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Measuring central bank policies in COVID-19 era

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Abstract: COVID-19 quickly turned into a disaster that spread worldwide and resulted in extraordinary economic losses. Policies implemented to combat with negative effects of COVID-19 vary due to differences in economic and institutional structures of countries. In this study, an index called Monetary Policy Response Index (MPRI) was developed to measure central banks' policy diversity and differences were examined by grouping countries according to income level and governance indicators. Although there are some exceptions, countries with high economic prosperity or higher development levels exhibit greater diversity of measures than other countries. It is important to understand the factors that determine MPRI values in order to interpret them. The results of the empirical analysis conducted for this purpose indicate that the main factors determining the diversity of economic responses are institutional structure, demographic characteristics and level of economic prosperity. In conclusion, understanding differences between countries is important for assessing the effects of proactive policy responses by central banks and determining the most effective measures against similar shocks in the future. This study demonstrates that central bank responses in pandemics or other crisis situations are shaped by a country's development and governance capacity and these factors play a decisive role in policy diversity.

Keywords: *COVID-19, monetary policy, central bank, governance, MPRI.*

Introduction

COVID-19 has made a mark in history not only as a biological natural disaster but also as a systemic shock that profoundly shook the global economy. It quickly turned into a disaster that spread worldwide and resulted in extraordinary economic losses. The contraction in demand rapidly increased unemployment rates and disruptions in global supply chains hindered production capacity. The harsh response of financial markets rendered traditional monetary policy mechanisms dysfunctional. Financial markets reacted strongly and the channels through which monetary policy usually operates failed to function as expected. The sudden decline of income and revenues increased the risk of loan default. The demand for cash negatively impacted all asset markets.

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The main reasons of economic contraction are sudden slowdown in economic activity, productivity losses and increased uncertainty. The impacts have created both supply and demand-side shocks, leading to multifaceted consequences for the labour market, production chains and the financial system. Central banks have implemented extensive monetary policies and the type, scope and impact of measures varied significantly across countries.

Welfare differences and inequalities between countries have become even more pronounced under COVID-19 conditions. Developed countries have been able to develop more comprehensive policy responses thanks to both greater institutional capacity and more independent and well-equipped central banks. The tools have varied significantly depending on various factors such as economic structure, institutional quality and financial depth.

In general, sudden and rapid course of economic disruption, market volatility and uncertainty created by the pandemic led central banks to respond in extraordinary ways in terms of speed, scope and scale (Cantú et al., 2021, p. 2; Cavallino & De Fiero, 2020, p. 1; Mosser, 2020; Haas et al., 2020). However, disruptions in market functioning reduced the effectiveness of monetary policy transmission mechanisms and prevented them from operating as expected. Therefore, central banks had to respond quickly to the overlapping challenges, developing comprehensive policy sets and flexible intervention tools.

Within this scope, central banks immediately began to revise and expand measures developed during the global financial crisis (Cantú et al., 2021, p. 2). In developed economies, short-term interest rates were reduced to prevent the pandemic from escalating into a renewed financial crisis. Liquidity was provided to banks on favourable terms through purchase of public assets. Measures to address pressures in foreign exchange markets included strengthening existing swap lines and establishing new ones. Within the scope of regulatory measures, many practices were implemented such as releasing banks' capital buffers and easing capital and liquidity requirements and collateral eligibility rules. As the liquidity situation of economic actors began to deteriorate, central banks' primary objective became to alleviate the contraction in real activity and despite increasing credit risk they provided loans with attractive terms (Cavallino & De Fiero, 2020, p. 2; Cantú et al., 2021, p. 1; Boone & Rawdanowicz, 2021).

The comprehensive actions of central banks in developed countries calmed the turmoil in global financial markets. This development allowed central banks in developing countries to direct monetary policy toward domestic objectives (Aguilar & Cantú, 2020, p. 1; Cantú et al., 2021, p. 1). In developing countries, primary objective of monetary policy at the beginning of crisis was to facilitate the flow of funds to businesses. Therefore, traditional monetary policies have been used less frequently and unconventional policies like credit incentives, state guarantees on loans, direct government financing and targeted credit programs have been more widely used (Céspedes & Gregorio, 2021; Drakopoulos et al., 2021).

It is natural for central bank policy components to vary due to the unique structural characteristics of economies and institutions. Analysing the reasons for this variation and the factors that determine country responses is critical for assessing effectiveness of implemented policies. In this context, this study aims to quantify the diversity in central bank monetary policy responses during the pandemic and to comparatively analyse differences across countries. The lack of a comparative assessment of this scale and scope in the literature highlights the unique contribution of this research. Furthermore, understanding the relationship between the economic impacts of COVID-19 and central bank policy responses will provide an important reference point not only in the context of current crisis but also for developing policy frameworks to counter similar shocks in the future. This study develops a unique index using Multiple Correspondence Analysis (MCA) to measure monetary policy responses of 91 countries for the period from March 2020 to June 2021. The study continues with the literature review, methodology, empirical findings and conclusion sections.

Literature Review

Initial studies about economic consequences of the outbreak and economic policies focused on the transmission mechanisms of the crisis's shocks to the economy (Baldwin, 2020; Baldwin & Weder Di Mauro, 2020; Bénassy-Quéré et al., 2020; Carlsson-Szlezak et al., 2020; Furman, 2020; Gopinath, 2020; Gourinchas, 2020; Weder Di Mauro, 2020). Studies have also been conducted on micro indicators such as consumer spending habits, debt payment behaviors and individual risk perception, which address the impact of COVID-19 from an individual behavioral perspective and have not been explored in previous crises (Baker et al., 2020; Chang & Meyerhoefer, 2020; Clemens & Veuger, 2020; Chetty et al., 2020; Binder, 2020; Eichenbaum et al., 2020).

Studies examining pandemic from an aggregate supply perspective (Bonadio et al., 2020; Baqaee & Farhi, 2020; Eppinger et al., 2020) and studies about the economic policies implemented in response to the pandemic are generally theoretically based due to data access limitations (Bianchi et al., 2020; Bigio et al., 2020; Guerrieri et al., 2020; Céspedes et al., 2020; Elenev et al., 2020; Didier et al., 2021). The scope and components of policy actions developed vary significantly between countries. Differences are observed even among countries within the same group or between poor and rich groups within the same country (Hausmann & Schetter, 2020; Loayza & Pennings, 2020; Hevia & Neumeyer, 2020; Masi & Marchesi, 2020; Kaplan et al., 2020; Long et al., 2021). Therefore, studies that measure economic measures through index creation and investigate the factors that determine stringency of measures have also gained importance (Elgin et al., 2020; Porcher, 2020a, 2020b, 2020c; Hale et al., 2020; Noy et al., 2019; 2020a, 2020b; Cheng et al., 2020).

Elgin et al. (2020) classified the measures taken by 166 countries as fiscal, monetary and exchange rate measures to examine the intensity of policy responses implemented until April 2020 and created an index using Principal Component Analysis (PCA) method. The findings of the study indicate some significant relationships without suggesting any causality. Accordingly, demographic structure, public health measures and economic variables are positively and significantly associated with economic stimulus packages.

Porcher (2020a, 2020b, 2020c) examined determinants of public health measures implemented. The index, created using the PCA method, covers 13 different public health policies implemented in 189 countries between January 1 and April 14, 2020. According to findings, the measures implemented vary across countries and over time. Countries with well-functioning healthcare systems and more effective governance tend to be less stringent. Conversely, case rates, distance from China and period since the first death are associated with stricter policies.

In a study conducted by Hale et al. (2020), 18 different policy measures implemented in 165 countries were reported. Using daily and real-time data, the study created four different indexes to identify variation in government policies. Each index consists of a set of individual policy indicators. According to the results, government responses continued to increase throughout the pandemic, especially in March 2020. Furthermore, while differences were observed between countries' index values in the early months of the pandemic, these differences decreased over time.

Noy et al. (2019) measured the economic risk of outbreaks caused by diseases transmitted from animals to humans using PCA method by dividing them into four components: magnitude of hazard, exposure to hazard, vulnerability and resilience. In this study, a global economic risk map was created by combining data on the number of outbreaks from 1970 to 1980, the probability of outbreaks and the estimated outbreak risk measured using the *"Emerging Infectious Diseases"* index along with country indicators. The study concluded that economic risk of outbreaks is particularly high in much of Africa, Indian subcontinent, China and Southeast Asia. Different weighting methods used produced similar results.

Noy et al. (2020a, 2020b) created an economic risk index for COVID-19 using PCA method. The first study used a sample of a large country, while the next study focused on developing countries. The magnitude of hazard depends on factors such as exposure, vulnerability and resilience. These factors were calculated using COVID-19 case numbers and various economic indicators from 2014 to 2018. Calculations using different weighting methods yielded similar results, concluding that the highest economic risk was not in China or Western Europe, but in Sub-Saharan Africa, South Asia and Southeast Asia.

Cheng et al. (2020) created *"CoronaNet"* database, which includes COVID-19 related policies announced in 198 countries between December 31, 2019, and May 24, 2020. The study calculated *"Government Policy Activity Index"* that shows the level of countries' response to pandemic policies using a method based on ideal point modeling. The findings show that index scores, which remained low until March 2020 have increased rapidly in many countries. In particular, a clear break is observed in implementation of stricter policies worldwide as of March 1, 2020.

The studies mentioned above reveal the diversity of economic policies targeting COVID-19 and the factors that shaped them. Analyzing the reasons for this variation and the factors that determine country responses is critical for assessing effectiveness of implemented policies. In this regard, we aim to measure the diversity of central banks' monetary policy responses during the pandemic and analyze their differences across countries. Furthermore, understanding the relationship between different variables and policy responses will provide an important reference point not only in the context of COVID-19 but also for developing policy frameworks to counter similar shocks in the future.

Monetary Policy Response Index

In an environment of uncertainty, monetary policy stands out as one of the fundamental tools in systematic and effective decision-making (Apergis, N., 2021, p. 45). In this study, an index called MPRI was developed to measure the diversity of monetary policy measures implemented by central banks during the pandemic. This approach makes a unique contribution to literature as the existing one lacks such an index. The main factors determining the index value were analyzed in the second part of study.

Data and Model

The primary data source used in the study is *"Policy Responses to COVID-19 Policy Tracker"* dataset (International Monetary Fund, 2021). This dataset summarizes main economic policy responses of countries. From the dataset covering 195 countries, some countries with low populations (less than one million in 2019 in which the pandemic began) and/or low incomes (less than USD 3.000 in 2019) along with 10 countries with limited measures were excluded. In contrast, India was included due to its large total GDP. Consequently, 91 countries examined represent approximately 95.71% of world's income and 74.41% of world's population.

The policy tools used by central banks do not fully overlap due to differences in countries' economic and institutional structures. Accordingly, the study utilises sources such as English et al. (2021), Cantú et al. (2021), and Cavallino & De Fiero (2020) to define a total of 20 policies under four main categories. Policy measures are categorised as **(i)** liquidity policies (reductions in policy interest rates, reserve requirement ratios, open market operations and/or repo transactions, facilitation of these operations, new liquidity facilities and/or refinancing programs), **(ii)** regulatory policies (facility provided in loan classifications and provisioning protocols, regulations regarding loan restructuring, deferral of payments, reduction/deferral/cancellation of loan interest and commissions, facilitation of bank liability ratios and capital requirements and/or release of buffer reserves, deferment/cancellation of banks' administrative penalty payments, facilitation of interest and participation fee payments and facilitation of credit risk groupings) **(iii)** administrative policies (legal and/or administrative moratoriums, deferring debt payments, strengthening banks' capital structures,

regulatory actions, supervisory actions, reporting facilities, prudential measures and/or verbal guidance, direct government financing by central bank, incentive programs, special funds, capital transfers, special purpose vehicles and/or targeted loan programs, encouraging credit extensions and/or providing government guarantees to creditors.) and **(iv)** other measures targeting securities and foreign exchange markets (measures targeting securities markets such as limiting the movement band, prohibiting short selling, foreign exchange interventions or regulations targeting capital flows, swap, credit and repo transactions conducted with international organizations and central banks.).

Each policy type is coded as "1" for the month in which it was implemented and "0" for the period following the month in which it was not implemented or terminated. The dataset consists of a total of 29.120 observations of 20 different policy types from 91 countries over a 16-month period.

The index value is calculated based on policies the country implemented and the policies implemented by other countries. Index values are calculated for each month and a weighted average structure is obtained using MCA. Accordingly, the model is as follows:

$$MPRI_{it} = MCA\ (policy1_{it}, policy2_{it}, policy3_{it}, \ldots\ldots policy20_{it}) \quad eq\ (1)$$

In this model, $MPRI_{it}$ represents index value of country i in month t, $policy_{it}$ represents policy value of country i in month t (0 or 1) and PCA represents the method used to create the index.

Methodology

MCA is a classification technique that allows working with categorical data and aims to represent complex relationships in the dataset with simple structures. It is frequently preferred for large and heterogeneous data structures since it operates independently of model assumptions and does not require specific conditions for data distribution.

Table 1 shows the structure of policy measures implemented by countries for each month. Each cell contains binary (0/1) values indicating whether a particular policy was implemented in a particular month.

Table 1: Country and policy values

Country	**Policy$_1$**	**Policy$_2$**		**Policy$_{20}$**	**Row Total**	**Country Value**
Country$_1$-Month$_1$	$X_{1.1.1}$	$X_{1.1.2}$	→	$X_{1.1.20}$	R_1	a_1
Country$_1$-Month$_2$	$X_{1.2.1}$	$X_{1.2.2}$	→	$X_{1.2.20}$	R_2	a_2
Country$_1$-Month$_3$	$X_{1.3.1}$	$X_{1.3.2}$	→	$X_{1.3.20}$	R_3	a_3
↓	↓	↓	↓	↓	↓	↓
Country$_{91}$-Month$_{14}$	$X_{91.14.1}$	$X_{91.14.2}$		$X_{91.14.20}$	R_{1454}	a_{1454}
Country$_{91}$-Month$_{15}$	$X_{91.15.1}$	$X_{91.15.2}$		$X_{91.15.20}$	R_{1455}	a_{1455}
Country$_{91}$-Month$_{16}$	$X_{91.16.1}$	$X_{91.16.2}$	→	$X_{91.16.20}$	R_{1456}	a_{1456}
Column Total	C_1	C_2	→	C_{20}	-	-
Policy Value	b_1	b_2	→	b_{20}	-	-

The aim is to find country ($a_1, a_2, \ldots, a_{1456}$) and policy ($b_1, b_2, \ldots, b_{20}$) values for bivariate distribution in the table with the highest possible correlation. In this context, the solution for maximizing the correlation between country and policy values is as follows:

$$a_1 = \{(X_{1.1.1} / R_1).b_1 + (X_{1.1.2} / R_1).b_2 + \cdots\cdots + (X_{1.1.20} / R_1).b_{20}\} / r \quad eq\ (2)$$

$$a_2 = \{(X_{1.2.1} / R_2).b_1 + (X_{1.2.2} / R_2).b_2 + \cdots\cdots + (X_{1.2.20} / R_2).b_{20}\} / r \quad eq\ (3)$$

$$a_3 = \{(X_{1.3.1} / R_3).b_1 + (X_{1.3.2} / R_3).b_2 + \cdots\cdots + (X_{1.3.20} / R_3).b_{20}\} / r \quad eq\ (4)$$

$$\downarrow$$

$$a_{1454} = \{(X_{91.14.1}/R_{1454}).b_1 + (X_{91.14.2}/R_{1454}).b_2 + \cdots + (X_{91.14.20}/R_{1454}).b_{20}\}/r \quad eq\ (5)$$

$$a_{1455} = \{(X_{91.15.1}/R_{1455}).b_1 + (X_{91.15.2}/R_{1455}).b_2 + \cdots + (X_{91.15.20}/R_{1455}).b_{20}\}/r \quad eq\ (6)$$

$$a_{1456} = \{(X_{91.16.1}/R_{1456}).b_1 + (X_{91.16.2}/R_{1456}).b_2 + \cdots + (X_{91.16.20}/R_{1456}).b_{20}\}/r \quad eq\ (7)$$

$$b_1 = \{(X_{1.1.1}/C_1).a_1 + (X_{1.2.1}/C_1).a_2 + \cdots\cdots + (X_{91.16.1}/C_1).a_{1456}\}/r \quad eq\ (8)$$
$$b_2 = \{(X_{1.1.2}/C_2).a_1 + (X_{1.2.2}/C_2).a_2 + \cdots\cdots + (X_{91.16.2}/C_2).a_{1456}\}/r \quad eq\ (9)$$
$$b_3 = \{(X_{1.1.3}/C_3).a_1 + (X_{1.2.3}/C_3).a_2 + \cdots\cdots + (X_{91.16.3}/C_3).a_{1456}\}/r \quad eq\ (10)$$
$$\downarrow$$
$$b_{18} = (X_{1.1.18}/C_{18}).a_1 + (X_{1.2.18}/C_{18}).a_2 + \cdots\cdots + (X_{91.16.18}/C_{18}).a_{1456}/r \quad eq\ (11)$$
$$b_{19} = (X_{1.1.19}/C_{19}).a_1 + (X_{1.2.19}/C_{19}).a_2 + \cdots\cdots + (X_{91.16.19}/C_{19}).a_{1456}/r \quad eq\ (12)$$
$$b_{20} = (X_{1.1.20}/C_{20}).a_1 + (X_{1.2.20}/C_{20}).a_2 + \cdots\cdots + (X_{91.16.20}/C_{20}).a_{1456}/r \quad eq\ (13)$$

R_i, represents sum of policy values for country i (between 0 and 20); C_j represents sum of country values for policy j (between 0 and 1456); X_{ijm} represents value of policy j for country i in month m; a_i represents country value for country i in the relevant month; b_i represents the policy value for policy j; and r represents the maximum correlation value to be achieved (between 0 and 1). The country value for a country in any month (such as a_1) is the weighted average of the policy measures implemented by that country (country i). The weight (b_j) of policy measure is proportional to X_{ijm}/R_i value. Similarly, policy value of a policy (such as b_1) is weighted average of all values of that policy (policy j). The weight (a_i) of a country's month value is proportional to X_{ijm}/C_j value (Manly & Alberto, 2017, pp. 234-235).

In the analysis using STATA software, a total of 29.120 binary observations were evaluated using 1.456 observations (91 country×16 months x 20 policy) The resulting index values range from 0 to 1 and were rescaled to 0 to 100 for ease of comparative analysis.

Empirical Findings

The monthly averages and distribution statistics of MPRI are presented in Table 2. The monthly average response index for all countries followed a fluctuating but relatively stable course.

Table 2: Monthly average MPRI statistics

Month		Mean	Standard Deviation	Minimum	Maximum
2020	Mach	39,54	24,86	0,00	92,66
	April	42,44	24,79	1,52	92,66
	May	43,41	24,73	1,52	92,66
	June	44,38	26,00	1,52	99,04
	July	46,39	28,78	1,52	99,99
	August	46,57	28,68	1,52	99,99
	September	46,97	28,77	1,52	99,04
	October	46,85	29,03	1,52	99,04
	November	46,94	29,11	1,52	99,04
	December	46,91	29,06	1,52	99,04
2021	January	45,52	29,11	0,00	99,04
	February	45,69	28,93	0,00	99,04
	March	45,28	29,01	0,00	99,04
	April	44,59	28,96	0,00	99,04
	May	44,70	29,00	0,00	99,04
	June	44,35	29,11	0,00	99,04
Average		**45,03**	**27,96**	**0,00**	**99,99**

During the first shock, central banks driven by a *"do whatever is necessary"* approach implemented strong and rapid interventions, focusing primarily on market stability. As markets and economies began to recover, particularly from mid-2020 onward, most central bank actions refocused on meeting traditional inflation and employment/growth targets. A range of tools were employed starting in March 2020 and the intensity of policy response remained largely unchanged in subsequent periods. Speed and scope of policy implementation also varies depending on whether these policies have been implemented before (English et al., p. 7).

The results by country are presented in Table 3. MPRI averages ranged from 1,52 to 97,84, with an overall average of 45,03 which suggests significant variation. The high standard deviations and wide ranges between minimum and maximum values support this heterogeneity.

Table 3: PPTE and development indicators by country

Country	Average	MPRI Rank	Standard Deviation	Min.	Max.	GDP (USD)	GDP Rank	Governance Score	Governance Rank
Italy	97,84	1	2,49	92,66	99,04	**33.674**	**23**	**0,5312**	**38**
France	97,25	2	3,16	89,58	99,04	**40.495**	**21**	**1,1292**	**19**
Ireland	95,83	3	5,99	84,16	99,99	**80.848**	**2**	**1,3196**	**14**
Germany	95,48	4	6,32	83,21	99,04	**46.805**	**14**	**1,4265**	**11**
Netherlands	95,48	5	6,32	83,21	99,04	**52.476**	**9**	**1,5873**	**8**
Portugal	95,48	6	6,32	83,21	99,04	**23.331**	**33**	**1,0317**	**21**
Finland	95,02	7	7,22	80,76	99,04	**48.630**	**12**	**1,7230**	**3**
Spain	94,68	8	3,16	87,01	96,46	**29.582**	**26**	**0,8320**	**27**
Cyprus	93,03	9	6,32	80,76	96,59	**29.420**	**27**	**0,8122**	**30**
Slovenia	92,94	10	8,07	77,58	97,54	**26.043**	**28**	**0,9653**	**22**
Belgium	92,39	11	2,99	84,56	94,01	**46.642**	**15**	**1,1570**	**17**
Austria	92,12	12	3,43	84,56	96,59	**50.068**	**11**	**1,4252**	**12**
Lithuania	88,89	13	6,32	76,63	92,45	19.616	34	**0,9288**	**23**
Slovakia	88,89	14	6,32	76,63	92,45	19.382	35	**0,6274**	**33**
Greece	88,89	15	6,32	76,63	92,45	19.144	36	0,3295	44
Latvia	88,77	16	6,32	76,50	92,33	17.883	39	**0,8318**	**28**
Estonia	87,94	17	6,20	75,61	91,44	**23.582**	**31**	**1,2163**	**16**
Singapore	72,03	18	9,78	36,42	76,12	**66.082**	**4**	**1,6030**	**7**
Australia	64,46	19	9,03	52,03	72,89	**55.050**	**8**	**1,5122**	**10**
USA	64,25	20	1,94	59,51	66,09	**65.548**	**5**	**1,0694**	**20**
India	61,13	21	7,33	38,21	68,03	2.050	91	-0,1529	62
Denmark	60,62	22	2,41	55,60	61,78	**59.593**	**7**	**1,6478**	**6**
Japan	59,66	23	2,86	49,30	60,63	**40.416**	**22**	**1,2904**	**15**
Sweden	58,88	24	4,33	53,28	62,23	**51.939**	**10**	**1,6537**	**5**
Canada	58,47	25	2,29	52,39	59,33	**46.353**	**16**	**1,5470**	**9**
New Zealand	57,35	26	8,69	33,57	62,36	**42.747**	**19**	**1,7385**	**1**
United Kingdom	55,35	27	4,49	49,30	59,79	**42.663**	**20**	**1,3619**	**13**
Norway	54,75	28	1,15	51,72	55,19	**76.431**	**3**	**1,7326**	**2**
Sri Lanka	53,58	29	7,17	27,10	55,95	4.083	82	-0,1544	63
Trinidad &Tobago	52,13	30	12,46	36,04	61,78	15.642	43	0,0246	52
Chile	49,78	31	4,94	42,21	53,49	14.616	45	**0,8150**	**29**
South Korea	49,15	32	7,00	29,99	57,35	**31.902**	**24**	**0,9252**	**24**
Hong Kong	48,33	33	0,00	48,33	48,33	**48.359**	**13**	**1,1334**	**18**
Poland	48,24	34	4,18	40,39	54,03	15.700	42	**0,6251**	**35**
Ecuadorian Guinea	48,24	35	3,88	41,52	50,48	7.317	62	-1,2683	91
Gabon	48,24	36	3,88	41,52	50,48	7.524	60	-0,7796	89
Switzerland	47,88	37	3,90	43,23	56,30	**84.122**	**1**	**1,6970**	**4**
Israel	46,21	38	4,21	35,32	53,09	**44.452**	**18**	**0,6980**	**32**
South Africa	46,21	39	10,46	30,61	54,23	6.703	66	0,0468	51
Türkiye	45,87	40	6,98	26,62	54,86	9.215	56	-0,4877	81
Bulgaria	45,40	41	5,96	37,95	50,50	9.874	54	0,2338	47
Hungary	45,05	42	2,56	40,00	48,63	16.786	40	**0,4462**	**39**
Ukraine	42,99	43	6,59	28,28	54,91	3.662	84	-0,5835	82
Mexico	42,95	44	1,47	39,53	44,03	10.435	51	-0,4508	79
China	39,11	45	2,65	37,43	44,57	10.144	52	-0,3702	76
Thailand	37,47	46	4,74	24,97	40,10	7.629	59	-0,2471	69
Morocco	37,12	47	5,85	30,61	51,56	3.499	86	-0,3248	72
Indonesia	34,69	48	3,77	26,66	44,79	4.151	81	-0,1705	64
Philippines	33,49	49	2,81	32,17	41,01	3.414	89	-0,3236	71
Namibia	33,46	50	0,00	33,46	33,46	5.126	73	0,3048	45
Oman	33,17	51	3,21	29,29	36,44	19.132	37	0,1443	49
Argentina	33,04	52	4,70	23,74	35,66	9.964	53	-0,1058	58
Dominican Rep.	32,86	53	0,00	32,86	32,86	8.173	58	-0,2256	67
Croatia	31,98	54	4,43	25,07	37,68	15.219	44	**0,4250**	**40**
Kuwait	31,87	55	5,51	14,76	35,78	**31.230**	**25**	-0,0691	54
Costa Rika	31,77	56	2,41	26,75	32,93	12.669	47	**0,5956**	**37**
Colombia	30,63	57	1,55	24,73	31,11	6.437	68	-0,1831	66
Azerbaijan	30,12	58	8,98	12,47	44,43	4.806	74	-0,6723	86
Tunisia	29,52	59	0,50	29,08	30,09	3.478	88	-0,1809	65
Jamaika	29,36	60	0,00	29,36	29,36	5.626	71	0,2084	48
Serbia	27,43	61	6,49	13,89	34,09	7.417	61	-0,1063	59
Brazil	27,39	62	5,16	21,38	33,29	8.845	57	-0,2333	68
Romania	27,02	63	2,41	22,00	28,18	12.958	46	0,2441	46
Georgia	25,48	64	3,28	21,07	30,46	4.741	75	**0,4046**	**41**
Czechia	25,37	65	2,30	19,20	26,24	**23.665**	**30**	**0,9137**	**25**
Paraguay	24,64	66	2,48	23,20	28,94	5.808	70	-0,3568	75
Saudi Arabia	24,09	67	1,35	21,43	25,02	**23.406**	**32**	-0,2865	70

Country	Average	MPRI Rank	Standard Deviation	Min.	Max.	GDP (USD)	GDP Rank	Governance Score	Governance Rank
Russia	23,51	68	3,73	19,21	32,27	11.448	48	-0,6190	84
Belarus	23,06	69	9,85	10,85	36,19	6.838	64	-0,4601	80
Qatar	23,04	70	1,28	21,59	24,16	**62.827**	**6**	**0,3795**	**43**
Panama	22,33	71	3,32	15,62	24,25	16.473	41	0,0892	50
Macedonia	21,97	72	4,33	15,31	28,15	6.719	65	-0,0759	55
Kazakhstan	20,30	73	5,02	15,47	38,20	9.813	55	-0,3362	74
UAE	20,21	74	0,00	20,21	20,21	**45.376**	**17**	**0,6260**	**34**
Albania	20,13	75	6,05	8,27	23,60	5.396	72	-0,0879	56
Palestine	19,89	76	1,67	16,78	21,80	3.657	85	-0,7581	87
Mauritius	19,50	77	0,34	19,38	20,39	11.403	49	**0,7236**	**31**
Malaysia	19,38	78	4,66	9,33	22,64	11.132	50	**0,3897**	**42**
El Salvador	17,37	79	1,48	14,88	18,44	4.280	79	-0,3290	73
Uruguay	16,78	80	2,96	14,67	24,56	18.149	38	**0,8849**	**26**
Jordan	16,75	81	2,08	15,75	21,07	4.160	80	-0,1087	60
Ecuador	16,66	82	1,08	14,57	18,64	6.204	69	-0,4038	78
Botswana	15,61	83	1,92	12,47	17,74	6.691	67	**0,5979**	**36**
Bahrain	13,17	84	3,54	10,05	17,19	**25.869**	**29**	-0,1520	61
Peru	12,22	85	2,05	10,72	16,33	6.957	63	-0,0894	57
Algeria	10,55	86	2,72	0,00	11,25	4.530	77	-0,9305	90
Egypt	9,71	87	5,04	3,48	16,57	3.017	90	-0,7611	88
Mongolia	9,29	88	2,97	2,14	10,96	4.395	78	0,0015	53
Eswatini	3,34	89	2,77	0,00	6,89	3.843	83	-0,5994	83
Guatemala	2,55	90	1,35	1,52	5,11	4.648	76	-0,6646	85
Vietnam	1,52	91	0,00	1,52	1,52	3.491	87	-0,3850	77

* Bold values in the table indicate developed countries.

Central banks have demonstrated strong and sustained intervention in countries with high MPRI values. Conversely, in countries with low MPRI values, monetary policy tools were either used to a limited extent, or interventions were delayed or inadequate. Significant differences in MPRI values provide important clues that this may be due not only to countries' economic size but also to their institutional capacity, governance structures and policy-making competencies. Therefore, to analyze whether index values are related to structural factors such as economic wealth and governance quality, countries were classified according to two primary indicators: GDP per capita was used as an indicator of economic prosperity and World Bank's World Governance Indicators (WGI) were used as indicators of development/public capacity. The panel average was set as the threshold level and countries above average were grouped as *"developed countries"* and those below as *"other countries"*. As a result of this classification, 75 of the 91 countries were grouped in the same group for both indicators. This classification aimed to reveal the determinants of policy responses during the pandemic.

Country Comparisons in Terms of Per Capita GDP

Average GDP per capita of 91 countries was USD 22.107. Countries above this average had an average MPRI of 65,47; while 58 countries below it had an average of 33,40. This finding suggests that countries with higher economic prosperity implement more diverse and comprehensive monetary policy measures (see Table 3), while some countries remain outside this general trend. Bahrain, Kuwait, Saudi Arabia, UAE and Switzerland stand out among countries with high per capita income but low MPRI. This situation in Gulf countries has been associated with *"natural resource curse"* concept in the literature and autocratic governance styles. Switzerland, despite ranking first in terms of GDP per capita, presents a different example with its MPRI of 47,88. According to Jordan (2021), this can be explained by small capital markets in Switzerland, limited access of a large portion of economic agents to financial markets and upward pressure on Swiss franc as the primary cause of low inflation (p. 130).

On the other hand, the active role of central banks with low-income but high MPRI countries like India has been decisive. Due to limited fiscal measures implemented by central and local governments, Reserve Bank of India has played a crucial role. The Bank has undertaken more policy actions than any other central banks of developing countries.

Country Comparisons in Terms of Governance Score

The average governance indicator across 91 countries is 0,35. The average MPRI value for 43 countries above this average is 61,90 while the average MPRI for remaining 48 countries is 29,93. This suggests that countries ranking higher in the governance indicator list take more robust and diverse monetary policy responses. However, there are some countries that do not conform to this general trend.

Although Gabon and Ecuadorian Guinea are at the bottom of the list in terms of governance scores, their MPRI values are above average. This situation can be attributed to the fact that some African countries, mostly former French colonies, continued their monetary dependence to the former colonial power. A total of six countries including these two, have a common central bank (BEAC) and use a common currency (Asongu et al., 2020, p. 6). Independent of country's governments, BEAC implemented many different monetary measures.

While India and Sri Lanka rank low in terms of governance scores, they differ with their high MPRI values. The Reserve Bank of India, with its broad authority and responsibility, stands out as one of the institutions that implements the most monetary measures among developing countries. Similar central bank activism is observed in Sri Lanka.

New Zealand ranks first in terms of governance, but its MPRI value is slightly above the average of all countries, but below the average of developed countries. This difference is due to the fact that the country was the earliest to emerge from pandemic in terms of health and therefore, terminated monetary measures early. Indeed, new liquidity facilities and measures to strengthen banks' capital structures were terminated in March 2021 and the policy of direct government financing by the central bank was terminated in June 2020.

There are two possible reasons for low MPRI values of Norway, Sweden and Denmark. First, these countries have adopted more flexible measures in terms of both public health and monetary policies, distinguishing them from other developed countries in this respect. Second, these countries have significantly higher per capita public health expenditures. Indeed, out of 91 countries ranked by this criterion, Norway ranks first, Sweden third and Denmark fourth.

Switzerland ranks fourth in terms of governance indicator, but its MPRI value is slightly above average. This result can be explained by the fact that Switzerland's monetary policy response differs from that of many other developed countries for various reasons (Jordan, 2001).

DETERMINANTS OF RESPONSE INDEX

It is crucial to analyze the factors that influence index values to interpret them. Key factors that might influence response index include the level economic welfare, institutional development, geographical characteristics, the degree of economic integration and population's lifestyle. This section examines the impact of these variables on monetary policy responses.

Data and Model

The variables and data sources used in study are presented in Table 4. All data are from 2019 except for MPRI. While MPRI is calculated for 91 countries, the number of countries has been reduced to 88 due to missing data for Hong Kong, Palestine and Trinidad & Tobago.

Table 4: Definition of variables and data sources

Variable	Description	Data Source
avermpri	16-month average of MPRI	Calculated by author
governance	Worldwide average of governance indicators (WGI)	World Bank
pop65	Population aged 65 and over to total population (%)	
gdppc	(ln) value of GDP per capita in USD (constant)	
distance	Flight distance from Wuhan city to national capital/1.000	distancecalculator.net
open	Ratio of total exports and imports to GDP	World Bank
healthexppc	(ln) value of public health expenditure per capita in USD (current)	
urbanpop	Ratio of urban population (%)	

The primary factors shaping economic responses to COVID-19 are believed to be the level of development and the quality of institutional structures of countries. Therefore, only governance

indicator was used as an independent variable in the first model. Similarly, the simple arithmetic average of six governance indicators was used as a development indicator as in the study of Vienna & Mollick (2018). The model created for this purpose is as follows:

$$avermpri_i = \beta_0 + \beta_1 governance_i + \beta_2 X_i + \varepsilon_i \quad eq\ (14)$$

$avermpri_i$ is mean MPRI value of country i in relevant month, $governance_i$ is governance value of country i, and X_i is the set of explanatory variables for country i. In these equations, β_0 represents constant term and β values represent slope coefficients. A positive relationship is expected between independent variables of *governance, pop65, gdppc, open, urbanpop* and $avermpri_i$ and a negative relationship is expected between *distance, healthexppc* and $avermpri_i$. Descriptive statistics for variables used in the study are presented in Table 5. As can be seen, there are significant differences between countries in terms of the mean values and minimum-maximum ranges.

Table 5: Descriptive statistics of variables

Variable	Observation	Mean	S. Deviation	Minimum	Maximum
avermpri	88	45,20	28,01	1,52 (Vietnam)	97,84 (Italy)
governance	88	0,36	0,76	-1,27 (E. Guinea)	1,74 (New Zealand)
pop65	88	12,44	6,71	1,17 (Qatar)	29,28 (Japan)
gdppc	88	9,51	0,98	7,57 (India)	11,38 (Switzerland)
distance	88	8,87	4,18	1,06 (China)	19,45 (Chile)
open	88	91,84	48,57	26,28 (USA)	323,07 (Singapore)
healthexppc	88	6,30	1,40	3,01 (India)	8,83 (Norway)
urbanpop	88	71,32	16,90	18,59 (Sri Lanka)	100,00 (Kuwait & Singapore)

Methodology

It is believed that countries with inclusive institutions will have a high diversity of policy tools and methods available to them and a high motivation to use these tools. To test this hypothesis, the study will use cross-sectional data to make an estimation using the least squares method (LSM). LSM is the method that closely approximates relationship between dependent and independent variables when certain assumptions are met. The fundamental assumptions are that the regression model is linear; the error term has a zero mean and a constant variance; there is no serial correlation between the error terms; there is no relationship between independent variables and the error term and there is no strong relationship between independent variables. The functional relationship between dependent and independent variables is as follows:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots . + \beta_k X_{ki} + u_i \quad eq\ (15)$$

In this equation, the value of Y is determined by linear form of k-1 independent variables. After econometric model is estimated, it is necessary to investigate whether the estimates are meaningful or valid. For this purpose, several tests are conducted according to economic, statistical and econometric criteria. Tests conducted according to economic criteria include investigating whether the signs and magnitudes of the estimated parameters conform to economic theory or expectations. Tests conducted according to statistical criteria include standard error of the estimate, coefficient of determination, t-tests and F-tests. Tests conducted according to econometric criteria are aimed at identifying heteroscedasticity, autocorrelation and multicollinearity problems in the model (Gujarati & Porter, 2009; Newbold, 1991).

According to constant variance assumption, the variance of error terms does not depend on the value of independent variable, and it is constant. In cross-sectional data, we are interested in members (individuals, families, firms, industries or geographic divisions) of a population at a specific point in time. These units can range in size, such as small, medium, and large firms or low, middle and high-income economic units (Gujarati, 2003, p. 359). Therefore, one of the most frequently encountered problems in estimation process using OLS in cross-sectional data analysis is the problem of heteroscedasticity. In this case, OLS estimators, while unbiased and consistent, lose their minimum variance properties. Furthermore, t and F values of OLS

estimators deviate from their expected values. For this reason, the model must be converted to a constant variance model using various methods. White or Breusch-Pagan tests are widely used to test for heteroscedasticity (Gujarati & Porter, 2009, pp. 64-66; Newbold, 1991, pp. 605-611).

Another assumption in cross-sectional analyses is absence of autocorrelation between error terms. If the model suffers from an autocorrelation problem, the parameter estimates are unbiased but inefficient. The variance of error terms is underestimated and predictions based on OLS estimates are inefficient. The presence of an autocorrelation problem is commonly analyzed using by Durbin-Watson and Breusch-Godfrey tests (Gujarati & Porter, 2009, pp. 66-67; Newbold, 1991, pp. 611-625).

If there is heteroscedasticity problem, White-Huber correction should be preferred for robust estimation. If both autocorrelation and heteroscedasticity are present, HAC (Newey-West) correction should be chosen (EViews Guide II, 2015, p. 411). As a result of these corrections, the coefficient estimates remain unchanged but standard errors become more reliable, thus increasing accuracy of statistical inferences and reliability of the results.

Empirical Findings

It is assumed that countries with inclusive institutions will have a high diversity of policy tools and methods available to them, and a high motivation to use these tools and methods. The results of cross-sectional analysis for the models constructed to test the validity of this assumption are presented in Table 6.

Table 6. Determinants of response index

Variable/Model	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
governance (+)	**23.752***** (0.00)	**13.776***** (0.00)	7.187 (0.15)	7.183 (0.15)	6.303 (0.22)	9.261 (0.16)	8.306 (0.20)
pop65 (+)	-	**1.745***** (0.00)	**1.823***** (0.00)	**1.803***** (0.00)	**1.832***** (0.00)	**2.026***** (0.00)	**1.945***** (0.00)
gdppc (+)	-	-	**6.267***** (0.05)	**6.263***** (0.05)	**6.100*** (0.07)	**10.317*** (0.07)	**11.017*** (0.06)
distance (-)	-	-	-	-0.0004 (0.51)	-0,0000784 (0,87)	0.0001 (0.82)	0.0002 (0.72)
open (+)	-	-	-	-	0.049 (0.22)	0.043 (0.28)	0.042 (0.29)
healthexppc (-)	-	-	-	-	-	-5.044 (0.39)	-3.880 (0.53)
urbanpop (+)	-	-	-	-	-	-	-0.130 (0.44)
c	**36.634***** (0.00)	**18.519***** (0.00)	-39.660 (0.19)	-37.109 (0.25)	-41.697 (0.23)	-54.516 (0.11)	**-58.286*** (0.09)
R^2	0.417	0.519	0.538	0.540	0.546	0.552	0.555
$\overline{R}^2$	0.411	0.507	0.522	0.517	0.518	0.518	0.516
White test	2.239 (0.11)	2.735 (0.03)	2.634 (0.01)	2.070 (0.02)	2.833 (0.00)	2.534 (0.00)	2.483 (0.00)
Durbin- Watson test	1.932	1.864	1.761	1.769	1.772	1.793	1.808
Breusch- Godfrey LM test	0.336 (0.72)	0.163 (0.85)	0.523 (0.60)	0.485 (0.62)	0.637 (0.53)	0.707 (0.50)	0.792 (0.46)

Note: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively. Values in parentheses in the variable/model column indicate the expected sign of independent variable. Other values in parentheses indicate probability values. White correction for heteroscedasticity was applied to all models except the first model.

Based on the assumption that main factor shaping economic responses to COVID-19 is the level of development and quality of institutional structures, the governance indicator was used as sole independent variable in the first model. The results show a statistically significant and positive relationship between *governance* variable and the variety of policy measures implemented during the pandemic. This significant and positive relationship persisted in Model 2 when an additional control variable was included. However, in the expanded models that included additional variables, the coefficient of *governance* remained positive as expected, but was not statistically significant.

The variable of *pop65* which is added to measure the impact of demographic structure was positive in all models and statistically significant at 1% level. This suggests that as the proportion of elderly population increases, countries implement more diverse economic measures to combat pandemics. The elderly population's higher health risk from COVID-19 is a key factor that increases the variety of economic response and plays a decisive role in pandemic policies.

The *gdppc* variable which indicates the level of economic well-being, is generally positive across models and statistically significant at 10% level. As per capita GDP increases, countries tend to implement more various economic responses.

Consistent with expectations, the coefficient of *distance* variable is negative, but it is not statistically significant. This suggests that the impact of geographic location in explaining the diversity of economic responses during pandemic is limited. In other words, geographic location may not have a significant impact on economic responses.

Although the coefficient of *open* variable is positive, it is not statistically significant. This result can be interpreted as indicating that there is no clear relationship between the level of openness and the variety of countries' economic responses during pandemic. That is, the size of foreign trade volume did not emerge as a factor directly determining the variety of economic measures.

The coefficient of *healthexppc* variable is negative, but it is not statistically significant. This indicates that the magnitude of public health expenditures did not significantly affect the variety of economic responses during pandemic. However, the negative sign of the variable indicates a tendency for the severity of economic measures to be lower in countries with high health expenditures.

In rural areas with low population density, adapting to pandemic measures and maintaining social distancing is easier than in urban centers. In this context, the coefficient of ***urbanpop*** variable, added to the model to measure the impact of lifestyle, is negative and not statistically significant. This result indicates that urban population ratio did not have a significant effect on economic response index during pandemic.

The analysis results indicate that the main factors determining economic response of countries during COVID-19 period are institutional structures, demographic characteristics and economic wealth. In contrast, the effects of the variables of distance, foreign trade openness, public health expenditures and urbanization rate were in the expected direction but were not found to be statistically significant. This can be interpreted as the primary factors shaping economic response during pandemic period being the quality of institutions, population structure and economic capacity, while the direct impact of other factors was limited.

In previous part of the study, it was noted that some countries were at top of the list in GDP per capita but had very low governance and MPRI values or that some countries had low economic welfare but above-average index values. This can be interpreted as an indication that development rather than economic welfare is more important in determining MPRI value. Therefore, countries were grouped according to their level of development, and the analysis was re-run using a more homogeneous data set. To this end, countries were divided into two groups (developed countries and other countries) based on mean value (0,3529) of ***governance*** variable.

Findings for developed countries group are presented in Table 7.

Table 7. Determinants of response index in developed countries group

Variable/ Model	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
governance (+)	**26,603**** (0,01)	12,946 (0,15)	4,366 (0,71)	4,594 (0,70)	2,339 (0,83)	-8,464 (0,48)	-7,150 (0,55)
pop65 (+)	-	**2,541***** (0,00)	**2,711***** (0,00)	**2,698***** (0,00)	**3,017***** (0,00)	**2,309***** (0,00)	**2,014**** (0,01)
gdppc (+)	-	-	7,429 (0,26)	7,228 (0,29)	7,608 (0,24)	-6,948 (0,46)	-5,940 (0,53)
distance (-)	-	-	-	-0,0002 (0,88)	0,001 (0,49)	0,0004 (0,67)	0,001 (0,66)
open (+)	-	-	-	-	**0,151**** (0,02)	**0,194***** (0,00)	**0,182**** (0,01)
healthexppc (-)	-	-	-	-	-	**17,985**** (0,05)	**19,744**** (0,03)
urbanpop (+)	-	-	-	-	-	-	-0,324 (0,27)
c	**34,427***** (0,00)	6,794 (0,56)	-63,062 (0,32)	-59,654 (0,38)	-90,456 (0,17)	-53,711 (0,41)	-47,478 (0,46)
R^2	0,171	0,391	0,412	0,413	0,494	0,549	0,565
$\overline{R}^2$	0,150	0,361	0,366	0,349	0,424		0,476
White test	2,235 (0,12)	1,798 (0,14)	1,326 (0,26)	0,831 (0,63)	0,510 (0,93)	0,428 (0,97)	0,674 (0,79)
Durbin- Watson test	1,869	2,168	2,157	2,178	2,309	2,111	2,089
Breusch- Godfrey LM test	0,323 (0,73)	0,345 (0,71)	0,311 (0,73)	0,324 (0,73)	0,826 (0,45)	0,318 (0,73)	0,282 (0,76)

Note: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively. Values in parentheses in the variable/model column indicate the expected sign of independent variable. Other values in parentheses indicate probability values. White correction for heteroscedasticity was applied to all models except the first model.

The *governance* variable was statistically significant and positively signed only in Model 1 but was not found to be statistically significant in other models. The variables of *pop65, open* and *healthexppc* were statistically significant and positively signed in all models, while *gdppc* and *distance* variables were found to be statistically insignificant and their signs were inconsistent. The *urbanpop* variable was found to be statistically insignificant and its sign was inconsistent with expectations.

Compared to entire country group, the impact of ***governance*** variable is more limited in developed countries, and the proportion of elderly population and public healthcare expenditures are the main determinants. Geographic distance and urbanization rate are statistically insignificant in both groups, while the level of economic well-being is positive and significant only in entire country group. Foreign trade openness is significant and positive only in developed countries. This can be interpreted as indicating that in developed countries with greater openness to foreign trade in the fight against the pandemic they were more affected by disruptions in their supply chains and increased the variety of measures they took.

Cross-sectional analysis results for other country group are presented in Table 8.

Table 8: Determinants of response index in other countries group

Variable/ Model	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
governance (+)	10,589 (0,24)	6,260 (0,42)	4,698 (0,58)	4,718 (0,58)	6,594 (0,52)	**18,668**** (0,05)	**20,771**** (0,03)
pop65 (+)	-	**0,911*** (0,08)	**0,941*** (0,07)	**0,909*** (0,08)	**1,035**** (0,05)	**1,528**** (0,01)	**1,615***** (0,00)
gdppc (+)	-	-	4,992 (0,30)	5,255 (0,27)	5,652 (0,22)	**18,561***** (0,00)	**16,891***** (0,00)
distance (-)	-	-	-	-0,0003 (0,50)	-0,001 (0,14)	-0,000035 (0,92)	-0,0002 (0,66)
open (+)	-	-	-	-	**-0,167**** (0,04)	**-0,136**** (0,04)	**-0,140**** (0,04)
healthexppc (-)	-	-	-	-	-	**-14,468***** (0,00)	**-16,615***** (0,00)
urbanpop (+)	-	-	-	-	-	-	**0,221*** (0,08)
C	**32,456***** (0,00)	**23,341**** (0,00)	-21,484 (0,64)	-20,594 (0,66)	-8,124 (0,86)	**-55,636**** (0,04)	**-42,888**** (0,05)
R^2			0,163	0,172	0,260	0,421	0,449
$\overline{R}^2$			0,103	0,091	0,168	0,332	0,348
White test	3,926 (0,03)	3,701 (0,01)	5,343 (0,00)	3,552 (0,00)	5,528 (0,00)	2,021 (0,06)	2,839 (0,04)
Durbin- Watson test	2,198	2,197	2,156	2,143	2,125	2,335	2,197
Breusch- Godfrey LM test	0,428 (0,66)	0,507 (0,61)	0,385 (0,68)	0,329 (0,72)	0,439 (0,65)	0,996 (0,38)	0,467 (0,63)

Note: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively. Values in parentheses in the variable/model column indicate the expected sign of independent variable. Other values in parentheses indicate probability values. HAC correction for heteroscedasticity was applied to all models.

In other countries group, the *governance* variable is positive in all models, but statistically significant only in last two models. The variables *pop65, gdppc* and *urbanpop* are generally positive and statistically significant. In contrast, the *open* and *healthexppc* variables were found to be statistically significant and negatively signed. The *distance* variable was found to be negatively signed and statistically insignificant. According to the results of the largest model including all independent variables, the signs of six of the seven independent variables are consistent with expectations and five of them are statistically significant. This finding demonstrates that the variables included in the model of other countries group were quite successful in determining the value of response index.

A general evaluation of the analysis results summarizes the findings as follows: While the effect of governance score and the proportion of the population aged 65 and over is similar in all three groups, differences between the groups are evident in terms of economic welfare level, geographic distance, trade openness, public health expenditures and urbanization rate. Governance has a positive effect on all groups, but its significance is more limited in developed countries with a negative sign in the last two models. This may be associated with decrease in the marginal effect of governance quality in countries with high institutional capacity. The proportion of elderly population is effective in increasing policy diversity in all groups and is statistically significant. Although economic wealth had a significant positive effect on all and other country groups, it was not found to be significant in developed countries. This difference may be attributed to inherently limited contribution of additional income to policy diversity in developed countries.

The insignificance of *distance* variable across all country and developed country groups may be related to global spread dynamics of the pandemic. The insignificance of this variable can be explained by rapid global spread, very recent exposure of countries to the pandemic and limited role physical distance plays in determining policy responses due to international flow of information. In contrast, the sign of *distance* variable in the other country group was

consistent with expectations. This can be interpreted as indicating that the slower and more limited flow of information in these countries increases the importance of physical distance in determining policy responses.

The positive effect of openness on foreign trade in all and developed country groups and the negative effect in other country group indicates that supply chain vulnerabilities increase policy diversity in developed countries, while external dependence narrows policy space in developing countries. Contrary to expectations, public health expenditures have a positive effect in developed countries, but as expected, a negative effect in all and other country groups. This difference may be related to the population structure and the quality of health infrastructure. The urbanization rate was significant only in other country group. This can be explained by the fact that rapid and unregulated urbanization in developing countries increases the risk of an epidemic and necessitates additional measures.

Conclusion

Policies implemented to combat the negative effects of COVID-19 on the economy vary due to differences in economic and institutional structures of countries. To assess the effectiveness of policies, it is important to analyze the reasons for this variation and the factors that determine country responses. In this study, an index called MPRI was developed to measure policy diversity and differences were examined by grouping countries according to income level and governance indicators.

Although there are some exceptions, countries with high economic prosperity or higher development levels exhibit greater diversity of measures than other countries. It is important to understand the factors that determine MPRI index values in order to interpret them. The results of the empirical analysis conducted for this purpose indicate that the main factors determining the diversity of economic responses are institutional structure, demographic characteristics and level of economic prosperity. While the level of governance has a positive effect in all three groups, its significance is more limited in developed country group. This may be attributed to the diminishing marginal effect of governance quality in countries with high institutional capacity. Unlike the entire panel and other country groups, the level of economic prosperity was not found to be significant in developed country group. This difference is related to the limited contribution of additional income growth to policy diversity in developed countries. The proportion of elderly population is effective in increasing policy diversity in all three groups and is statistically significant. The effects of geographical distance and foreign trade openness vary across groups depending on countries' global information flows and supply chain vulnerabilities, but both are not statistically significant. The insignificance of geographical distance variable across all countries and developed country groups may be related to pandemic's global spread dynamics. Rapid global spread and international information flows have limited the role of physical distance in policymaking. Conversely, the importance of distance increases in other countries, where information flow is slower and more limited.

While emerging as important factors shaping policy responses particularly in developing countries, public health expenditures and urbanization rate are not statistically significant. Contrary to expectations, public health expenditures have a positive effect in developed countries group. This difference may be related to population structure and the quality of healthcare infrastructure. The urbanization rate was significant only in other country group. This can be explained by the fact that rapid and unregulated urbanization in developing countries increases the risk of an epidemic and necessitates additional measures. Overall results show that independent variables are more effective in determining the response index value in other country group compared to developed countries.

While MPRI offers a powerful tool for comparing policy diversity across countries and across time, it does not provide direct information about effectiveness of measures. Furthermore,

MPRI does not reflect the effective implementation of the policy or demographic or cultural characteristics that may influence spread of COVID-19. It could also be argued that some policy measures are not included in the calculation of index. The final limitation is the lack of consideration of the policy intensity implemented in the index creation process. Implementing a policy only once in a month would suffice for the relevant policy variable to take a value of one. Using daily instead of monthly data could be proposed as a solution to overcome this drawback.

In conclusion, understanding differences between countries is important for assessing the effects of proactive policy responses by central banks and determining the most effective measures against similar shocks in the future. This study demonstrates that central bank responses in pandemics or other crisis situations are shaped by a country's development and governance capacity and these factors play a decisive role in policy diversity.

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