Does Good National Governance Boost COVID-19 Vaccination? Cross-Country Evidence

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Research Article

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Abstract

Background

As herd immunity by universal vaccination is essential to end the COVID-19 pandemic, the COVID-19 Vaccine Global Access (COVAX) facility has been established to provide developing countries with subsidized vaccines. However, a critical issue is that the developing countries also need to effectively deploy vaccines to citizens. Although this argument suggests positive effects of good national governance on vaccination coverage, to the best of our knowledge, there is no such evidence. The goal of this study was to examine the association between the national governance index and vaccination coverage, particularly among developing countries.

Methods

Using cross-country data, an ordinary least squares regression was conducted to examine the association between the national governance index and two outcome variables on vaccination—the number of days until the administration of the first dose in the country since December 2019 and the number of doses per 100 citizens as of the end of July 2021. The results were compared between the model including all countries and the model including only non-OECD countries. We also examined the influence of governance on the selection of vaccine manufacturers.

Results

A one standard deviation increase in the national governance index was associated with 9.1 days (95%CI: -15.76, -2.43) earlier administration of vaccines in the country, and a 12.1 dose increase (95%CI: 4.76, 19.34) per 100 citizens. Results also showed that these associations were larger in the non-OECD sample and indicated the role of governance in the type of vaccine that is predominantly administered in the country.

Conclusion

The provision of subsidized vaccines alone is not sufficient to control the spread of infection in developing countries; logistical and administrative support should also be offered, especially in countries with low governance indices.

Trial registration

Not applicable.

1. Background

The COVID-19 pandemic has caused immense human and socio-economic harm, and is unlikely to end unless herd immunity is achieved through vaccinating large proportions of the global population [1, 2].

However, while wealthy countries have secured vaccine supplies for their citizens by negotiating bilateral deals with vaccine manufacturers, many developing countries remain burdened by financial constraints [3–5]. Anticipating the unequal distribution of vaccines across countries, the COVID-19 Vaccine Global Access (COVAX) facility—a global allocation mechanism—was established in April 2020 [6]. This facility allows developing countries to purchase vaccines at subsidized prices.

Although the provision of subsidized vaccines is undeniably important for these countries, the facility faces a critical issue in the effective distribution and deployment of vaccines to citizens [7]. To address this issue, it is essential for national and local governments to develop data infrastructures that promptly identify and allocate vaccines to eligible individuals by priority groups. Strong coordination with local institutions is also required to ensure the timely distribution of vaccines [1]. Furthermore, previous studies demonstrate that citizens' low trust in the government is a key driver of vaccine hesitancy [8, 9]. These arguments suggest the importance of good governance of national/local governments in achieving high vaccination coverage among its citizens. Nonetheless, to the best of our knowledge, there is no current evidence in the literature to support this notion.

Thus, the goal of this study was to examine whether good national governance facilitates the prompt and effective vaccination of citizens. The results of this study enable us to discuss appropriate interventions to boost vaccination, particularly in developing countries. Specifically, if good governance plays a pivotal role, developing countries should significantly benefit from logistical and administrative support from COVAX in addition to the subsidized vaccines.

2. Methods

2.1. Sample

The sample comprised 167 countries, excluding 11 countries that produce authorized vaccines, namely the United Kingdom, United States, Germany, China, Russia, Cuba, India, Kazakhstan, Taiwan, Uzbekistan, and the Netherlands. The origin of the vaccine manufacturer is elicited from *the COVID-19 Vaccine Tracker website*, except for Pfizer/BioNTech, which does not report any specific country name. We alternatively defined vaccine origin based on the location of the headquarters.

2.2. Measures

Vaccination Outcomes

Three types of vaccination outcomes were used as dependent variables: the number of days until the administration of the first vaccine dose in the country since December 31, 2019 (when the WHO China Country Office was informed of cases of pneumonia of unknown etiology detected in Wuhan City, China), the number of doses implemented per hundred citizens as of July 30, 2021; these data come from *Our World in Data* [5]. The third outcome was seven binary indicators which take unity if each of the major vaccines are approved and used in the country, and zero otherwise. The major vaccines include

Oxford/AstraZeneca, Pfizer/BioNTech, Moderna, Johnson&Johnson, Sputnik V, Sinopharm/Beijing, and Sinovac. Data on the third outcome were obtained from the *COVID-19 Vaccine Tracker website* [10].

Governance Index

The national governance data was obtained from *the Worldwide Governance Indicators*, which consist of six indicators in 204 countries: 1) voice and accountability; 2) political stability and absence of violence; 3) government effectiveness; 4) regulatory quality; 5) rule of law; and 6) control of corruption [11]. These are frequently employed in the literature on national governance [12]. We elicited the indices as of 2019—the latest values in the dataset. Standardized indices were used for the empirical analyses (mean = 0, SD = 1).

Controls

This study also used the cumulative number of confirmed cases as of July 30, 2021, the population size as of 2020, GDP per capita in the most recent year available, and binary indicators of member countries of the OECD and the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) as of 2021. The first three variables were obtained from *Our World in Data*, while the data on OECD and ICH membership come from the official website of each organization.

2.3. Statistical Analysis

First, for data reduction, we performed a principal component analysis using the items for national governance. Following the Kaiser-Harris criterion, we retained components with eigenvalues greater than one. The obtained composite index was standardized (mean = 0; SD = 1).

Second, an ordinary least squares (OLS) regression was conducted to examine the cross-country association between national governance and two outcome variables on vaccination—days until the administration of the first dose in the country and the number of doses per 100 citizens. Specifically, these outcomes were regressed on the composite governance index, GDP per capita, population size, indicator of ICH member countries, and the cumulative number of confirmed cases. Results are reported as OLS coefficients with 95% confidence intervals (95% CIs).

Third, to explore which component of governance plays a central role, we regressed the outcomes on individual governance indices separately.

Fourth, to test the heterogeneous patterns across vaccine manufacturers, multivariate logistic regression analysis was conducted for the seven major vaccines. The dependent variables were binary indicators of whether the country approved and used the vaccine. Results from regression analyses were reported as odds ratios (ORs) with 95% CIs.

We compared the results from the model using all countries (N = 167) and the model including only non-OECD countries (N = 133) throughout the analyses. All analyses were performed using the Stata 17.

3. Results

3.1. Sample Characteristics and Principal Component Analysis

Table 1 shows that 35 out of 167 sample countries (21%) participated in ICH. In the average country, over 200 thousand people were confirmed to be infected, and 46 doses were administered per 100 citizens as of the end of July 2021. On average, it took 420 days to administer the first dose since December 31, 2019. Oxford/AstraZeneca was the largest vaccine supplier, which distributed vaccines to 83% of the countries.

The results of the principal component analyses are reported in Table A1. The Kaiser-Harris criterion suggested that we keep the first component (eigenvalue = 5.078), which explained 84.6% of the variation in the original indicators. The rule of law demonstrated the highest factor loading, followed by government effectiveness.

Table 1
Summary Statistics

Variable			Source
Country Characteristics			
Mean government effectiveness, y (SD)	0.00	(1.00)	Worldwide Governance Indicators
Mean voice and accountability, y (SD)	0.00	(1.00)	Worldwide Governance Indicators
Mean political stability, y (SD)	0.00	(1.00)	Worldwide Governance Indicators
Mean regulatory quality, y (SD)	0.00	(1.00)	Worldwide Governance Indicators
Mean rule of law, y (SD)	0.00	(1.00)	Worldwide Governance Indicators
Mean control of corruption, y (SD)	0.00	(1.00)	Worldwide Governance Indicators
Mean composite governance index, y (SD)	0.00	(1.00)	Authors' calculation
Mean GDP per capita in the most recent year available (1000 USD), y (SD)	18.19	(19.51)	Our World in Data
ICH member, n (%)	35	(21.0)	ICH Official Website
Mean cumulative confirmed cases as of July 30, 2021 (1000 people), y (SD)	205.47	(585.45)	Our World in Data
Mean population in 2020 (million), y (SD)	24.50	(42.90)	Our World in Data
OECD member, n (%)	34	(20.4)	OECD Website
Vaccination Outcomes			
Mean days until the first dose since December 31, 2019, y (SD)	419.98	(44.41)	Our World in Data
The mean number of doses per 100 citizens as of July 30, 2021, y (SD)	46.22	(44.73)	Our World in Data
Oxford/AstraZeneca (UK), n (%)	138	(82.6)	COVID-19 Vaccine Tracker

Variable			Source
Pfizer/BioNTech (US and Germany), n (%)	86	(51.5)	COVID-19 Vaccine Tracker
Moderna (US), n (%)	55	(32.9)	COVID-19 Vaccine Tracker
Johnson&Johnson (Netherlands, US), n (%)	49	(29.3)	COVID-19 Vaccine Tracker
Sputnik V (Russia), n (%)	60	(35.9)	COVID-19 Vaccine Tracker
Sinopharm/Beijing (China), n (%)	55	(32.9)	COVID-19 Vaccine Tracker
Sinovac (China), n (%)	35	(21.0)	COVID-19 Vaccine Tracker
Observations	167		

3.2. Regression Results

Figure 1 presents the impact of national governance on the number of days until the administration of the first dose of vaccines. The estimation results are presented in Tables A2 and A3 in Additional File 1. The full sample result depicted at the top of the figure demonstrates that a one standard deviation increase in the composite governance index leads to earlier administration of the first dose in the country by 9.1 days (95%CI: -15.76, -2.43). The impact of governance increased up to 11.4 days (95%CI: -19.46, -3.31) for non-OECD countries. Among the original governance indices, government effectiveness demonstrated the largest association, followed by political stability.

Figure 2 depicts the impact of governance on the number of doses per 100 citizens as of the end of July 2021. The estimation results are presented in Tables A4 and A5 in Additional File 1. The observed patterns are comparable to those in the previous figure. In the full sample model, a one standard deviation increase in governance was associated with a 12.1 dose (95%CI: 4.76, 19.34) increase per 100 citizens. The association was larger (13.0 doses, 95%CI: 5.31, 20.68) for the non-OECD sample, and governance effectiveness demonstrated the largest association among the original indices.

Figure 3 illustrates the heterogeneous patterns of vaccine supply across the manufacturers. Three out of seven manufacturers: 1) Oxford/AstraZeneca; 2) Pfizer/BioNTech; and 3) Sinovac, supply vaccines to countries with better governance. In contrast, Sputnik V is distributed to countries with poor governance.

Finally, we confirmed the disparity in access to vaccines between wealthy and developing countries (Tables A2–A5). Even in the estimation results by vaccine manufacturers, none of the manufacturers showed significantly negative coefficients of GDP per capita (Tables A6 and A7 in Additional File 1). ICH member countries were more likely to administer Pfizer/BioNTech, Moderna, and Johnson&Johnson, and

achieve better vaccination performance overall, while non-ICH members were more likely to administer Sputnik V, Sinopharm/Beijing, and Sinovac.

4. Discussion

Findings from this study show that good national governance plays a pivotal role in facilitating vaccination in the country. Notably, the impact is larger for non-OECD countries. Additional analyses suggest that government effectiveness and political stability among the governance indicators are influential factors in driving the results. We also found robust patterns in which poorer countries had poorer access to vaccines. In addition, none of the major vaccine manufacturers distribute their products intensively to developing countries. Moreover, an intriguing difference was found between Pfizer/BioNTech and Sputnik V. Although both vaccines are distributed in high-income countries, the former targets ICH countries with a better governance index, while the latter is distributed in non-ICH countries with poorer governance.

This study contributes to the literature on the role of national governance in epidemic control. Although studies [3–5] have documented the unequal distribution of vaccines between wealthy and developing countries, other macro-level determinants of vaccination outcomes are not well understood. This study bridges this gap in knowledge. To the best of our knowledge, this is the first study to provide evidence on the role of national governance in the global distribution of COVID-19 vaccines.

This evidence is relevant, given that there is no current consensus on whether authoritarian regimes perform better than democratic regimes in epidemic control. On the one hand, studies show that authoritarian governments performed better during the initial period of the COVID-19 pandemic, as they could legally keep citizens' behavior under surveillance and enforce social-distancing requirements [13]. On the other hand, there is also evidence that lower reported deaths in authoritarian countries may be driven by data manipulation [14]. This study contributes to this argument by adding new evidence that, during the later stage of vaccination administration and achievement of herd immunity, countries with better governance, mostly democratic regimes, have an advantage. Notably, this is in line with previous studies that have demonstrated a positive relationship between democracy and health [15–17].

5. Conclusion

Policy implications can be derived from our findings. COVAX currently underscores the importance of providing subsidized vaccines to developing countries. However, this may not be enough to increase vaccination coverage in the countries; given their poor governance level, they may still face difficulties in facilitating the domestic deployment of vaccines to citizens. This issue may be particularly crucial in rural areas of countries that suffer from both poor local governance and a lack of public health infrastructure, suggesting that geographically and economically vulnerable areas in developing countries are left behind in the current approach. Furthermore, it may cause serious problems, even in developed countries. Incomplete vaccine coverage facilitates the emergence of COVID-19 variants, which may lower the

efficacy of currently available vaccines. Therefore, to address these issues, COVAX should also provide logistical and administrative support to developing countries, in addition to subsidized vaccines.

Abbreviations

COVAX: COVID-19 Vaccine Global Access

COVID-19: coronavirus disease of 2019

ICH: International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests

No relevant conflicts of interest.

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Authors' contributions

Equal contribution.

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Figures

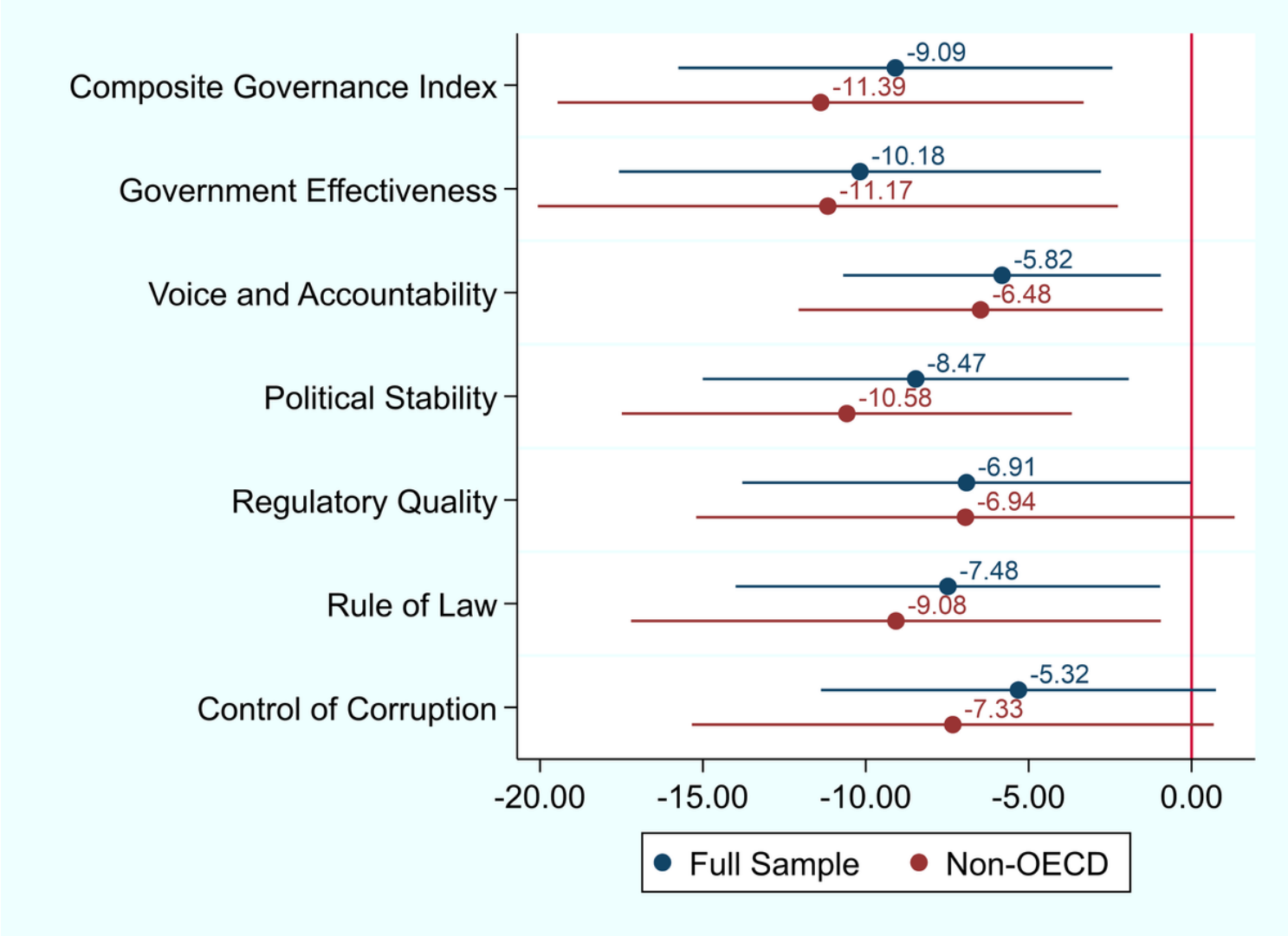

Figure 1

The Impact of National Governance on the Days until the First Dose. Note: The point estimates and 95% confidence intervals are depicted.

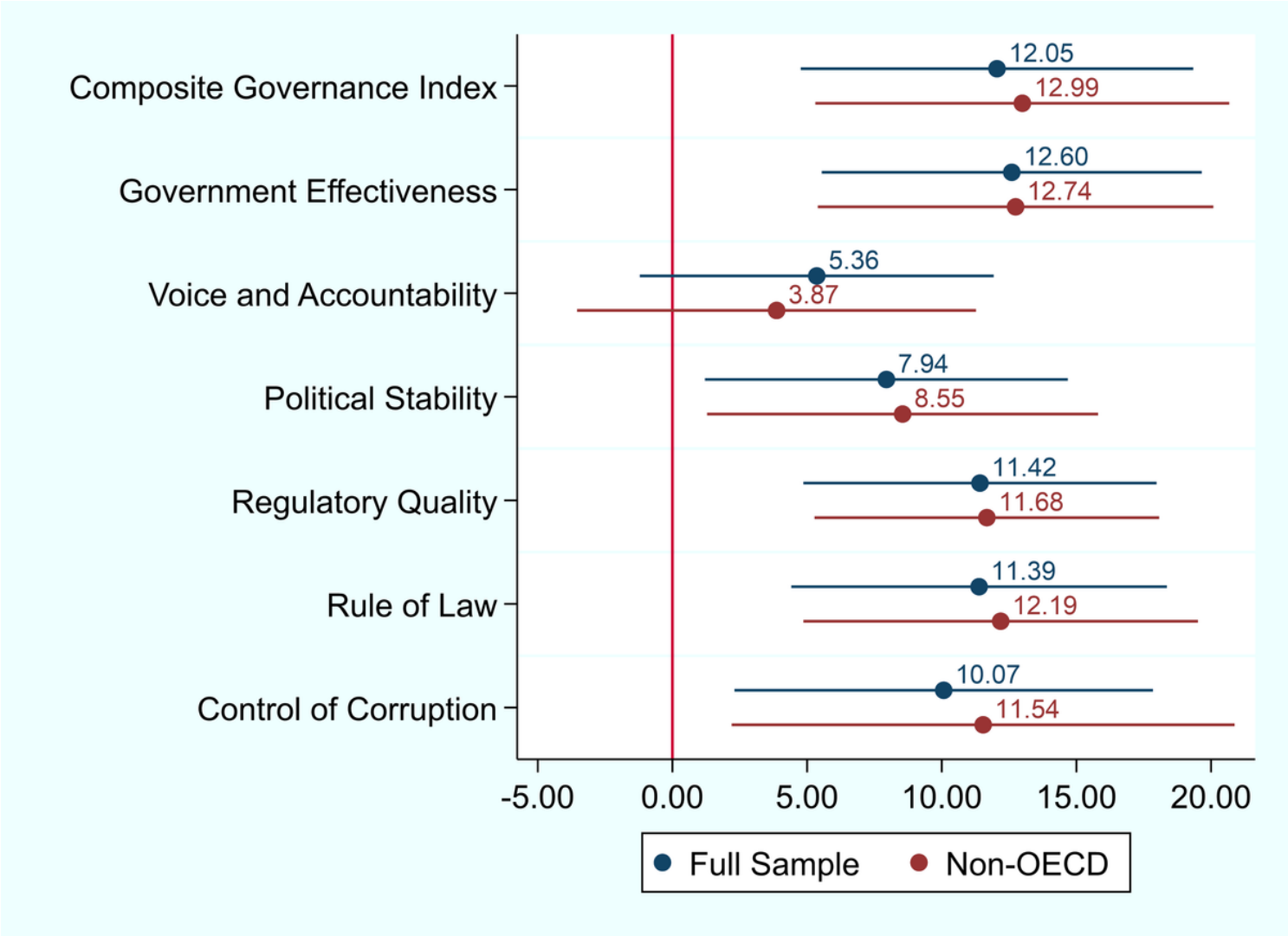

Figure 2

The Impact of National Governance on the Number of Doses per 100 Citizens. Note: The point estimates and 95% confidence intervals are depicted.

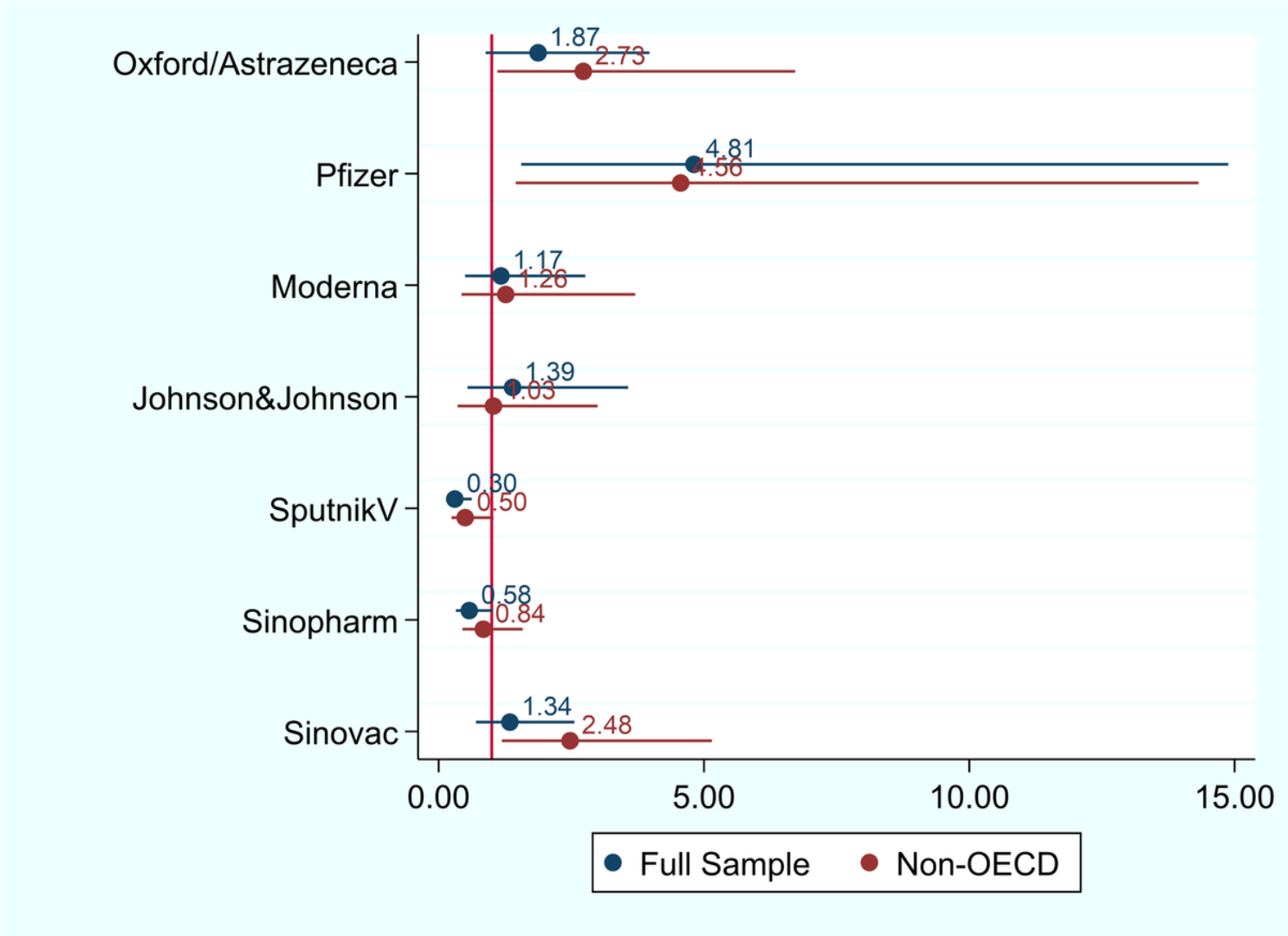

Figure 3

The Impact of National Governance by Vaccine Manufacturers. Note: The point estimates and 95% confidence intervals are depicted.

Supplementary Files

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- AdditionalFile1.docx