factors were decisive for each country in making reform decisions. At the same time, the absence of a solid theoretical framework on reform determinants caused some important variables affecting these policies not to be included in the econometric model. For both the problem of heterogeneity and omitted explanatory variables, the parameter estimates in the empirical studies made so far have been biased and inconsistent. Therefore, when the heterogeneity and the unknown covariates problem is solved, it has not been known what determined the reform policies. In this paper, the rationale for pro-market reforms is clarified for countries with different liberalization practices, thanks to two new panel quantile models. Previous studies stated that the same coefficient estimates of the reform determinants were valid for countries with different liberalization levels. The reason for this is that the differences in the level of liberalization of countries have not been taken into account. As a more realistic approach, the main contribution of this study to the literature is that it shows that different coefficient estimates are valid for each sub-country group rather than the same coefficient estimate for all countries.

The main hypothesis of this paper is that when the heterogeneity between countries is removed, different factors have an impact on pro - market reforms through the distribution. In line with this hypothesis, the aim of the study is to reveal which dynamics affect the reform policies in different quantiles when the heterogeneity and the bias of the omitted variable are corrected. At the same time, another purpose of this study is to make comparisons between these countries. For this reason, in this study, heterogeneity effects between countries are corrected with the methods developed by Powell (2015, 2016) and Machado and Silva (2019), and it is concluded that different determinants were effective on reforms in countries with different liberalization levels.

In the second section of the paper following this part, what triggered the reform policies is explained. In the third section, the problem of heterogeneity, which is frequently encountered in empirical studies that try to determine the political, economic and institutional factors that are effective on economic reforms, is mentioned and the negative impact of this problem on the inferences of the model is emphasized. In the fourth section following this section, the data used to investigate which political, economic and institutional factors determine reform policies are explained and the model is defined. In the fifth section, the results of the panel quantile regression model are explained and their place in the literature is discussed. In the sixth section, the conclusions of the paper are presented.

## **2. The Main Drivers of Reforms**

Economic reform policies are policies aiming at the emergence of a stable process in economic indicators and also containing pro-market regulations (Wiese, 2015). In which field, when and in what form the reforms will be implemented is significantly affected by the economic, political and institutional dynamics (Alesina et al., 2006). A deep economic crisis, periods of intense political disintegration, governments holding the majority in the parliament, when the general elections are held, whether the party at the head of the government is right or left oriented are the main determinants of reform policies (Haggard and Webb, 1993; Galasso, 2014; Duval et al., 2021).

The crisis hypothesis states that the economic crisis is the main reason for the economic reform policies. A bad situation that cannot be sustained as this hypothesis predicts opens the door to reform policies (Alesina and Drazen, 1991; Drazen and Grilli, 1990; Tomassi and Velasco, 1996). In the current situation, where economic activity is severely interrupted, change is inevitable, as the majority of society suffers from this situation. Deteriorations in economic activity are explained by undesirable conditions in economic indicators such as inflation, output gap, ratio of public debt to gross domestic product, unemployment rate. These undesirable situations are expressed as economic crises.

Different measures of crisis are used to test the validity of the crisis hypothesis. The methods used in the detection of crises are how the economic indicator changes compared to the previous year, whether it is above a certain threshold value, and the percentile as a result of ranking the observation values is at extreme values (Mahmalat & Curran, 2018). Despite the differences between methods, there is a strong causality relationship between deterioration in economic activity and reforms.

Although the crisis hypothesis establishes a strong link between negative developments in economic activity and reform policies, in some cases, as Campos and Horvath (2012) states, reforms cannot be made in cases where economic activity is interrupted. According to him, only when improvements in economic conditions can be observed, reform activities can be undertaken. Because, in periods of good economic conditions, reform policies find considerable support from the public (Golinelli and Rovelli, 2013). The opposite claim emphasizes that reform policies receive public support during economic recession (Friedrichsen and Zahn, 2014).

Powerful governments that have just entered office and hold the legislative majority play a key role in the implementation of reform policies (Alesina and Drazen, 1991; Haggard and Webb, 1994). Political tendencies of incumbent governments also play an important role in reform policies (Roberts and Saedd, 2012; Gupta and Jalles, 2020). While right-wing governments are important advocates of privatization and product market reforms (Biais and Perotti, 2002; Galasso, 2014), only left-wing governments can implement labor market reforms (Beazer and Woo, 2016). Apart from that, it is shown whether the electoral system is majoritarian or not, income distribution justice and foreign aids pave the way for reform policies (Haggard and Webb, 1994; Wiley, 2019).

Although it has been stated in the economic literature that reforms are affected by many economic, political and institutional factors, there is no theory that explains the conditions under which reforms have occurred. The lack of theoretical infrastructure causes many economic, political and institutional variables to be used in empirical studies and different results are obtained in each study. Since the heterogeneity between countries in the sample and the problem of omitted variables are not taken into account, the regression results become more sensitive to outliers.

### **3. Effects and Results of Heterogeneity**

In determining the causes of structural reforms, dynamic panel system GMM approach (Hoj, 2006), pooled or fixed effects model (Alesina et al., 2006; Compos et al., 2010), tobit model (Roberts and Saedd, 2012; Galasso, 2014), logit model (Wiese, 2014; Agnello et al., 2014; Wiley, 2019) and probit model (Agnello et al., 2015) were used. In all of these studies, it was accepted that the same econometric relationship is valid for all units of the sample. These models were also vulnerable to the significant influence of the extracted variables on the regression results. Due to these two reasons, there were large differences between the values predicted by the model and the actually observed values. This shows that the estimates are biased and inconsistent. Revealing a model in which error terms do not have high standard errors and unobservable explanatory variable effects are relatively weak will provide more realistic information on the conditions under which reform policies are implemented. As far as is known, there is no study that reveals what the reasons for the reform policies are, taking into account this heterogeneity. Panel quantile models estimate the regression separately for each quantile in the sample, taking into account the effects of heterogeneity. This method aims to minimize the absolute value of the error terms instead of minimizing the squares of the error. Thus, the error variances are smaller compared to other panel data models. Ultimately, this method ensures that regression estimators are unbiased and inconsistent (Koenker and Bassett, 1978).

There are variables that cannot be measured in econometric models such as the economic structure, social norms, legal regulations, which are influential on reform decisions and do not change easily over the years. It is a requirement that these variables be included in the model. For this reason, the panel quantile model should contain unit constant effects. Canay (2011) included fixed effects in the panel quantile model, but it caused the regression relationship to change because of using double equations. In order to solve this problem, Powell (2015,2016) provides that the regression relationship of the estimators of the model is found unchanged when the non-additive fixed effects model and fixed effects are included in the model. Another model developed for the estimation of panel quantile regression is the moment quantile regression method (MMQR), which provides unbiased estimators in cases where there is unit effects and causality between explanatory variables and error terms. This method also takes fixed effects into account.

### **4. Data and Methodology**

In this study, the data of 26 OECD countries between 1996 and 2017 were used to investigate the reasons for the reforms. Countries in the sample include developed and developing countries. This is important in terms of providing the opportunity to examine both country groups. The OECD countries were chosen because a reliable and comparable data set on the development of reform policies is presented by the OECD institution. The OECD provides a detailed analysis of reform policy decisions by monitoring the competitive practices of countries in different sectors. The advantage of the reform indicator offered by the OECD is that it accepts the inclusion of reform policies in legislation as a reform indicator. The use of this indicator as a reform indicator makes it easier to analyze how policy decisions are made.

In this study, the variables explaining the reform policies were chosen from among the variables used in previous experimental studies, since the theoretical background explaining the reasons for the reforms was not sufficient. In this study, the output gap indicating the amount of output below the potential output, the inflation rate showing the changes in the consumer price index, the public debt burden equal to the ratio of public debt to gross domestic product, the unemployment rate are used to test the crisis hypothesis. In addition to these, whether right-leaning governments are in office or not and how the composition of the government is formed

are taken into account as political variables that determine reform policies. The famous War of Attrition model of Alesina et al. (2006) will be tested through political variables. This hypothesis states that the political will for reform policies must necessarily have a legislative majority in order to enact the reform policies. At the same time, the effect of the political tendencies of the governments, which the partisan approach predicted, on the reform policies will be tested through political variables.

Variable definitions and summary statistics are in table 1. The product market regulation index (PMR) created by Conway and Nicoletti (2006) is used to measure reforms in the product market. PMR data evaluates countries by examining competitive policies in five different infrastructure sectors, namely electricity and natural gas supply, road, airline, rail transport, communication and telecommunications sectors, and enables comparisons between them. Data on inflation, output gap, unemployment rate and public debt are taken from OECD World Economic Outlook Report. The political variables driving the reforms are taken from the World Bank's Political Institutions Database.

**Table 1. Variable definitions and sources**

Variable	Definition	Source
product	Summary indicator showing pro-market regulations in the product market	Conway, P. and G. Nicoletti (2006)
un	Unemployment rate(%)	OECD Economic Outlook Database, (2020)
gap	Ratio of difference between real gdp and potential gdp to potential gdp (%)	OECD Economic Outlook Database ,(2020)
inf	Percentage change in the consumer price index(%)	OECD Economic Outlook Database, (2020)
pd	Ratio of net public debt to gdp (%)	OECD Economic Outlook Database, (2020)
frac	The degree of concentration of the government is the sum of the squares of the relative majority in the parliament of all parties that make up the government	Scartascini et al., (2021)
right	1 if the incumbent government is right-wing, 0 otherwise	Scartascini et al., (2021)

Summary statistics are shown in Table 2. According to the table, the lowest volatility is seen in the reform indicator. The results of the normal distribution test performed by considering the skewness and kurtosis values of the variables show that the  $H_0$  hypothesis, which expresses the normal distribution for all variables, is rejected, therefore not all variables have a normal distribution.

**Table 2. Summary Statistics**

Variable	product	gap	un	inf	pd
Obs	594	594	594	594	594
Mean	2.220	-0.460	7.267	2.315	-1.691
Std. Dev.	0.967	3.346	4.416	2.479	4.473
Min	0.540	-15.627	-4.738	-4.478	-32.066
Max	5.161	10.760	27.466	23.469	27.466

Variable	product	gap	un	inf	pd
Pr(Skewness)	0.000	0.000	0.000	0.000	0.064
Pr(Kurtosis)	0.080	0.000	0.000	0.000	0.000
chi2(2)	57.970	55.730	.	0.000	67.690
Prob>chi2	0.000	0.000	0.000	0.000	0.000

Table 3 shows the correlation matrix. The highest correlation coefficient is between inflation and product market regulation index. Countries with high inflation tend to be less liberal.

**Table 3. Correlation Matrix**

	product	gap	un	inf	pd
product	1				
gap	0.0029	1			
un	0.1218	-0.5512	1		
inf	0.3748	0.1655	0.0469	1	
pd	-0.034	0.277	-0.447	-0.095	1

#### 4.1. Model Identification

The econometric model used to reveal the main motivations of reform policies

$$Y_{i,t} = \sum X_{j,i,t-1} + \sum W_{j,i,t} + \vartheta_i + \varepsilon_{i,t} \quad (1)$$

Here, Y shows the economic indicator value determined by the reform policies,  $X_{j,i,t-1}$  shows the lagged values of the economic explanatory variables,  $W_{j,i,t}$  shows the values of the political explanatory variables at the t period. i is the sub-index of the countries, t is the time sub-index,  $\vartheta_i$  is the constant effects of the countries that do not change over time, and  $\varepsilon_{i,t}$  is the random error term.

The reason for taking the lagged values of the economic explanatory variables is that after the reform, the effect of the economic indicator on these variables causes a statistical correlation between the error term and the explanatory variables, and this causes the coefficient estimates to be biased. In order to avoid this problem, lagged values of explanatory variables are included in the model identification.

Homogeneity test was applied to understand whether the parameter estimates between units are the same (Pesaran and Yamagata, 2008). It was concluded that a single parameter estimation cannot be valid for all countries, since the parameter estimations, in which the test results are taken into account, vary among units. This supports our hypothesis that there are different coefficient estimates at different levels of liberalization.

**Table 4. Homogeneity Test**

Test	Statistics	P-value
Delta_tilde:	24.700	0.000
Delta_tilde_adj:	26.603	0.000

#### 4.2. Model

The effect of the mean distribution of the explanatory variable on the conditional mean distribution of the dependent variable has been analyzed in the studies carried out to reveal how reform policies were determined up to this time. An important assumption behind these analyzes is that the regression variables are normally distributed and the variances of the error terms are constant. However, as shown in the previous section, the variables do not follow the normal distribution. Also, the variances of the error terms are not constant. In this case, regression estimators are biased and inconsistent (Koenker and Basset, 1978). In order to eliminate the problem caused by this situation, the panel quantile regression model, which provides consistent and unbiased estimators even when the variables do not fit the normal distribution, will be used in the analysis (Akram et al., 2020). Quantile regression model:

$$Q\tau (Y_{i,t} / Z_{i,t}) = \alpha_{\tau} Z_{i,t} + \beta_{\tau} \gamma_{i,t} \quad (2)$$

Here, Z represents the vector of the explanatory variables included in the model,  $\gamma$  is the vector of the unobservable variables, and  $\tau$  represents the quantile value. The coefficient estimates of the variables are the optimum values of the following function, which aims to minimize the absolute value of the residuals. In this way, regression estimators are less sensitive to over-observations (Chernuzkunov and Hansen, 2008). The function used to determine the parameter estimators for each quantile:

$$Q\tau(\alpha_{\tau}) = \min_{\alpha} \sum_{i=1}^n (|Y_{i,t} - \alpha_{\tau} Z_{i,t}|) \quad (3)$$

Although this approach developed by Koenker(2004) can explain how the dependent variable is determined in different quantiles of the sample distribution, it cannot include the fixed effects that affect the reform policies (Hoj et al., 2006; Galasso, 2015; Agnello *et al.*, 2014,2015; Alesina *et al.*, 2006). Powell (2015, 2016) extended the model to include fixed effects and introduced a more realistic approach. The model described by Powell:

$$z_{i,t} = \sum_{k=1}^s D'_{i,t} \delta_k (\gamma_{i,t}^*) \quad (4)$$

Here  $z_{i,t}$  represents the outcome variable  $\delta_k$  parameter estimate,  $D'_{i,t}$  vector of independent variables,  $\gamma_{i,t}^*$  error term including constant and random effects. The panel quantile regression for each quantile must satisfy the following probability condition.

$$P(z_{i,t} \leq D_{i,t}' \delta(\theta) | D_{i,t}) = \delta \quad (5)$$

The meaning of this equation is that the probability that the predicted variable values are smaller than the outcome variable is the same for each quantile. However, this probability may change between units and over time between units. It can do this with two constraints, conditional and unconditional:

$$P(z_{i,t} \leq D_{i,t}' \delta(\theta) | D_i) = P(z_{i,s} \leq D_{i,s}' \delta(\theta) | D_i) \quad (6)$$

$$P(z_{i,t} \leq D_{i,t}' \delta(\theta)) = \delta \quad (7)$$

The first of these constraints is for fixed effects that do not change with time, and the second is for each observation. The Powell (2016) model can also be predicted by Markov Chain Monte Carlo (MCMC) method. Notation of this method:

$$Q\tau (Y_{i,t} / Z_{i,t}) = \theta_{\tau} = \arg \min [(\vartheta_{\tau} (Y_1 - qZ_i))] \quad (8)$$

Here,  $\theta_i$  is the coefficient estimates of the explanatory variables and unobserved variables in the equation no. 1, obtained by the MCMC method.

In addition to the Powell (2016) method, the Machado and Silva (2020) moment quantile regression method (MCMC) is frequently used in the derivation of reliable coefficient estimators in the presence of fixed effects and heterogeneous effects. An important advantage of this method is that it can resolve heterogeneous effects by allowing unit effects to vary between quantiles. At the same time, this model can offer unbiased estimators in the presence of endogenous explanatory variables (Machado and Silva, 2019). Therefore, this method is also included in the study.

## 5. Panel Quantile Model Results and Discussion

Panel quantile models are able to present the effects of explanatory variables on the dependent variable for the entire sample distribution. Most importantly, it can present unbiased and consistent estimators instead of biased and inconsistent estimators caused by unobserved variables and heterogeneity effects. It does this by including the fixed effects of the units in the model that do not change over the years and affect the reform policies.

The panel quantile regression results including non-additive fixed effects developed in Powell (2015, 2016) are shown in Table 5. The regression results show that the coefficient of the output gap is statistically significant in all quantiles except the 50th quantile, and it is only positive in the 75th quantile. A 1% increase in the output gap decreases the reform index by 0.02, 0.033, 0.001, 0.045 units for the 10th, 25th, 50th and 90th quantiles, respectively. The inflation rate is statistically significant for all quantiles and has a positive sign. A 1% increase in the inflation rate causes the reform index to increase by 0.32, 0.146, 0.146, 0.140 and 0.118 units for the 10th, 25th, 50th, 75th and 90th quantiles, respectively. Unemployment rate is significant in all quantiles except the lowest quantile. The coefficient of unemployment rate is negative in the 25th quantile and positive in the quantiles above it. The increase in the concentration level of the parties forming the government has a positive effect on the reform index in all quantiles. The coefficient estimate for right-wing governments is statistically significant and negative in other quantiles, except for the lowest quantile and the 50th quantile. In summary, according to the results in the table, the political and economic variables that affect the reform decisions have heterogeneous effects on the reform policies. In all quantiles, the coefficient of this variable is the largest in all quantiles compared to other coefficients.

**Table 5. Results of Panel Quantile Regression (Powell,2016)**

Variables	Quantiles				
	10th	25th	50th	75th	90th
gap	-0.026*** (0.004)	-0.333*** (0.000)	-0.001 (0.005)	0.026*** (0.002)	-0.045*** (0.000)
inf	0.032*** (0.004)	0.146*** (0.000)	0.146*** (0.003)	0.140*** (0.001)	0.118*** (0.001)
un	0.002 (0.003)	-0.030*** (0.000)	0.005** (0.002)	0.016*** (0.001)	0.015*** (0.000)
pd	0.014*** (0.004)	0.010*** (0.000)	-0.006** (0.002)	-0.007*** (0.000)	-0.040*** (0.000)



Variables	Quantiles				
	10th	25th	50th	75th	90th
right	-0.019	-0.154***	-0.029	-0.248***	-0.626***
	(0.032)	(0.003)	(0.018)	(0.001)	(0.001)
frac	-1.287***	-0.611***	-1.506***	-1.620***	-1.022***
	(0.100)	(0.007)	(0.066)	(0.040)	(0.006)

Note: Numbers in the parentheses represent standard error. \*significant at 10% level, \*\*significant at 5% level, \*\*\*significant at 1% level.

Although the model developed by Powell (2016) explains the effects of independent variables on the dependent variable across different quantiles of the sample distribution, it is far from addressing the problem of endogeneity arising from the effects of unit effects between these quantiles and the effects of dependent variable on independent variables. Essentially, unit effects are different in each distribution, and there is a bidirectional causality relationship between economic indicators and the level of liberalization (Agnello *et al.*, 2015; Gupta and Jalles, 2019). For this reason, in this paper, the method developed by Machado and Silva (2019), where unit effects can vary between quantiles and which reveals more realistic results in the presence of endogeneity, has been considered as the baseline model. The MMQR regression results introduced by Machado and Silva (2019) are shown in Table 6. Accordingly, the coefficients of output gap and public debt are not statistically significant in all quantiles. The coefficient of inflation is significant and positive in all quantiles. A 1% increase in the inflation rate leads to an increase of 0.125, 0.132, 0.140, 0.161 and 0.118 units in the reform index for the 10th, 25th, 50th, 75th and 90th quantiles, respectively. The unemployment rate is significant only in the 25th and 50th quantiles, at 10% and 5% confidence levels, respectively. The positive and significant effects of right-wing governments on reform policies are seen in high quantiles. The fact that right-wing governments are in office compared to other governments causes a 0.206 and 0.626 unit reduction in the reform index for the 75th and 90th quantiles, respectively. The fact that the government consists of parties with politically similar ideology has a positive effect on reforms in all quantiles. The quantitatively largest explanatory variable among the variables determining the reform index in all quantiles is the concentration index.

**Table 6. Baseline Model: MMQR Results (Machado and Silva, 2019)**

Variables	Quantiles				
	10th	25th	50th	75th	90th
gap	-0.007	-0.011	-0.016	-0.029	-0.046
	(0.017)	(0.014)	(0.012)	(0.023)	(0.000)
inf	0.125***	0.132***	0.140***	0.161***	0.118***
	(0.019)	(0.016)	(0.014)	(0.026)	(0.001)
un	-0.028	-0.029*	-0.030**	-0.034	0.015
	(0.020)	(0.016)	(0.014)	(0.026)	(0.000)
pd	0.019	0.018	0.016	0.011	-0.041
	(0.014)	(0.011)	(0.010)	(0.018)	(0.000)
right	0.024	-0.023	-0.071	-0.206**	-0.626**
	(0.074)	(0.059)	(0.054)	(0.098)	(0.001)
frac	-0.594**	-0.657***	-0.723***	-0.904***	-1.023*



	(0.262)	(0.206)	(0.186)	(0.340)	(0.006)
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Note: Numbers in the parentheses represent standard error. \*significant at 10% level, \*\*significant at 5% level, \*\*\*significant at 1% level.

Figure 1. Baseline Model Coefficient Estimators Across Quantiles

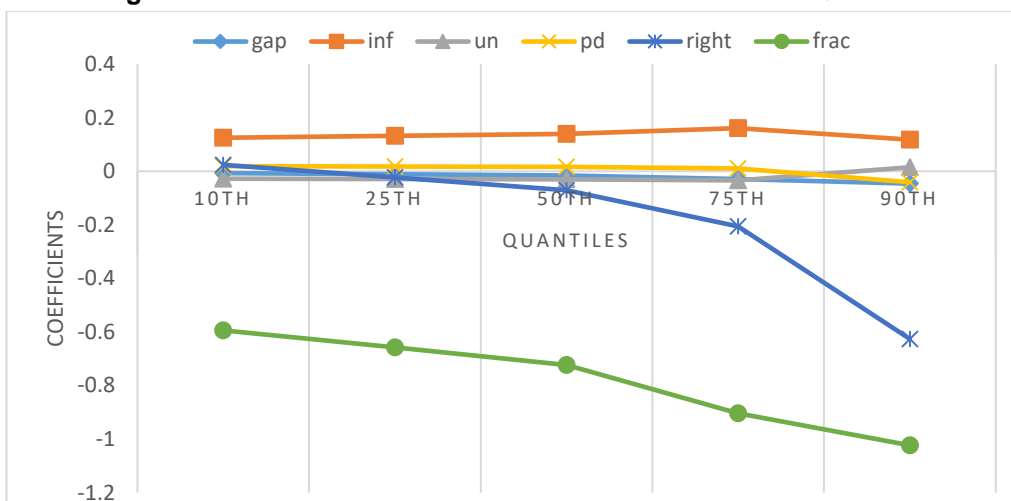


Figure 1 shows the distribution of coefficient estimates in the basic model across quantiles. Clearly, it depicts that the effects of reform determinants on reform are quite different for different liberalization levels.

In order to test the robustness of the results obtained in the baseline model, two alternative models were used. In the first model, the statistically insignificant variables were removed and the model was re-estimated. Table 7 shows the robustness test results. In Panel A, the results of the restricted model are included. In panel B, the results of the general quantile regression model, in which country fixed effects are not included, are displayed. In both models, the asymmetric effects of the reform determinants on the reform index can be traced in the coefficient estimates. Just as in the baseline model, the negative effects of increases in inflation are seen on reforms, strong governments' great influence on reforms is preserved, and the effects of right-wing governments on liberalization policies increase in high quantiles. This strengthens the reliability of the results of the baseline model.

Table 7. Robustness Tests

Panel A. Restricted Model					
Variables	Quantiles				
	10th	25th	50th	75th	90th
inf	0.120*** (0.018)	0.126*** (0.015)	0.134*** (0.013)	0.155*** (0.023)	0.178*** (0.046)
un	-0.025 (0.015)	-0.023* (0.012)	-0.021* (0.011)	-0.015 (0.020)	-0.008 (0.037)
right	0.007	-0.032	-0.077	-0.196**	-0.334*



	(0.071)	(0.057)	(0.052)	(0.097)	(0.177)
frac	-0.627**	-0.676***	-0.733***	-0.881***	-1.053*
	(0.258)	(0.206)	(0.186)	(0.344)	(0.634)
<b>Panel B. General Quantile Regression</b>					
<b>Variables</b>	Quantiles				
	10th	25th	50th	75th	90th
gap	-0.025*	-0.031**	-0.010	0.035	-0.033
	(0.014)	(0.012)	(0.014)	(0.022)	(0.025)
inf	0.061**	0.122***	0.138***	0.121***	0.105***
	(0.026)	(0.024)	(0.017)	(0.016)	(0.041)
un	0.011	0.009	0.013	-0.034	0.026
	(0.007)	(0.009)	(0.009)	(0.026)	(0.003)
pd	0.034***	0.022***	0.005	-0.002	-0.001
	(0.005)	(0.006)	(0.006)	(0.014)	(0.017)
right	-0.240***	-0.224***	-0.081	-0.338***	-0.556**
	(0.065)	(0.058)	(0.071)	(0.127)	(0.134)
frac	-0.555*	-0.681***	-1.111***	-1.377**	-1.293***
	(0.323)	(0.053)	(0.269)	(0.616)	(0.485)

Note: Numbers in the parentheses represent standard error. \*significant at 10% level, \*\*significant at 5% level, \*\*\*significant at 1% level.

### 5.1. Discussion and Policy Implications

In the previous section, using the methods developed by Powell (2015, 2016) and Machado and Silva (2019), we presented the results on the main causes of reforms at different liberalization levels for OECD countries. According to these results, although the economic and political variables affecting reform policies in both methods have different coefficient estimates and levels of significance, they have different effects on reforms in different product market regulation index quantiles.

The results in Tables 5 and 6 show that high inflation has adverse effects on economic reform policies. This is because high inflation may result in the continuation of price controls. Although Agnello et al., (2015) also states that high inflation will encourage liberalization, the findings obtained in this paper are the opposite of this. Similarly, the fact that the government consists of parties with different ideologies has negative effects on reform policies. This supports the results found by Duval et al. (2020), which shows that strong political will is an important factor for reforms. Because when parties with different ideologies are in the same government, it becomes difficult for them to reach an agreement on a common idea (Alesina et al., 2006; Hoj et al., 2006). Because when parties with different ideologies take part in the same government, it becomes difficult to agree (Alesina et al., 2006; Hoj et al., 2006).

For this reason, it can be said that strong governments can implement reforms more easily. However, the influence of right-wing governments on reform policies is more limited. Both methods show that right-wing governments have positive effects on reform policies in countries where there is a lot of regulation in the product market. Although Galasso (2014) and Duval et al. (2021) also state that right-wing governments accelerate the reform process, according to them,

this effect is the same for all countries. However, the situation is the exact opposite. Compared to other countries, in countries with intense market controls, right-wing governments are more decisive on reforms. Moreover, in liberal market economies, the ideology of the government does not have any effect on reforms. The unemployment rate is statistically significant in the 25th and 50th quantiles in both methods. This situation confirms the results found by Duval et al. (2020), which emphasizes the average effect of explanatory variables on reforms, on the one hand, and shows that their results are not valid for high and low quantile countries, on the other hand. However, due to the different sign of the coefficients, care should be taken in evaluating the effect of unemployment rate on reform policies.

There are conflicting results on the impact of the output gap and public debt on reform policies. It can be said that these conflicting results may be due to endogenous explanatory variables and/or because the MMQR method, our baseline model, is more sensitive to unit effects (Machado and Silva, 2019). When the results of the basic model are taken into account, the statistically insignificant effects of increases in the public budget deficit and output gap on the reform index across all quantiles are in notable contrast to the ideas of crisis hypothesis proponents such as Tomassi and Velasco (1996) and Friedrichsen and Zahn (2014).

As far as we know, in previous studies, no thought has been put forward about how economic and political dynamics affect reform policies in different quantiles of liberalization index (PMR). In this study, the finding of different coefficient estimates in different quantiles of the product market regulation index, instead of the uniform and fixed effect of economic and political determinants on the reform policies, shows that the causes of the reforms have heterogeneous effects on the reforms.

In our opinion, there is not enough evidence in favor of the crisis hypothesis as a result of taking into account heterogeneous effects and endogeneity and eliminating their effects. Moreover, the coefficient of inflation is significant and positive in the results of both methods. In addition, although the coefficient of output gap is negative for both models, the meaningful results obtained in only one model require a cautious approach to the thought that crises are a necessity for economic reforms. Another important point is that the impact of right-wing governments on reforms is different for different country groups rather than being the same for all countries. This raises questions as to why political orientation is so important in economies with market controls. Although the effect of political disintegration on reform policies takes place in the economics literature, it has not been brought up as much as it deserves. Because it is statistically significant in all quantiles in both methods.

This study not only presents empirical findings for OECD countries, but also makes an important contribution to theoretical explanations on economic reforms. Because the factors that determine the reforms have heterogeneous effects on the reforms and theoretical explanations should definitely take this fact into account.

In addition to the theoretical implications, it would be useful to mention some policy implementations that can guide policy makers in the policy making process of research findings. At this point, the policy proposal presented by the baseline model results assumes that price stability is a key factor in order to be able to make reforms, and therefore, the politician who wants to reform must first ensure price stability. The fact that the government holding the legislative majority has the greatest influence on reforms indicates that reforms can be brought about by governments with political power. For this reason, it seems essential to achieve consensus in determining policies in government management. Differences of opinion in the policies delay the reforms. Another fact that the analysis results suggest is that leftist governments are less willing to reform when market controls are intense. Therefore, in more liberal economies, policy convergence occurs between governments that have different ideologies regarding liberalization reforms. As a result, a politician advocating pro-market reform policies should aim to ensure price

stability, and in addition to gain as much support as possible from the legislature and executive body, instead of raising public awareness of the extent of the weakening in economic activity.

In this study, the heterogeneous effects on reforms are revealed. However, it still has limitations in certain respects. These limitations can be summed up in six points. Firstly, although certain economic and political variables were evaluated in the study, not all possible determinants were evaluated. Therefore, working with a larger set of explanatory variables may lead to more comprehensive results. It seems necessary to establish a theoretical framework explaining the dynamics of reforms by making use of empirical findings. It seems necessary to establish a theoretical framework explaining the dynamics of reforms by making use of empirical findings. Secondly, the coefficient estimation of unemployment rate in our baseline model was found to be significant only for the 25th and 50th quantiles. The reasons for this situation seem necessary to be explained. A possible explanation is the fact that while these effects are seen on the mean, this relationship does not appear in the extreme values. Thirdly, in many models explaining the reforms, the lagged values of the dependent variable were included in the model definitions and significant coefficients were found for these lagged values. In this study, both preventing the endogenous effects caused by the strong connection between the error terms and the explanatory variables and the theoretically higher fit of goodness of the quantile regression model caused these lagged values not to be included in the model. Fifthly, the econometric analysis only considered advanced OECD economies. For this reason, the paper does not provide any information on countries other than developed economies. Finally, the analysis could not be performed for a longer period due to the availability of data. It is necessary to investigate which factors were effective on the reforms in different periods.

## **6. Conclusion**

Experimental studies on the main reasons for reform policies explain the effect of the conditional mean distribution of the explanatory variables on the conditional mean distribution of the dependent variable. However, to the best of our knowledge, no research has been conducted on the effect of explanatory variables on the overall distribution of the dependent variable. In this study, the factors determining product market reform policies were estimated for OECD economies with two different panel quantile methods developed by Powell (2015, 2016) and Machado and Silva (2019). Both methods include fixed effects, which are frequently used in panel regression models that explain reform policies, and can estimate for the entire sample distribution by taking these effects into account. While Powell's (2016) method is advantageous in the case of unknown explanatory variables and nonlinear effects, Machado and Silva's (2019) method is advantageous in cases of unit effects and endogeneity problems.

The results of both methods show that high inflation and the fact that the government consists of parties with different ideologies affect reform policies positively in the entire distribution. Coefficient estimates of these variables are statistically significant at the 1% significance level in all quantiles. In all quantiles, the variable that has the greatest quantitative impact on reforms is the level of government concentration. At the same time, right-wing governments have a positive effect on the reform process, especially in countries where market controls are intense. According to the results of the baseline model, the coefficient estimates for right-wing governments are -0.206 and -0.626 at the 75th and 90th quantiles, respectively. Different results were obtained for both methods regarding the unemployment rate, the output gap, and the effect of public debt on reforms. Public debt did not have any significant effect on the reform process. In our baseline model, only the coefficient estimate of the unemployment rate is statistically significant in the 25th and 50th quantiles. For all these reasons, it is possible to state that strong and right-wing governments are able to carry out reforms rapidly in a low inflation environment. In addition, the crisis hypothesis found little support in the analysis results. Empirical results provide an important

and new perspective on the rationale for reforms. There are some limitations to these results. It will be very useful for future studies to provide explanations for a wider period and countries outside the developed country group on the determinants of reforms.

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