(Determinants of COVID-19 vaccination)

TO

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Introduction

Background Information

For the massive widespread of Coronaviruses – COV19 : SARS-CoV-2 started from Q4/2021 and threatened all the nations and continue to upgrade rapidly with the variant of species generate both direct and indirect effect. As of December 2021, 5.32 million of world populations deaths and infected around 271 million (21,000 people deaths and 2.17 million infected in Thailand reported by WHO. This crisis still causes long-term effect to the structure of world economy like economic recession, strong lockdown in world's crucial economic zone, international trade slowdown, countries shutdown and tourism flow restriction along with causing new normal life of world populations

This massive widespread of COV-19 cause all the nations try to figure out and solve for this crisis and stop this widespread for returning to the normal situation by cancel the tourism flow restriction and continue international trade. One of most common solution that all countries agree is research and develop the vaccine to control and stop the crisis as soon as possible. Thanks to the ideas, the vaccine start to play significant role of crisis solver as many advanced economic countries design and launch COV-19 vaccine like viral vector : Astrazeneca (United Kingdom), Sputnik V (Russia) mRNA type like Pfizer (USA and Germany) and other types like Sinovac and Sinopharm (China). Many countries focus on the process of procurement, bidding or providing vaccine to their populations rapidly as compatible with the structure of population and demographic structure for instance the countries with high proportion of aging society relative to teenage tend to buy vaccine to fit with their senior population first. Vaccination can generate both benefit and side effect directly to the population. This vaccine distribution process from sellers to buyers can be in forms of bidding, donation, G2G (government to government agreement), Private to government. Many of sellers are advanced economy countries with high technology and abundant resources sell the vaccine to developing countries so unequally distribution, oligopoly power, some exploitation occurred causing both winner and looser from this situation. Countries mainly focus on herd immunity by increase the rate of vaccination to majority of population. This herd immunity will generate positive externalities to the social and reduce the ministry of health's budget to serve the case and the deaths from COV

Refer to aforementioned statement, rate of vaccine access and speed of vaccinations are varied by countries but it's the fact that high rate of population vaccinated can provide the positive externalities to social along with benefit to economy. Low income countries tend to have low rate of vaccination because of barrier to access vaccine like high cost of providing vaccine that cause high rate of COV case

Main Objectives of Study

1.) To study the economic indicators can generate different of vaccination across the countries
2.) To compare the difference of fully vaccinated and partial vaccinated
3.) To study the countries difference regime like poor and rich nations

Research Hypothesis

1.) Economic indicators should have direct effect to rate of vaccination
2.) Number of case and number of deaths per million of population should be initial factor affect the rate of vaccination
3.) Poor and rich nations may have different rate of vaccination

Literature Review and Related Theory

Literature Review

Vaccination can reduce health cost of social compare to do nothing by reducing mortality rate along with number of days staying in hospital for around 50%. Case study for United states if absorption rate or successful rate of vaccination is significantly high will reduce vaccination project cost around 60% (William V. Padula,2021) moreover we found that most of world supply of vaccine are distributed to advanced economy countries or limited countries. Some studies suggested that limited vaccination will have relative high cost compared to globally vaccination and equally distributed. Advance economy countries account for 49% of total economics cost of COV-19 widespread although most of nations are fully vaccinated (Cem Cakmakli, 2021)

Case Study for Japan, vaccination to the teenage and children can reduce number of deaths (from the linear relationship estimation) but will give the better result if we focus on senior citizen along with some policy like work from home (non-liner regression estimation) (Satoshi Sunohara, 2021). Vaccination strategy and targeted group of countries should be relied on characteristics of countries. For aging society countries, the focused group should be senior citizen first and then cascade to teenage and children (Yang Liu, 2021)

Countries can attract population to be vaccinated by monetary incentives because only social value and private benefit are not enough for rotate people from say no to say yes like in Sweden willingness to earn for vaccination is around GBP 20 (Pol-Campos Mercade, 2021) and in United states is around 100-200 USD for each vaccination (Joan Costa-Font, 2021). The success of vaccination still depended on the experience faced by population in the countries. The empirical result showed that countries with massive widespread of COV-19 tend to be vaccinate rapidly compared to other countries with never face massive widespread and correlation between COV perception and demand for vaccine is positive (Hackenberger, 2021)

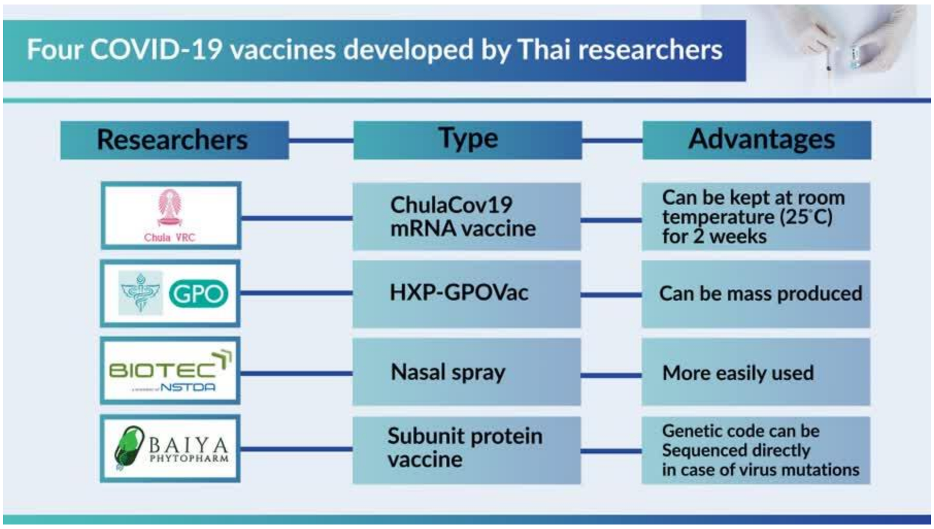
Related Data and theory

Characteristics of available vaccine

	Astrazeneca	Pzfizer	Sinovac	Sputnik V	Moderna	Johnson
Efficiency	62-90 %	95%	50-70%	91.4%	95%	80%
Price	USD 4-5	USD 20	USD 5	USD 10	USD 33	USD 10
Main Buyer	EU, UK	EU, US	Indonesia	India Brazil	EU CANADA	EU CANADA

Source : World Health Organization (WHO) agencies

Vaccines developed by Thai researchers



Research Tools

1.) **Heteroskedasticity** : The econometrics test of error term assumption whether that variance of error term and independent variables are correlated or not. If heteroskedasticity occur, this may cause incorrect standard error not directly affect the biasedness of parameter but the test will not be reliable and lead to misleading of significant conclusion

H0 : Homoskedaticity

H1 : Heteroskedasticity

Generating Breusch-Pagan-Godfrey Test and if P-Value is less than p-value for significant level concluded that the model contain Heteroskedasticity problem

Solving by introducing adjusted Standard errors like Robust S.E. of HAC Newey-west S.E. to correct for heteroscedasticity problem

2.) RAMSEY RESET TEST : the test to validate the model is correctly set up and specified or not. The model may omitted variable or included irrelevant variables causing inconsistency estimation of parameter

H0 : No Misspecification Error

H1 : Misspecification Error

if P-Value is less than p-value for significant level concluded that the model contain Misspecification Error

Methodology and Conceptual Framework

Conceptual Framework

Thanks to the review of related literature, I gather the data of 195 countries in the period of Q4/2021 and simulate the cross-sectional data to generate linear regression. I collect the data for COV-19 dimension like Stringency Index, Partially Vaccinated and Fully Vaccinated, Number of case per 1 million people and number of deaths per 1 million people along with economic indicators like GDP growth rate and poverty rate

1.) Vaccinated Framework → to compare that the factors affect fully vaccinate and partial vaccinated (partially dose or not received booster dose) are different or not

2.) Economic Status of Nations → to compare whether rich and poor nations are different or not by using poverty rate = 0.3 as threshold rich nations (poverty rate < 0.30 and poor nations (poverty rate > 0.3)

DATA

1.) COVID : ourworldindata.org
2.) GDP Growth Rate and Poverty Rate : tradingeconomics.com

Research Tools

1.) Linear Regression Analysis (Ordinary Least Squared) : simulate linear regression through statistical software to check the magnitude of parameters and significant through T-stat and p-value

2.) Correlation Matrix : To check the correlation of independent variables to prevent perfect collinearity in model and multicollinearity

3.) Heteroskedasticity Test : To generate model health of check of inconsistency of t-stat or p-value by Breusch-Pagan-Godfrey test to validate the model not contain heteroscedasticity problem

4.) RAMSEY RESET Test : To check the model is correctly specified and set up

Model and Variables

Partially Vaccinated

$$PV = \beta_0 + \beta_1 NCPM + \beta_2 NDPM + \beta_3 POVRATE + \beta_4 GDPGROWTH + \beta_5 STRIND$$

Fully Vaccinated

$$FV = \beta_0 + \beta_1 NCPM + \beta_2 NDPM + \beta_3 POVRATE + \beta_4 GDPGROWTH + \beta_5 STRIND$$

Variables	Description	Unit
FV (Fully Vaccinated)	Number of fully vaccinated	Percent to pop.
PV (Partially Vaccinated)	Number of partial vaccinated	Percent to pop.
NCPM (Number of Case per million)	Number of cases per 1 million	per 1 million of pop.
NDPM (Number of Deaths per million)	Number of deaths per 1 million	per 1 million of pop.
POVRATE (Poverty Rate)	Poverty rate	percentage
GDPGROWTH	GDP Growth Rate	percentage
STRIND (Stringency Index)	Stringency Index	-

Model 1 : Fully Vaccinated All Nations

Model 2 : Partially Vaccinated All Nations

Model 3 : Fully Vaccinated Poor Nations (POVRATE > 0.3)

Model 4 : Partially Vaccinated Poor Nations (POVRATE > 0.3)

Model 5 : Fully Vaccinated Rich Nations (POVRATE < 0.3)

Model 6 : Partially Vaccinated Rich Nations (POVRATE < 0.3)

Expected Sign and Hypothesis

	Expected Sign	สมมติฐาน	Reference
NCPM	+	Higher NCPM will lead to higher vaccination rate	Hackenberger
NDPM	+	Higher NDPM will lead to higher vaccination rate	Hackenberger
POVRATE	-	Higher Poverty rate will reduce Vaccination rate	Cem Cakmakli
GDPGROWTH	+	Higher GDP growth rate will increase vaccination rate	Cem Cakmakli
STRIND	+	Higher Stringency Index will increase vaccination rate	Hackenberger

Findings and Result

1.) Correlation Matrix

	GDPGROWTH	NCPM	NDPM	POVRATE	STRINGENCY INDEX
GDPGROWTH	1	0.136726871	0.193704992	-0.248255395	0.058988938
NCPM	0.136726871	1	0.517373632	-0.340419108	0.185103323
NDPM	0.193704992	0.517373632	1	-0.317116413	0.144609711
POVRATE	-0.248255395	-0.340419108	-0.317116413	1	-0.341672032
STRINGENCY INDEX	0.058988938	0.185103323	0.144609711	-0.341672032	1

Pairwise Correlation of variables not exceed -0.9 or +0.9 meaning that no variables have high correlation so the model should not have perfect collinearity

2.) Model

	World (FV)	World (PV)	Poor (FV)	Poor (PV)	Rich (FV)	Rich (PV)
C	0.44926 (5.4316)	0.092167 (4.058)	0.09 (0.769)	0.089 (1.704)	0.421 (3.90)	0.056 (2.34)
GDP GROWTH	0.0072 (1.8732)	-0.00037 (-0.2568)	-0.00035 (0.081)	-0.00257 (-1.321)	0.014 (1.91)	0.0013 (1.232)
NCPM	0.000353 (6.1974)	-0.000056 (-2.306)	0.00059 (1.87)	0.0001 (0.7027)	0.00031 (3.612)	-0.000051 (-3.671)
NDPM	-0.0086 (-1.5123)	-0.00104 (-0.47319)	0.31349 (4.55)	0.079 (2.565)	-0.011 (-1.43)	-0.00171 (-1.82)
POVRATE	-0.85426 (-6.3316)	-0.08416 (-2.22841)	-0.14457 (-0.748)	-0.1581 (1.829)	-0.886 (-2.53)	0.1572 (1.799)
STRIND	0.002122 (1.87217)	0.000093 (0.2857)	0.00118 (0.94)	0.00068 (1.203)	0.0027 (1.87)	-0.00019 (-0.420)
R2	0.5389	0.09477	0.5388	0.3806	0.2605	0.2027
Remarks	Model adjusted for hetero					Model adjusted for hetero

T-Stats stated in parentheses

GDPGROWTH : Increase GDP growth rate 1% will increase vaccination rate 0.7% (World FV) และ 1.4% (Rich FV)

NCPM : number of COV-case increase 1 per million of population will increase Fully vaccinated rate by 0.0353% (World), 0.059% (Poor) and 0.031% (Rich) และ Partially decrease 0.005%

NDPM : number of COV-deaths increase 1 per million of population will increase for poor nations 31.3% (fully vaccinated) and 7.9% (Partial vaccinated)

POVRATE : increase in poverty rate will decrease vaccination rate 85.4% (world FV), 8.41% (world PV),15.81% (Poor PV), 88.66% Rich FV

STRIND : Increase in stringency index will increase vaccination rate by 0.2%

3.) Heteroskedasticity and RAMSEY RESET

	Heteroskedasticity	RESET Test
World FV	Detected (0.05)	No Error (0.47)
World PV	Non-Detected (0.23)	No Error (0.70)
Poor FV	Non-Detected (0.62)	No Error (0.38)
Poor PV	Non-Detected (0.09)	No Error (0.12)
Rich FV	Non-Detected (0.22)	No Error (0.22)
Rich PV	Detected (0.02)	Error (0.04)

P-Value of test stated in parentheses

Conclusion and Policy Implication

Key Findings

1.) Domestic GDP Growth may increase vaccination rate for both fully vaccinated and partial vaccinated around 1% so GDP growth rate play the crucial role that better economic condition will provide the better quality of population life in terms of vaccination because country will have high power to negotiate for vaccine order

2.) Increase in number of COV-19 case will decrease rate of partial vaccination but increase incentive fully vaccination but increase number of COV-19 deaths will increase incentive to be vaccinated especially for poor nations

3.) Poverty rate and rate of vaccination have positive correlation so the higher rate of poverty rate will decrease rate of vaccination

4.) Stringency Index can be treated as proxy for perception of COV-19 pandemic. If stringency index increase meaning that massive widespread of COV-19 will increase preference of population toward vaccination

Policy Implication

1.) It's obvious that economic position of countries played significant role to vaccination rate so if countries would like to yield higher rate of vaccination or control widespread of COV-19 in the countries. As empirical data showed that the countries which are distributed vaccine first or win the bidding auction are all advanced economic countries. The countries in middle or low income should plan to invest in buying vaccine for population

2.) Hackenberger showed that experience of countries' population toward COV-19 pandemic can affect incentive of vaccination like rapid increase in the number of COV-19 case and COV-death can induce population to be vaccinated faster so the government should launch campaign or attract people to be vaccinated in the period of COV-19 massive widespread

3.) The study reveal that 1 death of COV-19 will be more sensitive to vaccinated rate compared to 1 case of COV-19 meaning that new death can increase incentive more than new COV-19 Case

Further Study and Research Gap

1.) This study is designed to collect and gather data by the cross-sectional model method so the study may ignore the dynamic change or lagged effect of some variables for example the number of COV-19 cases may increase rate of vaccination after One-week so the further study may be extend model to the panel data analysis

2.) More economic indicators should be introduced to study in depth of more dimension or further study should setup the other criteria to compared countries like poverty line or GINI Coefficient

3.) Introducing of dummy variables or interaction terms to compare in the country-specific level

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<u>All Nations</u>

1.) (Fully Vaccinated) All Nations

Dependent Variable: FV

Method: Least Squares

Date: 12/16/21   Time: 22:46

Sample (adjusted): 1 146

Included observations: 121 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.44926	0.076207	5.895232	0
GDPGROWTH	0.007207	4.96E-03	1.4543	0.1486
NCPM	0.000353	8.08E-05	4.366954	0
NDPM	-0.008602	0.007224	-1.190816	0.2362
POVRATE	-0.85426	0.127878	-6.680287	0
STRIND	0.002122	0.001125	1.885169	0.0619
R-squared	0.538965	Mean dependent var		0.388377
Adjusted R-squared	0.51892	S.D. dependent var		0.280588
S.E. of regression	0.194616	Akaike info criterion		-0.387267
Sum squared resid	4.355647	Schwarz criterion		-0.248632
Log likelihood	29.42964	Hannan-Quinn criter.		-0.330962
F-statistic	26.88773	Durbin-Watson stat		1.789988
Prob(F-statistic)	0			

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.244483	Prob. F(5,115)	0.0545
Obs*R-squared	10.75809	Prob. Chi-Square(5)	0.0564
Scaled explained SS	6.844072	Prob. Chi-Square(5)	0.2325

Ramsey RESET Test

Equation: UNTITLED

Specification: FV C GDPGROWTH NCPM NDPM POVRATE

STRINGENCY_INDEX

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.722731	114	0.4713
F-statistic	0.522340	(1, 114)	0.4713

Likelihood ratio	0.553147	1	0.4570

Regression after HAC Newey-West Correction

Dependent Variable: FV

Method: Least Squares

Date: 12/16/21 Time: 22:55

Sample (adjusted): 1 146

Included observations: 121 after adjustments

HAC standard errors & covariance bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.49E-01	8.27E-02	5.431683	0
GDPGROWTH	0.007207	0.003847	1.873276	0.0636
NCPM	0.000353	5.70E-05	6.197442	0
NDPM	-8.60E-03	0.005688	-1.51232	0.1332
POVRATE	-0.85426	0.13492	-6.3316	0
STRINGENCY_INDEX	0.002122	0.001133	1.872175	0.0637
R-squared	0.538965	Mean dependent var		0.388377
Adjusted R-squared	0.51892	S.D. dependent var		0.280588
S.E. of regression	0.194616	Akaike info criterion		-0.38727
Sum squared resid	4.355647	Schwarz criterion		-0.24863
Log likelihood	29.42964	Hannan-Quinn criter.		-0.33096
F-statistic	26.88773	Durbin-Watson stat		1.789988
Prob(F-statistic)	0	Wald F-statistic		48.66351
Prob(Wald F-statistic)	0			

2.) All Nations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.091267	0.02249	4.058177	0.0001
GDPGROWTH	-0.00037	0.001441	-0.25688	0.7977
NCPM	-5.61E-05	2.43E-05	-2.30675	0.0229
NDPM	-0.00104	0.002202	-0.47319	0.637
POVRATE	-0.08416	0.037766	-2.22841	0.0279
STRINGENCY_INDEX	9.30E-05	0.000325	0.285699	0.7756
R-squared	0.094775	Mean dependent var		0.060046
Adjusted R-squared	0.054363	S.D. dependent var		0.057522

S.E. of regression	0.055936	Akaike info criterion		-2.8797
Sum squared resid	0.350432	Schwarz criterion		-2.73882
Log likelihood	175.9024	Hannan-Quinn criter.		-2.8225
F-statistic	2.345218	Durbin-Watson stat		1.588192
Prob(F-statistic)	0.045758			

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.386225	Prob. F(5,112)	0.2348
Obs*R-squared	6.876863	Prob. Chi-Square(5)	0.2300
Scaled explained SS	16.80868	Prob. Chi-Square(5)	0.0049

Ramsey RESET Test

Equation: UNTITLED

Specification: PV C GDPGROWTH NCPM NDPM POVRATE

STRINGENCY_INDEX

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.374989	111	0.7084
F-statistic	0.140617	(1, 111)	0.7084
Likelihood ratio	0.149390	1	0.6991

<u>Poor Nations</u>

3.) (Fully Vaccinated) (POVRATE > 0.3)

Dependent Variable: FV

Method: Least Squares

Date: 12/16/21 Time: 23:04

Sample (adjusted): 1 45

Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.090094	0.117074	0.769548	0.4469
GDPGROWTH	-0.00035	0.004352	-0.08122	0.9357
NCPM	0.000595	0.000318	1.87027	0.0701
NDPM	0.313494	0.068842	4.553832	0.0001
POVRATE	-0.14457	0.193213	-0.74826	0.4594
STRINGENCY_INDEX	0.001187	0.001262	0.940008	0.3538

R-squared	0.538837	Mean dependent var		0.138043
Adjusted R-squared	0.471019	S.D. dependent var		0.16596
S.E. of regression	0.120704	Akaike info criterion		-1.25346
Sum squared resid	0.495366	Schwarz criterion		-1.00013
Log likelihood	31.06923	Hannan-Quinn criter.		-1.16187
F-statistic	7.945327	Durbin-Watson stat		2.161618
Prob(F-statistic)	0.000048			

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.706255	Prob. F(5,34)	0.6227
Obs*R-squared	3.763556	Prob. Chi-Square(5)	0.5839
Scaled explained SS	8.572804	Prob. Chi-Square(5)	0.1274

Ramsey RESET Test

Equation: UNTITLED

Specification: FV C GDPGROWTH NCPM NDPM POVRATE STRINGENCY_INDEX

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.872612	33	0.3892
F-statistic	0.761452	(1, 33)	0.3892
Likelihood ratio	0.912485	1	0.3395

4.) (Partially Vaccinated) (POVRATE > 0.3)

Dependent Variable: PV

Method: Least Squares

Date: 12/16/21 Time: 23:06

Sample (adjusted): 1 45

Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.089285	0.052372	1.704806	0.0974
GDPGROWTH	-0.00257	0.001947	-1.32092	0.1953
NCPM	0.0001	0.000142	0.70272	0.487
NDPM	0.079021	0.030796	2.565971	0.0149
POVRATE	-0.15812	0.086432	-1.82935	0.0761
STRINGENCY_INDEX	0.00068	0.000565	1.203212	0.2372
R-squared	0.380675	Mean dependent var		0.052494
Adjusted R-squared	0.289598	S.D. dependent var		0.064064
S.E. of regression	0.053996	Akaike info criterion		-2.86232
Sum squared resid	0.09913	Schwarz criterion		-2.60899
Log likelihood	63.24645	Hannan-Quinn criter.		-2.77073
F-statistic	4.179698	Durbin-Watson stat		1.848906
Prob(F-statistic)	0.00456			

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.057606	Prob. F(5,34)	0.0952
Obs*R-squared	9.291928	Prob. Chi-Square(5)	0.0980
Scaled explained SS	9.670478	Prob. Chi-Square(5)	0.0851

Ramsey RESET Test

Equation: UNTITLED

Specification: PV C GDPGROWTH NCPM NDPM POVRATE

STRINGENCY_INDEX

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.575970	33	0.1246
F-statistic	2.483681	(1, 33)	0.1246
Likelihood ratio	2.902613	1	0.0884

Rich Nationss

5.) (Fully Vaccinated) (POVRATE < 0.3)

Dependent Variable: FV

Method: Least Squares

Date: 12/16/21 Time: 23:13

Sample (adjusted): 1 100

Included observations: 81 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.421527	0.107877	3.907485	0.0002
GDPGROWTH	0.014514	7.58E-03	1.915188	0.0593
NCPM	0.000317	8.78E-05	3.612022	0.0005
NDPM	-0.01114	0.007757	-1.43547	0.1553
POVRATE	-0.88679	0.350193	-2.53228	0.0134
STRINGENCY_INDEX	0.002718	0.001446	1.879874	0.064
R-squared	0.306767	Mean dependent var		0.511999
Adjusted R-squared	0.260552	S.D. dependent var		0.240541
S.E. of regression	0.206844	Akaike info criterion		-0.24251
Sum squared resid	3.208845	Schwarz criterion		-0.06515
Log likelihood	15.82177	Hannan-Quinn criter.		-0.17135
F-statistic	6.637753	Durbin-Watson stat		1.630357
Prob(F-statistic)	0.000036			

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.420557	Prob. F(5,75)	0.2267
Obs*R-squared	7.007381	Prob. Chi-Square(5)	0.2201
Scaled explained SS	4.873119	Prob. Chi-Square(5)	0.4316

Ramsey RESET Test

Equation: UNTITLED

Specification: FV C GDPGROWTH NCPM NDPM POVRATE

STRINGENCY_INDEX

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.213814	74	0.2287
F-statistic	1.473344	(1, 74)	0.2287
Likelihood ratio	1.596870	1	0.2063

6.) (Partially Vaccinated (POVRATE < 0.3)

Dependent Variable: PV

Method: Least Squares

Date: 12/16/21 Time: 23:16

Sample (adjusted): 1 100

Included observations: 78 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.056868	0.027429	2.073269	0.0417
GDPGROWTH	0.001327	1.86E-03	0.71395	0.4776
NCPM	-5.13E-05	2.22E-05	-2.31314	0.0236
NDPM	-0.00171	0.00199	-0.85736	0.3941
POVRATE	0.157298	0.088984	1.76772	0.0813
STRINGENCY_INDEX	-0.00019	0.000351	-0.53049	0.5974
R-squared	0.202791	Mean dependent var		0.063919
Adjusted R-squared	0.147429	S.D. dependent var		0.053889
S.E. of regression	0.049758	Akaike info criterion		-3.08949
Sum squared resid	0.178262	Schwarz criterion		-2.9082
Log likelihood	126.4899	Hannan-Quinn criter.		-3.01691
F-statistic	3.663011	Durbin-Watson stat		1.273225
Prob(F-statistic)	0.005216			

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.855985	Prob. F(5,72)	0.0208
Obs*R-squared	12.90954	Prob. Chi-Square(5)	0.0242
Scaled explained SS	27.52558	Prob. Chi-Square(5)	0.0000

Ramsey RESET Test

Equation: UNTITLED

Specification: PV C GDPGROWTH NCPM NDPM POVRATE

STRINGENCY_INDEX

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	2.064344	71	0.0426
F-statistic	4.261516	(1, 71)	0.0426
Likelihood ratio	4.546546	1	0.0330

Dependent Variable: PV

Method: Least Squares

Date: 12/16/21 Time: 23:18

Sample (adjusted): 1 100

Included observations: 78 after adjustments

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed

bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.69E-02	2.43E-02	2.340742	0.022
GDPGROWTH	0.001327	0.001076	1.232653	0.2217
NCPM	-5.13E-05	1.40E-05	-3.67175	0.0005
NDPM	-0.00171	0.000934	-1.8269	0.0719
POVRATE	0.157298	0.087425	1.79924	0.0762
STRINGENCY_INDEX	-0.00019	0.000443	-0.42062	0.6753
R-squared	0.202791	Mean dependent var		0.063919
Adjusted R-squared	0.147429	S.D. dependent var		0.053889
S.E. of regression	0.049758	Akaike info criterion		-3.08949
Sum squared resid	0.178262	Schwarz criterion		-2.9082
Log likelihood	126.4899	Hannan-Quinn criter.		-3.01691
F-statistic	3.663011	Durbin-Watson stat		1.273225
Prob(F-statistic)	0.005216	Wald F-statistic		4.313116
Prob(Wald F-statistic)	0.00173			