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Citizenship, Rights, and Human Security

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The Impact of Purchasing Power Parity (PPP), Infrastructure, and Decentralization on Pandemic Restrictions

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Abstract:

This research compares a country's mandate to shift to remote work between the federal and regional levels in comparison to PPP. We focus on how economic factors determine a country's ability to move to remote work and at what level of government the decision is made. The findings suggest that while there was variation in which level of government issued work-from-home requirements, there were strong trends for most mandates to come from the federal level. Moreover, an overwhelming majority of countries issued such federal mandates regardless of PPP. We then compare PPP per capita and the stringency of public transportation restrictions in low-income countries, expecting that countries with lower PPPs would have the incentive to keep public transportation available. At higher PPPs, population would likely have more access to technology and the ability to shift to remote work, and they also likely have more access to personal vehicles and rely less on public transportation. The findings show low correlation, but there are notable trends in the data. Our research suggests that there is room for further exploration with a broader range of observations and controls, including political and institutional controls. Additionally, we query whether countries with empowered sub-national governments saw more policy decisions on the regional level rather than the national one. Our findings here are generally null but open the door for future research on regional policy autonomy in unitary systems and potential decision space thresholds for crisis response.

Key Words:

COVID-19 Restrictions, Public transportation, Work From Home, Sub-national governments, United States, China, Russia, Mexico, Pakistan, New Zealand

1. How COVID-19 Shaped Crisis Mitigation Around the World

What are the qualities of a country that determine the response and realities of its authorities and people during a crisis? The COVID-19 pandemic forced countries worldwide to implement various public health measures to curb the spread of the virus. Countries enacted various policies with many common staples, such as mask mandates. While crucial for public health, these measures also had significant economic and social impacts. This research explores the complex interplay and possible path dependency between three key areas: governance structures, economic factors, and public health considerations. Some critical factors under the microscope will be levels of regional authority, structural infrastructure, and online infrastructure.

Our analysis focuses on three primary hypotheses. The first examines the relationship between economic development and remote work adoption. We hypothesize that countries with higher PPPs and a greater shift to remote work experienced stricter restrictions on public transportation. This is because a stronger economy facilitates a smoother transition to remote work; moreover, distinguishing between regional and national mandates gives us a clearer image of where decision space was given regarding COVID policies.

The second hypothesis delves deeper into the economic factor, specifically focusing on the link between PPP per capita and public transportation restrictions in low-income countries. We propose that countries with lower PPPs likely implement less stringent restrictions on public transportation. This could be due to limited access to technology, remote work opportunities, and a higher dependence on public transportation due to fewer personal vehicles.

The final hypothesis explores the role of governance structures. We hypothesize that countries with empowered sub-national governments witnessed more regional-level policy decisions regarding public health measures. Here, we explore if being empowered during a crisis inherently leads to proactive policy within this decision space, deepening our understanding of such by identifying trends.

This research aims to examine relationships between economic development, public health considerations, and governance structures in shaping COVID-19 policy responses by testing these hypotheses. Furthermore, for the hypotheses surrounding the measure of wealth, we decided to use PPP as opposed to GDP per capita, as PPP helps to give a more comprehensive and standard understanding of countries' financial situations. As seen during the pandemic, many countries that were less wealthy were more likely to see-saw between immediate catastrophic extremes, and we hoped to mitigate these by using PPP based in 2017. Additionally, the first two hypotheses present data originally collected from the PPI Data Set. The PPI Data Set contains various countries and their COVID-19 policy responses (shown through regional policy

variables, national policy variables, and variables on both levels) – this information is used to create the "Protective Policy Indiex" demonstrated in the data set. However, the values have been modified for the specific parameters. In the original data set, each variable had a value between 0 and 1 for each day of the year. To facilitate the analysis we needed, the values were collected and summed up for the entire year, resulting in the larger values in the table. Understanding these relationships can inform future pandemic preparedness and response strategies, ensuring a more holistic and effective approach to public health emergencies.

Codebook: PLSC 485O: Final Codebook

2. Main Argument and Relative Literature

As countries forcibly shifted their constituents from in-person operations to working from home, no one truly understood how this change would affect companies on a micro level and whole economies on a macro level. This indefinite shift during the pandemic's early aughts tested the international norms associated with working culture and the strength of the online infrastructures in all countries. To better understand the impacts of this shift, we look towards research during this tenuous period of time.

Sramana Mukherjee and Dushyant Narang, authors of *Digital Economy and Work-from-Home: The Rise of Home Offices Amidst the COVID-19 Outbreak in India*, highlight how working from home, otherwise commonly known as telecommuting, was not an entirely novel idea. Instead, since as early as the 1980s, professionals have already proposed the idea of WFH in order to mitigate traffic congestion and create more flexible working conditions for all. Since the mid-2000s, Mukherjee and Narang suggest that "at least 37% of all companies started offering WFH arrangements by then. As a global trend, estimates indicated that home-based or virtual working started becoming increasingly more popular over time, especially in the UK, where it had more than doubled in popularity in 8 years to 2.4 million employees working from home, and in the USA, where it grew between 11 and 20% per year, representing over 20 million employees employed in WFH (Mukherjee and Narang, 2023)." The research from these authors suggests that WFH has been a feasible and trending idea, especially in the Asia and Pacific Island (APAC) region, as the burgeoning economies have been able to support this shift. However, this creates the question. What occurs in countries without strong economies or with low-wage workers?

Mariana Viollaz's *Does Working From Home Work in Developing Countries?* study investigates the feasibility and implications of remote work in developing countries. Viollaz found that opportunities for remote work are scarcer in developing countries compared to developed countries, owing in part to limitations in infrastructure and the nature of work itself. While some occupations, such as call centers, could be performed remotely with appropriate

technology, many jobs necessitate physical presence, like operating industrial machinery (Viollaz, 2022). The study highlights both the potential benefits and drawbacks of remote work, including its impact on work-life balance, productivity, and worker satisfaction. The possibility of a hybrid work model, combining remote and in-person work, is suggested as a potential solution. However, it is evident that there is a significant disconnect between high PPP countries and lower ones in terms of capacity for online infrastructure.

When it comes to observing COVID-19 response policies, many aspects must be considered. Different countries experienced wildly different circumstances that shaped their reactions to the situation. When observing low-income countries with relatively low PPPs per capita, there must be some ways to categorize how their responses differed from those of developed countries. One such categorization could be to observe public transportation restrictions. While personal vehicles may be highly available to the general public in countries with high PPPs, and thus, not having access to public transportation was a smaller problem, we must observe how countries with lower access to private vehicles handled the situation.

In *Dealing with Impact of COVID-19 on Transportation in a Developing Country: Insights and Policy Recommendations*, the effect of COVID-19 on transportation in Lagos is observed. In the context of Lagos, Nigeria, the transportation system faces many challenges, such as inadequate infrastructure and heavy dependence on road transport. Despite the infrastructure being posed to favor private vehicles, there is a limited availability of personal transportation; this creates a greater need for public transportation. (Mogaji et al.) During the pandemic, issues like financial sustainability for transport operators and compliance with safety guidelines further emphasized the significance of public transport in providing essential services to commuters in regions with low access to personal vehicles. This paper delves into policy recommendations that consider the importance of ensuring efficient and accessible transportation to the public while also maintaining safe and healthy standards.

The information in Mogaji's article is reinforced by *Impact of COVID-19 on public transport usage in an anticipated 'new normal' situation: The case of a South Asian country based on first wave data*. This paper discusses trends in public transportation usage during the COVID-19 pandemic. It highlights that low-income groups were the most likely to continue using public transportation despite social distancing and quarantine restrictions. This was largely due to the lack of affordable alternatives (Zafri et al.) The unavailability of alternative transportation in countries with low PPPs per capita could potentially lead to lower restrictions on public transportation, despite risks, in order to accommodate the reliance on public transport by lower-income people. This information is further backed up by *Willingness to pay for COVID-19 mitigation measures in public transport and paratransit in low-income countries*, which highlights the importance of transportation availability in developing countries. This article talks about how, due to the pandemic, health becomes a larger consideration for travel

rather than time or efficiency. People who don't have access to private vehicles are still in need of mobility but are fearful for their health. (Bwambale et al.)

During the COVID 19 pandemic, various countries adopted different strategies to combat the pandemic. Protective policies and strategies on a microlevel such as mask mandates and school closures are heavily discussed. However, observing macrotrends (and realities) such as style of governance is also essential to understanding crisis management within a country. Whether a country is a federalist or unitary state is likely to play a role in how protective policy was carried out/distributed during the pandemic.

A country that is considered to be the standard of how a unitary state should have responded during the pandemic is Vietnam. An analysis of its success during the pandemic was carried out by Kris Hartley, Sarah Bales, and Azad Singh Bali from Policy Design and Practice, noted several key factors: "command-and-control governance, extensive preparation, fostering cooperative sentiment and solidarity, political readiness and communication, policy coordination, and adaptation." Another notable aspect of Vietnam was a high level of community engagement and buy-in to protective policy. Vietnam, being a unitary government, enacted policy horizontally but efficiently. This was possible due to the efficiency of more local apparatus (Hartley, Bales, Bali, 2021). Essentially, the key takeaway from the case of Vietnam when analyzing protective policy in unitary states is that in order to horizontally apply policy in an effective manner, the country must have strong administrative networks and community buy-in.

An analysis of European federalism during the COVID-19 pandemic done by Yvonne Hegele and Johanna Schnabel provides an analytical framework for multiple avenues of federalist governance. The two dimensions they provide are centralized and decentralized, as well as coordinated and unilateral. In their literature review, they mention that federalist countries that have a decentralized approach enjoy many advantages, such as being more representative of the citizens' needs. However, decentralization in federalist states can lead to collective action problems and a lack of a provision of goods and services (Hegele, Schnabel, 2021). The authors of this paper specifically observed Germany, Switzerland, and Austria and noted a variation of policy approach within these governments.

When discussing decision space, it is impossible to accurately reflect possible realities in a crisis without considering the possibility of "shirking responsibility." Bossert and Beauvais highlight that much of the literature on decentralization and decision space neglects actors having a variety of reasons to leave decisions up to other authorities. Some do it to show solidarity. Some prefer to use higher levels of authority as lightning rods for potentially unpopular policies (Bossert, Beauvais, 2002). The list goes on.

However, an analysis done on countries across Europe by Tomas Bergström, Sabine Kuhlmann, Martin Laffin, and Ellen Wayenberg provides an insightful view of intergovernmental relations and policies during the pandemic. From their work, there were important takeaways. One being that responses that were multilayered rather than centralized proved to be more effective. Their caveat to decentralization being inherently more effective was that the lower levels of authority needed to have vertical avenues to resolve conflict. They emphasized the success of countries with empowered local authorities (Bergström, Kuhlmann, Laffin, M, Wayenberg, 2022). To summarize their work, decentralization and constitutionally protected pathways to resolve conflict were aspects that provided the most effective intergovernmental responses across European countries during the first year of the COVID-19 pandemic. This paper seeks to explore if a more diverse selection of countries follows a similar trend at a regional level and if that inherently means more protective policy in that vein.

This study investigates the interplay between governance structures, economic factors, and public health considerations during a crisis. The first hypothesis examines the relationship between a country's shift to remote work and the stringency of public transportation and school closures. It posits that economic factors influence a nation's ability to adopt remote work, with stricter public health measures implemented in countries with stronger economies. The second hypothesis analyzes the association between PPP (Purchasing Power Parity) per capita and public transportation restrictions in low-income countries. It suggests that lower-income countries are incentivized to keep public transportation operational due to potential limitations in private vehicle access. The final hypothesis explores the impact of empowered sub-national governments on policy decisions. It proposes that regions with greater autonomy witnessed a higher frequency of local-level public health policymaking.

3. Stronger Online Infrastructure in High-PPP Countries Encouraged National Shifts to Remote Work

By exploring the connection between work-from-home requirements on a national and regional scale, in comparison to the PPP in 2017 of these countries, we endeavored to understand the correlation between the wealth of countries and the strength of their online infrastructure based on how countries were able to require working from home. We selected countries for a diverse spread of policy-making in government based on the countries that fit into the rigid criteria of all three hypotheses. We chose to study change over the entire year to see correlation spikes in policies over time, and as such, the data for both WFH requirements, both nationally and regionally, reflect the cumulation of data over the entire year. We looked to compare my findings on WFH requirements regionally and nationally to better understand where the decision space lies in COVID-19 policy decisions over 2020. As there is no specific data for tracking how strong a country’s online connectivity is, we hypothesized that the wealth of nations would

correlate with the strength of online infrastructure. Therefore, the wealthier the country is, the more work-from-home requirements will be mandated.

Table 1: ***2020 PPP (2017 international dollar) compared to Work From Home Requirement (Both Levels, National, Regional) (2020)***

Country Name	**Work From Home Requirements (Nat Avg)**	**Work From Home Requirements (Reg Avg)**	**2020 PPP (2017 international thousands $)**
Argentina	297	0	19.7
China	341	0	16.3
Ecuador	181	242	10.3
Mexico	283	0	18.7
Myanmar	282	0	4.7
New Zealand	127	0	42.0
Pakistan	222	155	5.4
Russia	0	267	26.6
United States	0	33	60.2

Source: Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022).
World Bank Development Indicators, The World Bank.
(Cumulative values calculated by author.)

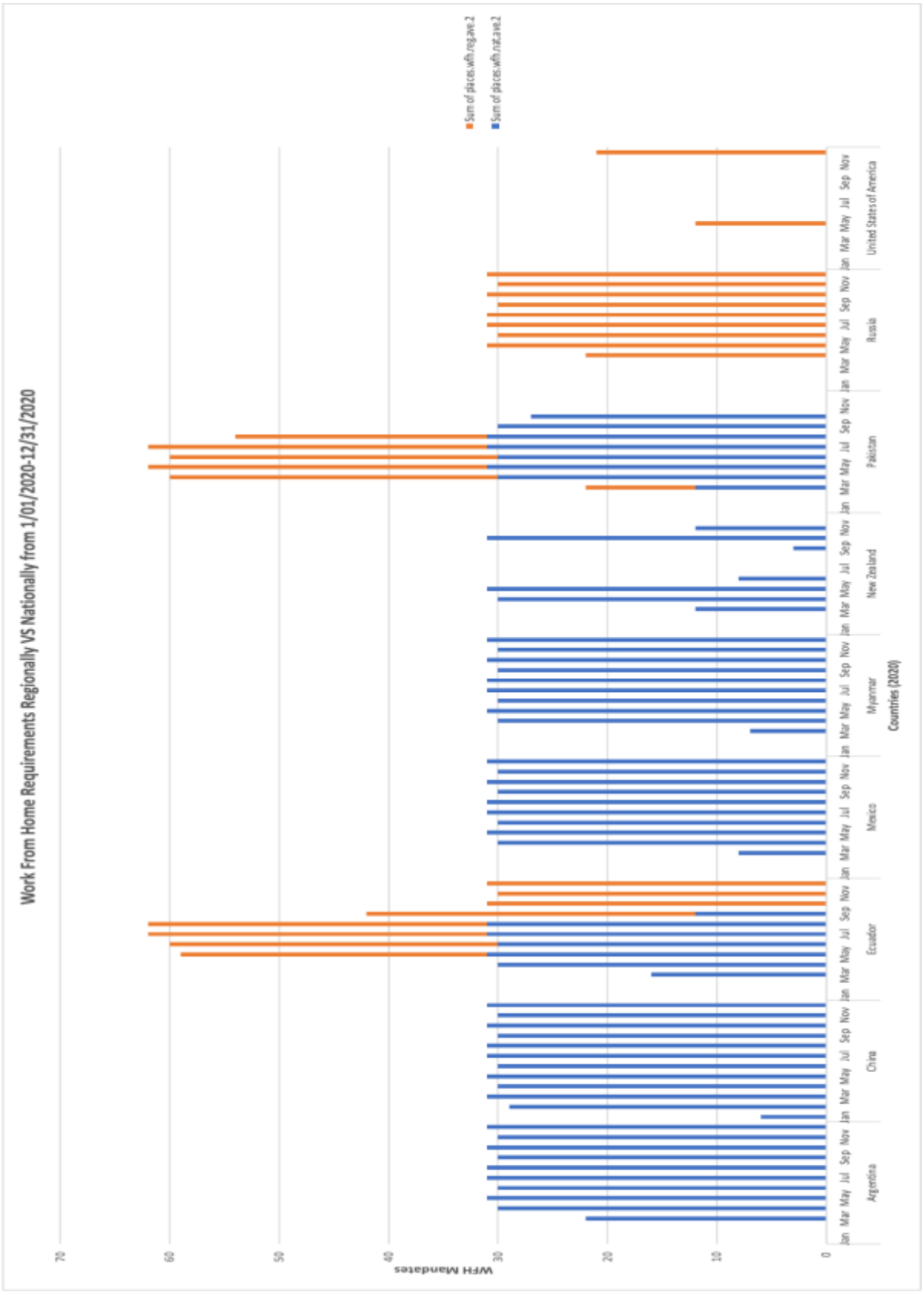

Work From Home Requirements Regionally VS Nationally from 1/01/2020-12/31/2020
Sum of places.wfh.regave2
Sum of places.wfh.natave2
WFH Mandates
0
10
20
30
40
50
60
70
Countries (2020)
United States of America
Russia
Pakistan
New Zealand
Myanmar
Mexico
Ecuador
China
Argentina
Jan
Mar
May
Jul
Sep
Nov

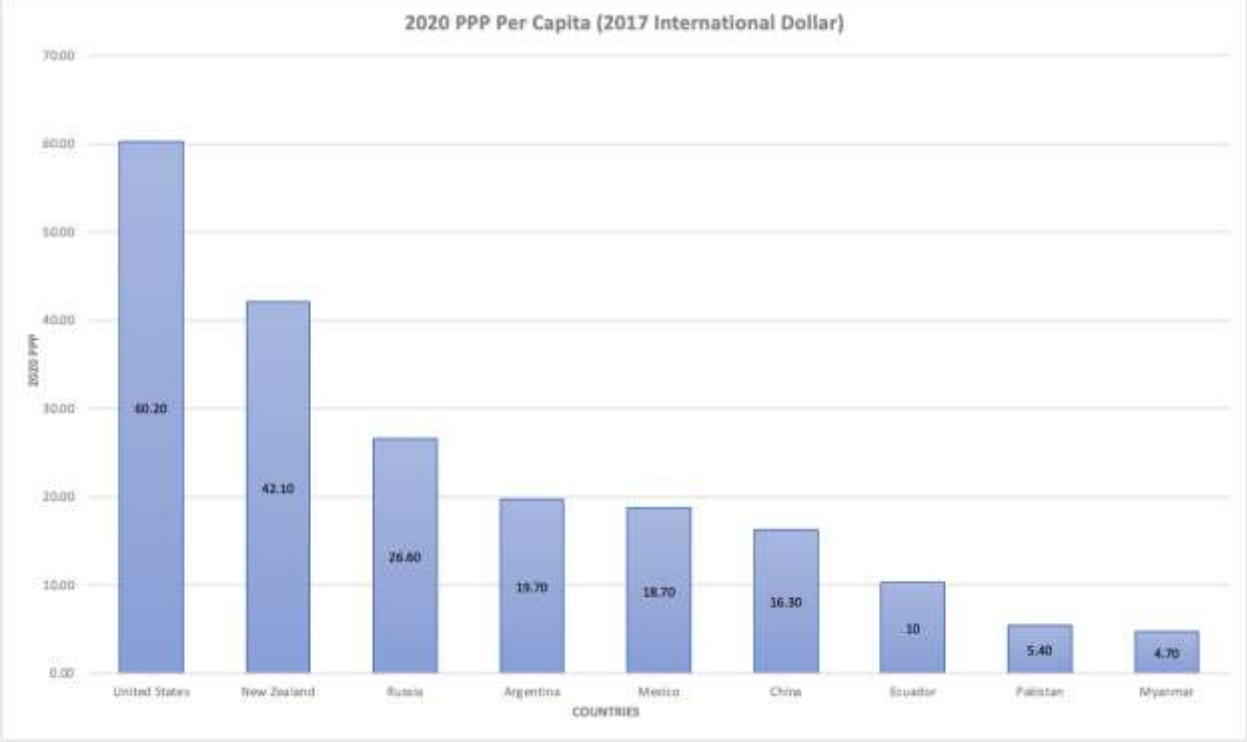
Figure 1a: Work From Home Mandates Regionally VS Nationally over 2020

Source: Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022)

Figure 1a exemplifies the WFH requirements regionally and nationally over 2020. The blue lines represent WFH mandates given nationally, while the orange represents WFH mandates given regionally. This chart shows that while most countries had WFH mandates given nationally, there were outliers like Russia and the United States, where all mandates came from the regional scale. Additionally, Pakistan and Ecuador were the only two countries with a spread of mandates given on a federal and regional basis.

Figure 1b: 2020 PPP Per Capita (2017 International Dollar)

Figure 1b demonstrates the *2020 PPP (2017 International Dollar)* in each of the nine countries from the table for Hypothesis 1 in order of largest *PPP per capita* to lowest.



Source: World Bank Development Indicators, The World Bank.

Figure 1b shows the PPP per capita of each country during 2020. This chart can be broken into three sections of PPP levels: low income, lower middle income, upper middle income, and high income per the World Bank, "The World By Income" graph. High income countries include: the United States and New Zealand. The upper middle income countries include: Russia, Argentina, Mexico, Ecuador, and China. The lower middle income countries include: Pakistan and Myanmar.

The analysis indicates that most countries released work-from-home mandates on the national level, but there were some interesting outliers. For example, the United States and Russia, the first and third highest economies of this study, released mandates all on the regional level. This coincides with the original hypothesis that countries with higher PPPs would have more instances of regional mandates. However, New Zealand, as the second largest PPP in this sample study, released mandates infrequently, all at the federal level. Ecuador and Pakistan were the only countries with a mix of mandates coming from regional and national levels. Argentina, China, Mexico, and Myanmar were the only countries where all the mandates came from at the national level and over the entirety of the year. Some points of future research include identifying how intertwined work-from-home mandates are with other forms of infrastructure, like the strength of public transportation and rates of employment. Additional information on these indicators may prove essential in understanding how regional and federal governments interact to make decisions regarding public health.

4. Lower-Income Countries saw fewer Local Public Transportation Restrictions.

Table 2: 2019 PPP (2017 international dollar) compared to Public Transportation Restrictions (Both Levels, National, Regional) (2020)

Country Name	Local Public Transportation Restrictions (Both Levels)	Local Public Transportation Restrictions (Nat Avg)	Local Public Transportation Restrictions (Reg Avg)	2019 PPP (2017 international $)
Argentina	158.6	158.5	46.3	22071.8
China	17.5	14.8	17.5	15977.8
Ecuador	145.5	145.5	121	11390.2
Mexico	43	0	43	20553
Myanmar	133.4	133	44	5214.4
New Zealand	200.9	177.5	47.2	43272.6
Pakistan	190.2	162.8	154.9	5157.6
Russia	93.6	13	93.3	27254.6
United States	37.88	0	37.9	62470.9

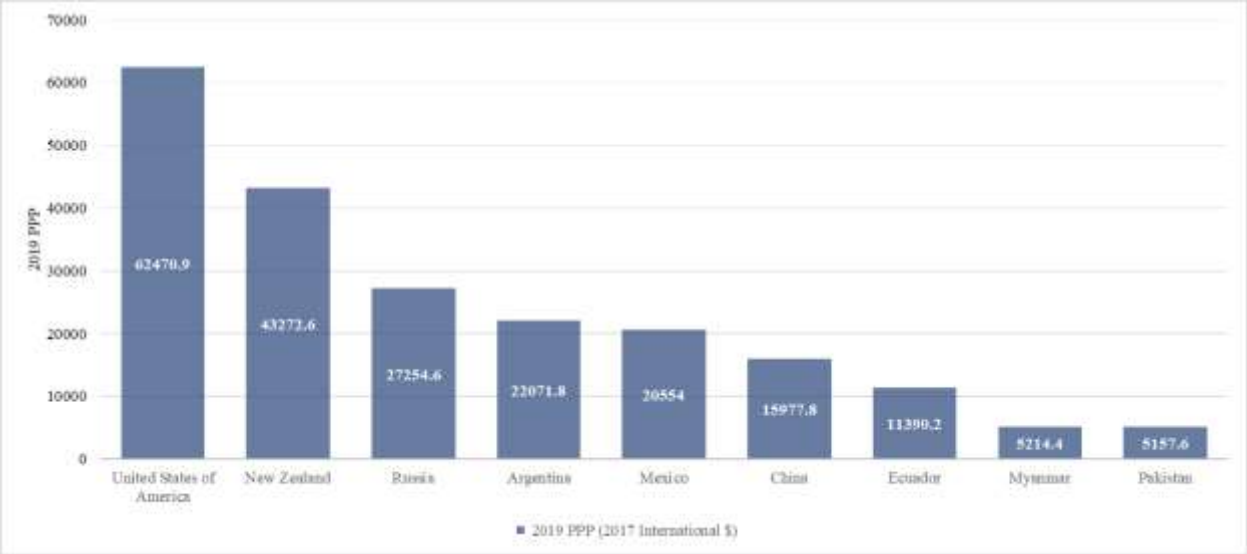
Source(s): Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022).
World Bank Development Indicators, The World Bank.

(Cumulative values and averages calculated by authors)

For the purpose of this hypothesis, we're comparing nine randomly selected countries that each have two qualifiers: data for each month of 2020 and 0< 2020 *Local Public Transportation Restrictions (Both Levels)*. Countries with no data for some months of 2020 or with no data for *Local Public Transportation Restrictions* were not included to ensure an accurate comparison. The values used to represent *Local Public Transportation Restrictions (Both Levels), (National),* and *(Regional)* in this table were collected from the PPI Data Set, but this is not how the values appear in the Data Set. Originally, the variables are represented by a number between 0-1 for each day of the year. For the purpose of this experiment, the values were collected and made cumulative for the year, which is why each of the variables has a much higher value. The countries in this table can be observed through various levels of PPP: low income, lower middle income, upper middle income, and high income, per the World Bank "The World By Income" graph. High-income countries include the United States and New Zealand. The upper-middle-income countries include Russia, Argentina, Mexico, Ecuador, and China. The lower-middle-income countries include Pakistan and Myanmar.

Additionally, this chart focuses on *PPP* from 2019 rather than 2020 because it was skewed after COVID-19 and would not accurately represent the general economic status of a country; it was affected by policy decisions that would not have been made under normal conditions and thus do not accurately portray countries' typical PPP. The PPP based on the 2017 international dollar is used in order to accurately assess the differences in wealth between various countries while accounting for purchasing power amongst countries. This hypothesis operates under the assumption that countries with lower *PPP per capita* have fewer individuals with access to private vehicles and must rely on public transportation for any commute. As such, to maintain a stable economy, countries with lower *PPP per capita* will have kept their *Local Public Transportation Restrictions* low to ensure that individuals can continue to work. There are few visible trends in the data. Five countries made more policy decisions on a national level, while four countries made more policy decisions on a regional level. The level of decision-making does not seem to correlate to *PPP per capita*. Additionally, there do not seem to be any trends between *PPP per capita* and *Local Public Transportation Restrictions*.

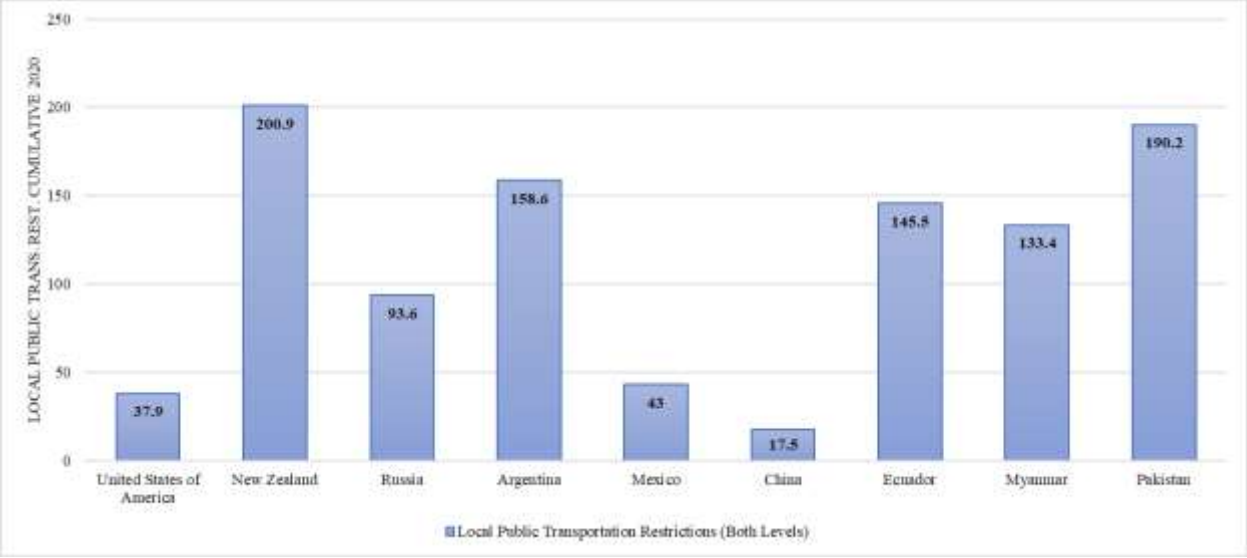
Figure 2a. 2019 PPP Per Capita (2017 International Dollar)



Source(s): World Bank Development Indicators, The World Bank.

Figure 2a demonstrates the *2019 PPP (2017 International Dollar)* in each of the nine countries from Table 2 in order of largest *PPP per capita* to lowest. The data in this graph can be interpreted through three sections of PPP levels: low income, lower middle income, upper middle income, and high income, per the World Bank "The World By Income" graph. High-income countries include the United States and New Zealand. The upper-middle-income countries include Russia, Argentina, Mexico, Ecuador, and China. The lower-middle-income countries include Pakistan and Myanmar. The countries are ordered from largest PPP to lowest.

Figure 2b. Local Public Transportation Restrictions (Both Levels, Cumulative 2020)

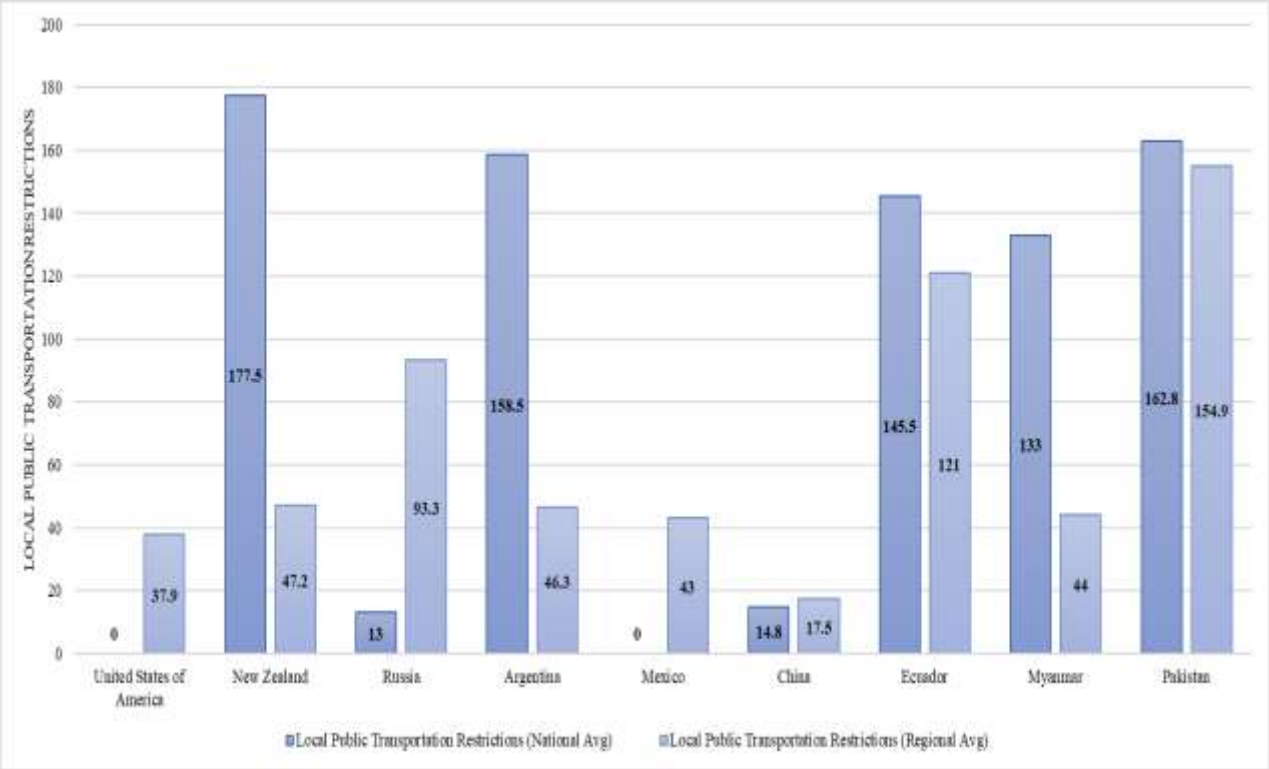


Source(s): Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022).

(Cumulative values calculated by author.)

Figure 2b demonstrates the cumulative level of local public transportation restrictions on both a national and regional level for the year 2020. It essentially shows all local public transportation restrictions implemented in each country during the COVID-19 pandemic in 2020. The countries are placed in the same order as in Figure 2a to make any correlation between variables easier to see.

Figure 2c. Local Public Transportation Restrictions, National vs Regional (Cumulative 2020)



Source(s): Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022).
(Cumulative values calculated by author.)

Figure 2c compares *Local Public Transportation Restrictions* on the *National and Regional Levels, Cumulative 2020* in each of the nine countries from Table 2 in order of largest *PPP per capita* to lowest. Figure 2c demonstrates the comparison between local public transportation restrictions on a national and regional level. This data shows both variables next to each other for each of the countries in the experiment. Figure 2c shows us what level these decisions are made for different countries and if they have any correlation with income level. The countries in this figure are in the same order as the two previous figures. The countries in Figure 2 are in order of largest *PPP per capita (2019)* to lowest in order to more easily compare how the variables correspond.

Although the figures suggest very little correlation between *PPP per capita* and *Local Public Transportation* on any level, there are a few notable trends. The data shows that lower-middle-income countries and the lowest of the higher-middle-income have relatively high levels of *local public transportation restrictions*, particularly at the national level. Countries that fell into high-income and higher-middle-income seemed to fluctuate between very low and very high *local public transportation restrictions.* It is unclear whether *Purchasing Power Parity* has any significant influence on *Local Public Transportation Restrictions.* As for the correlation between decisions made at the regional and national levels, there seems to be room for further research. Certain high-income and higher-middle-income countries, such as the United States and Russia, had little to no transportation restrictions nationally, and policy was primarily made on the regional level. On the other hand, countries with similar income levels, such as New Zealand and Argentina, had much higher national restriction levels. In certain higher-middle-income and lower-middle-income countries like Ecuador and Pakistan there was a large number of decisions made on both levels. Additional variables, such as government structures, can likely be observed to explain these trends.

It is crucial to acknowledge that the data observed within this hypothesis likely represents an incomplete picture. It does not encompass the full spectrum of factors potentially influencing the results. Notably, geographical considerations play a significant role, as local terrain and infrastructure directly impact the availability and nature of work opportunities. Furthermore, the hypothesis does not account for population variances and their distribution. Studying a more geographically defined area with a controlled population demographic could yield different results.

5. Subnational Governments were more active where regional authority was greater pre-pandemic

Table 3:Cumulative Regional Average PPI (2020) and Cumulative Total Average PPI (2020)compared to Country's Regional Authority Index and Regional Policy Autonomy from 2010-2018

Country Name	Total Average PPI (Cumulative, 2020)	Regional Average PPI (Cumulative, 2020)	Country's Average Regional Authority Index From 2010-2018	Country's Average Regional Level of Policy Autonomy From 2010-2018
Argentina	233.10	47.74	23.61	3

Country Name	Total Average PPI (Cumulative, 2020)	Regional Average PPI (Cumulative, 2020)	Country's Average Regional Authority Index From 2010-2018	Country's Average Regional Level of Policy Autonomy From 2010-2018
China	211.47	161.92	15.01	2.03
Ecuador	182.88	127.65	9.70	2.46
Mexico	165.33	59.16	21.18	3
Myanmar	194.44	29.16	11.79	0.87
New Zealand	150.88	40.22	11.00	1
Pakistan	215.69	168.96	26.22	3.80
Russia	189.20	149.72	19.53	1.31
USA	139.26	130.63	29.61	3.81

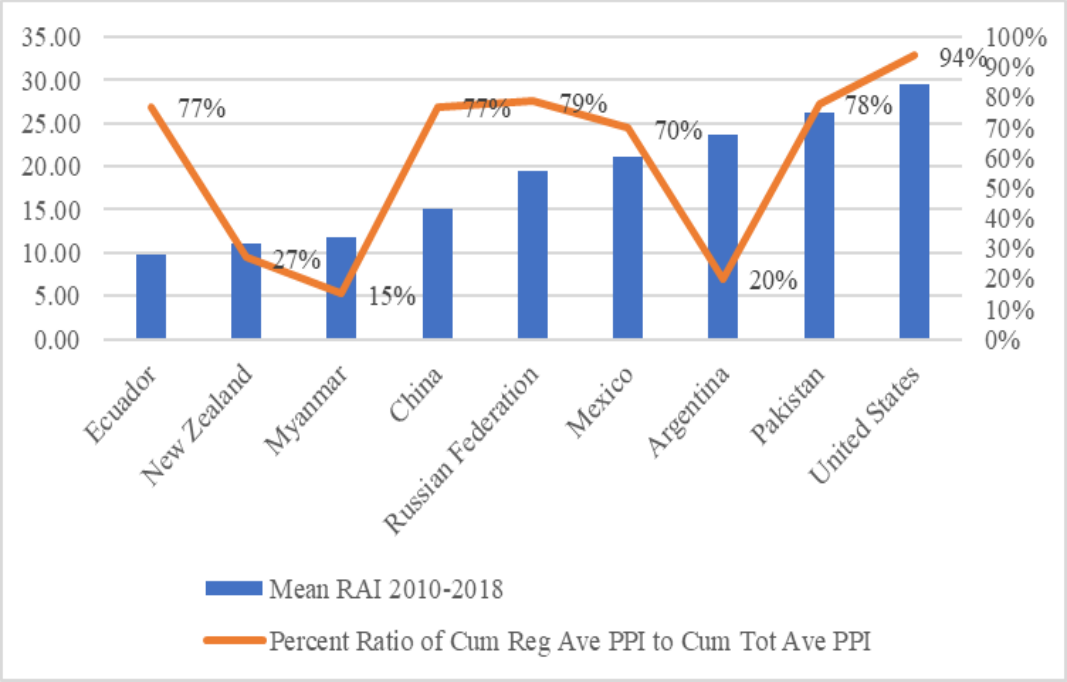
Sources: Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022)
HOOGHE, Elisabeth, MARKS, Gary, SCHAKEL, Arjan H., NIEDZWIECKI, Sara, CHAPMAN-OSTERKATZ, Sandra, SHAIR-ROSENFIELD, Sarah, *Regional authority index (RAI) v.3*, EUI Research Data, 2021, Robert Schuman Centre for Advanced Studies - https://hdl.handle.net/1814/70298
(Cumulative values and averages calculated by authors)

Table 3 displays the data for the nine countries in our sample, describing their different levels of protective policy during the COVID-19 Pandemic and their historical levels of regional empowerment (authority), pre-pandemic. Regional empowerment is measured through both RAI (regional authority index calculated by the European University Institute) and precisely the level of policy autonomy regions have in the listed countries.

Would historically empowered regional authorities lead to more protective policy enacted at the regional level in relation to the total level of protective policy? Answers to this question

deepen our understanding of decision space by understanding how actors at the regional level respond to crises when they are empowered. These countries were chosen to display a variety of socioeconomic conditions, as well as geographic and governmental realities. In line with my hypothesis, we chose a list of countries with varying levels of regional authority to increase validity. This data is sourced from the Regional Authority Index calculated and provided by the European University Institute. Additionally, the specific data on the dimension of policy autonomy is included and tested as a means of zeroing in on policy decisions. If my hypothesis proves correct, we should see a higher ratio of cumulative regional PPI to cumulative total average PPI in countries with higher regional authority and or policy autonomy over 2020. This will be assessed by observing, calculating, and comparing the mentioned ratio with a country's average regional authority (RAI) and level of policy autonomy from the dataset. Higher or lower ratios will be determined by observing the absolute difference between the given country's percentage ratio and 50% in either direction. Higher or lower RAI and level of policy autonomy will be determined by comparing the absolute difference between the given country's average value from 2010-2018 and that of other selected countries.

Figure 3a: Percent Ratio of Cumulative Regional Average PPI to Total Average PPI Compared to Mean RAI 2010-2018

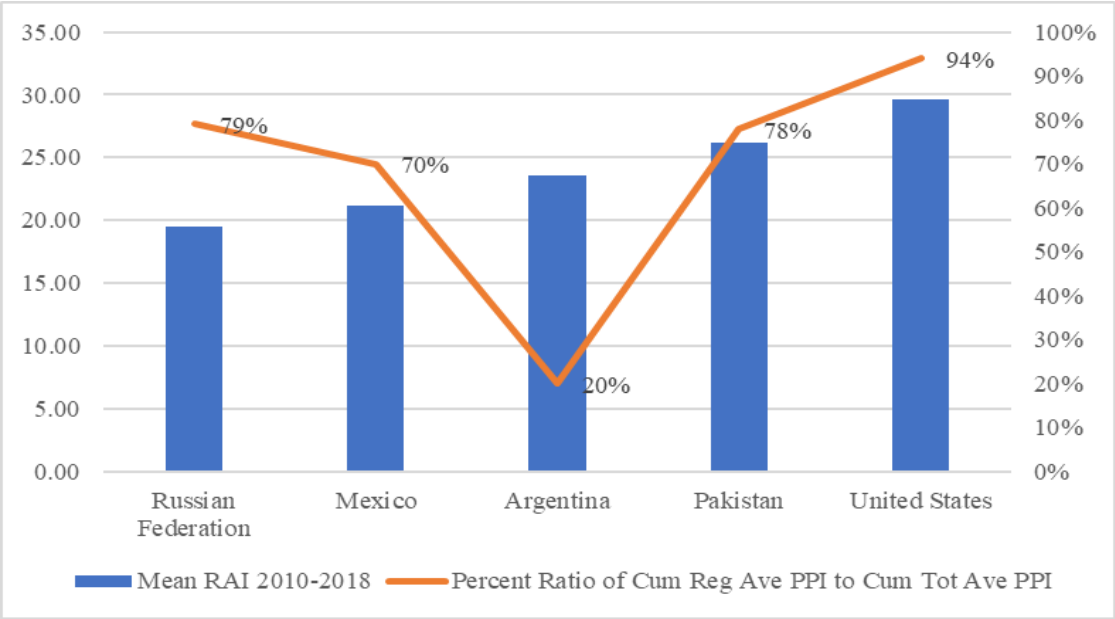


Sources: Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022)
HOOGHE, Elisabeth, MARKS, Gary, SCHAKEL, Arjan H., NIEDZWIECKI, Sara, CHAPMAN-OSTERKATZ, Sandra, SHAIR-ROSENFIELD, Sarah, *Regional authority index (RAI) v.3*, EUI Research Data, 2021, Robert Schuman Centre for Advanced Studies - https://hdl.handle.net/1814/70298

(Percent ratios and averages calculated by authors)

This figure displays the relationship between the percent ratio of cumulative regional PPI to cumulative total average PPI over the year 2020 and a country's average RAI 2010-2018 Each country is ordered from least to greatest Mean RAI 2010-2018

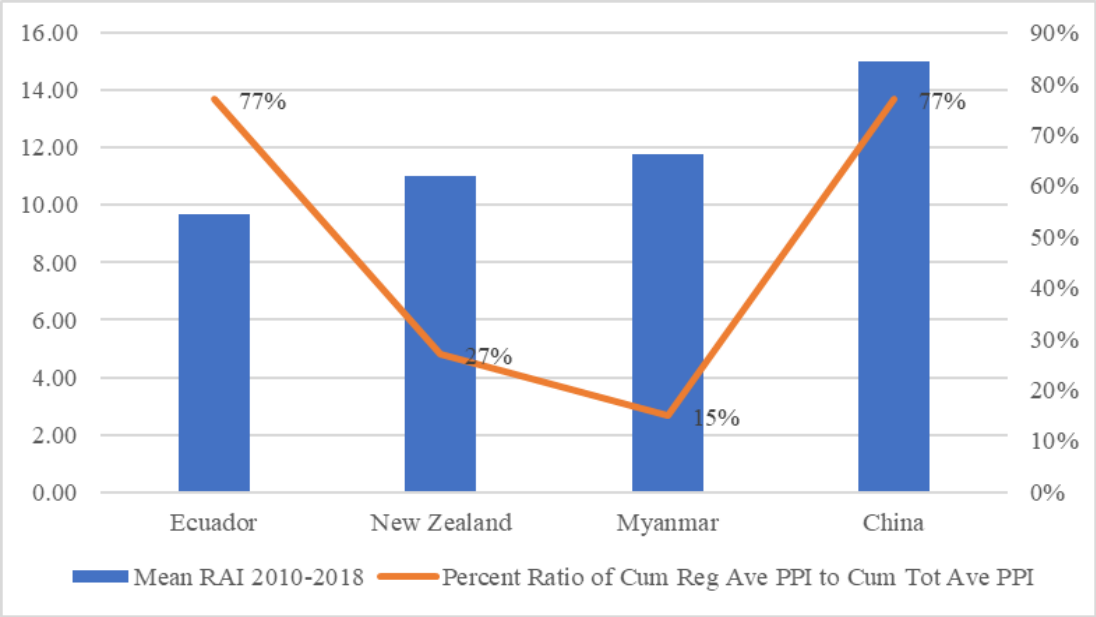
Figure 3b. Percent Ratio of Cumulative Regional Average PPI to Total Average PPI Compared to Mean RAI 2010-2018 in Federations



Sources: Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022)
HOOGHE, Elisabeth, MARKS, Gary, SCHAKEL, Arjan H., NIEDZWIECKI, Sara, CHAPMAN-OSTERKATZ, Sandra, SHAIR-ROSENFIELD, Sarah, *Regional authority index (RAI) v.3*, EUI Research Data, 2021, Robert Schuman Centre for Advanced Studies - https://hdl.handle.net/1814/70298
(Percent ratios and averages calculated by authors)

Figure 3b displays the relationship between the ratio of cumulative regional PPI to cumulative total average PPI over the year 2020 and a country's average RAI from 2010-2018 in federations, ordered from least to greatest average RAI for 2010-2018

Figure 3c. Percent Ratio of Cumulative Regional Average PPI to Total Average PPI Compared to Mean RAI 2010-2018 in Unitary Countries

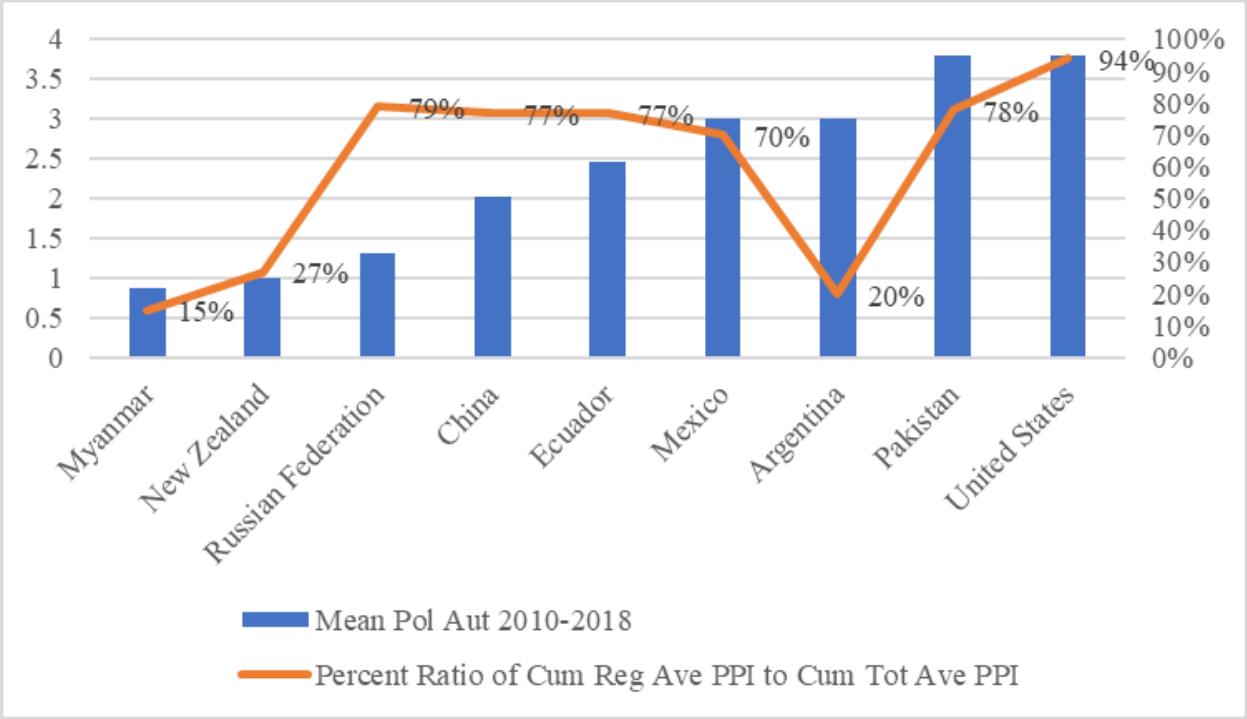


Sources: Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022)
HOOGHE, Elisabeth, MARKS, Gary, SCHAKEL, Arjan H., NIEDZWIECKI, Sara, CHAPMAN-OSTERKATZ, Sandra, SHAIR-ROSENFIELD, Sarah, *Regional authority index (RAI) v.3*, EUI Research Data, 2021, Robert Schuman Centre for Advanced Studies - https://hdl.handle.net/1814/70298
(Percent ratios and averages calculated by authors)

Figure 3c displays the relationship between the ratio of cumulative regional PPI to cumulative total average PPI over the year 2020 and a country's average RAI from 2010-2018 in unitary countries. Countries are ordered least to greatest Mean RAI 2010-2018

Figure 3d. Percent Ratio of Cumulative Regional Average PPI to Total Average PPI Compared to Mean Level of Policy Autonomy 2010-2018

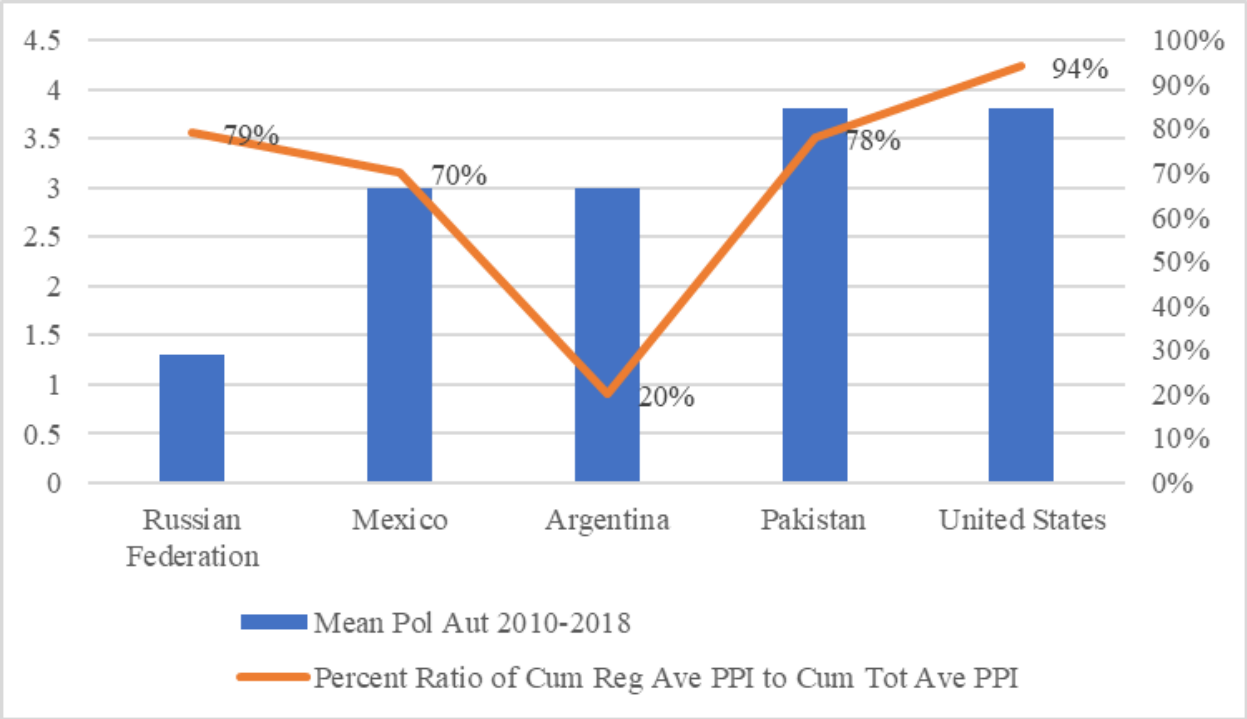
This graph displays the relationship between the ratio of cumulative regional PPI to cumulative total average PPI over the year 2020 and a country's average level of policy autonomy from 2010-2018 from the European University Institute's dataset.



Sources: Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022)
HOOGHE, Elisabeth, MARKS, Gary, SCHAKEL, Arjan H., NIEDZWIECKI, Sara, CHAPMAN-OSTERKATZ, Sandra, SHAIR-ROSENFIELD, Sarah, *Regional authority index (RAI) v.3*, EUI Research Data, 2021, Robert Schuman Centre for Advanced Studies - https://hdl.handle.net/1814/70298
(Percent ratios and averages calculated by authors)

This figure displays the potential relationship between the ratio of cumulative regional PPI to cumulative total average PPI over the year 2020 and a country's average level of policy autonomy from 2010-2018 from the European University Institute's dataset. Countries are ordered from least to greatest mean level of policy autonomy 2010-2018

Figure 3e. Percent Ratio of Cumulative Regional Average PPI to Total Average PPI Compared to Mean Level of Policy Autonomy 2010-2018 in Federalist Countries

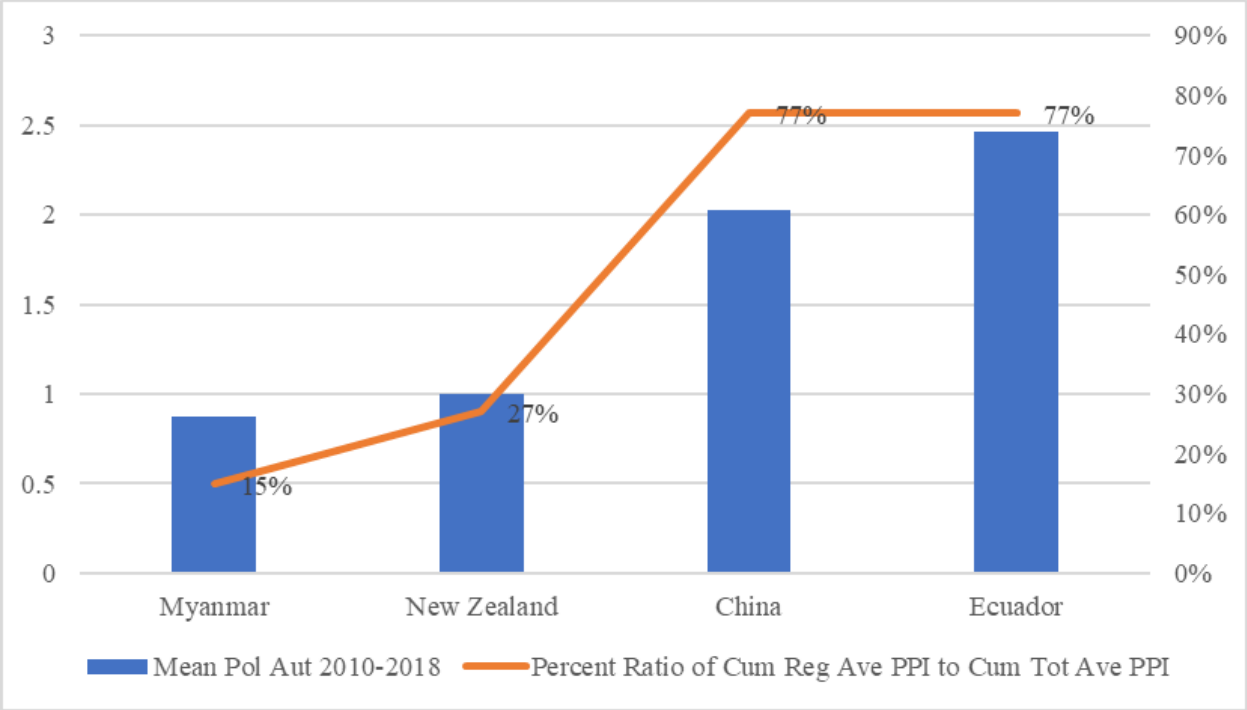


Sources: Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022)
HOOGHE, Elisabeth, MARKS, Gary, SCHAKEL, Arjan H., NIEDZWIECKI, Sara, CHAPMAN-OSTERKATZ, Sandra, SHAIR-ROSENFIELD, Sarah, *Regional authority index (RAI) v.3*, EUI Research Data, 2021, Robert Schuman Centre for Advanced Studies - https://hdl.handle.net/1814/70298
(Percent ratios and averages calculated by authors)

Figure 3e displays the relationship between the ratio of cumulative regional PPI to cumulative total average PPI, averaged over the year 2020 and a country's average level of policy autonomy from 2010-2018 in federations. Countries are ordered from least to greatest mean policy autonomy 2010-2018.

Figure 3f. Percent Ratio of Cumulative Regional Average PPI to Total Average PPI Compared to Mean Level of Policy Autonomy 2010-2018 in Non-Federalist Countries

This graph displays the potential relationship between the ratio of cumulative regional PPI to cumulative total average PPI over the year 2020 and a country's average level of policy autonomy from 2010-2018 in non-federalist countries from the European University Institute's dataset.

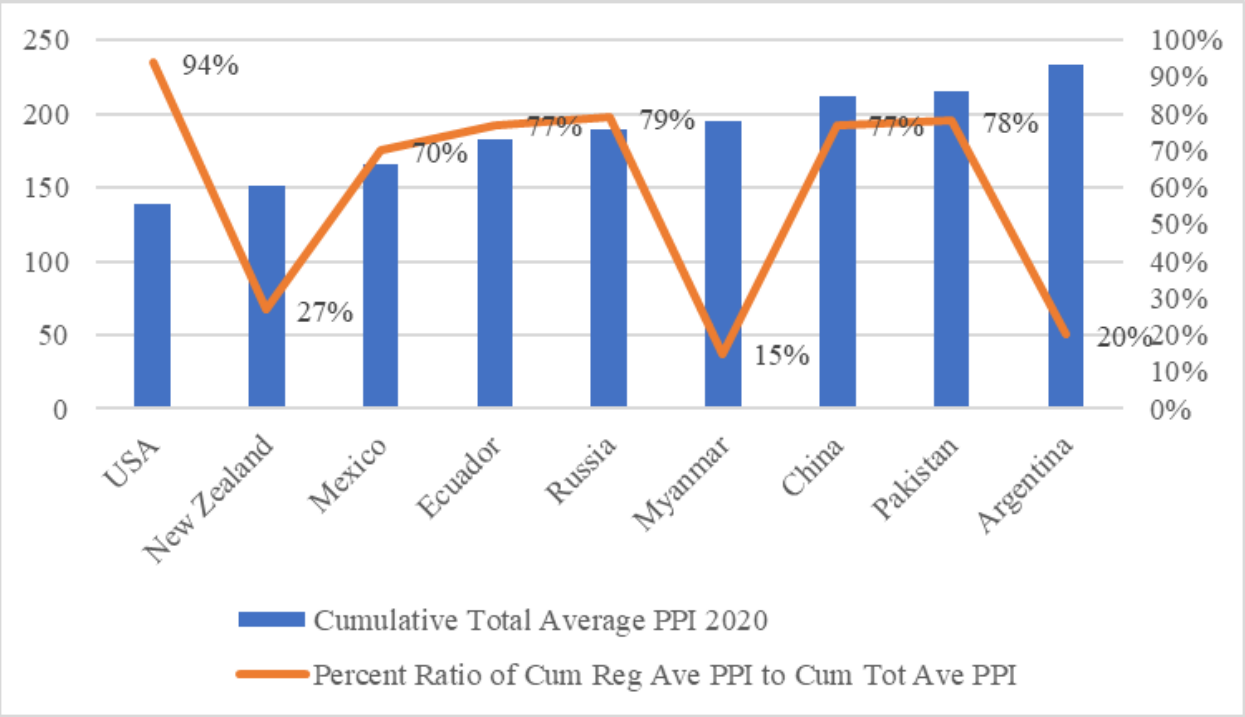


Sources: Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022)
HOOGHE, Elisabeth, MARKS, Gary, SCHAKEL, Arjan H., NIEDZWIECKI, Sara, CHAPMAN-OSTERKATZ, Sandra, SHAIR-ROSENFIELD, Sarah, *Regional authority index (RAI) v.3*, EUI Research Data, 2021, Robert Schuman Centre for Advanced Studies - https://hdl.handle.net/1814/70298
(Percent ratios calculated by authors)

This figure displays the potential relationship between the ratio of cumulative regional PPI to cumulative total average PPI over the year 2020 and a country's average level of policy autonomy from 2010-2018 in non-federalist countries from the European University Institute's dataset. Countries are ordered from least to greatest mean policy autonomy 2010-2018

Figure 3g. Percent Ratio of Cumulative Regional Average PPI to Total Average PPI Compared to Total Average PPI 2020

This graph displays the potential relationship between the ratio of cumulative regional PPI to cumulative total average PPI over the year 2020 and the cumulative total average PPI per country over 2020. This figure is included as a means of providing context as to which countries had more restrictive policy as a whole.



Sources: Institutional Origins of COVID-19 Public Health Protective Policy Response (PPI) Data Set (Shvetsova, O., Zhirnov, A., Adeel, A.B. et al. 2022)
HOOGHE, Elisabeth, MARKS, Gary, SCHAKEL, Arjan H., NIEDZWIECKI, Sara, CHAPMAN-OSTERKATZ, Sandra, SHAIR-ROSENFIELD, Sarah, *Regional authority index (RAI) v.3*, EUI Research Data, 2021, Robert Schuman Centre for Advanced Studies - https://hdl.handle.net/1814/70298
(Percent ratios and averages calculated by authors)

Figure 3g displays the relationship between the ratio of cumulative regional PPI to cumulative total average PPI over the year 2020 and the cumulative total average PPI per country over 2020. This figure is included as a means of providing context as to which countries had more restrictive policy as a whole. Countries are ordered from least to greatest cumulative total average PPI (2020)

This hypothesis was largely incorrect/null, with some noticeable trends. Two markers from the index were used to examine the relationship between regional authority and the ratio of regional average PPI to total average PPI. Regional authority index, or RAI, is the all-encompassing metric for regional empowerment calculated by the European Institute, which did not align with H3. As RAI increased, there was not a consistent increase in the ratio. When accounting for whether a country was federal or unitary, there are no significant trends in RAI in federal or non-federal countries. When the dimension of policy autonomy is examined, the only consistent, observable trend that neatly falls in line with H3 is the relationship between the PPI ratio and the level of policy autonomy observed in non-federalist countries. This proves fascinating because it almost seems to be the opposite of what one might expect. It is entirely

possible that the dynamic between local, regional, and more central authorities played a role. Without the federalist system, actors may have felt an inability to shirk responsibility since there is less "in-between" space between them and the central authorities. In the analysis done on the standard for effective handling of COVID-19 in a unitary state, Vietnam, it was concluded that its success was largely possible as a result of strong community buy-in and local administrative networks. One of the cited pillars of the mentioned "buy-in" was a feeling of unity against the virus, China, and other outside entities/problems. Therefore, it would not be surprising that the more empowered regional and local authorities were in unitary states, the more proactive they would be in keeping with the policy mood. It is also important to note that the countries that were unitary states all had levels of autonomy lower than those of federal states. Once this observation was made, it became apparent that H3 could be generally true in the realm of policy autonomy until the level of. After countries achieve a level of policy autonomy higher than slightly below 2.5, any semblance of a trend that there was disappears.

This hypothesis that a country having empowered regional authorities would lead to a higher ratio of regional protective policy to total protective policy proved to be null. There were few significant trends in my findings. However, this does not mean nothing was gained from this research endeavor. Multiple conclusions can be made. Initially, it was predicted that the unitary/ federalist dynamic would impact findings; however, it seems more likely that the level of regional policy autonomy impacts crisis management in ways not accounted for/ captured in this hypothesis. Further research can be done in this regard. Questions such as, "Is there a provable threshold in which a country's regional level of policy autonomy severely impacts how a country responds to crisis in ways countries below that threshold wouldn't? A country with empowered regions that do not have a high ratio does not mean that the regional authorities did not make decisions. The decision to not act or shirk responsibility is a decision. Being empowered means having autonomy. Regional authorities behaved as actors who saw fit to play the game to their benefit. An optimist could argue that the decision space allowed for them to make or shirk decisions in the best interest of that particular region. A pessimist could argue otherwise. Regional authorities working within unitary systems were more proactive with respect to their level of policy autonomy. Was it a sense of responsibility? Did they feel as though the eyes of their constituents were on them? Or was it a trend not assessed by the hypothesis having to do with the level of policy autonomy rather than a style of governance? Other methods of researching this question may involve tweaking sample countries, or what other data from regional authority indexes could be used to measure variables. Overall, these results leave the door open for future research on regional empowerment in unitary systems.

6. Conclusion

The countries we selected to observe for our hypotheses were sifted through a strict set of criteria in order to accommodate all of the different variables; as a result, we only have a limited

sample of countries. This likely affected our results, which may have shown different observations had we been able to use a larger sample.

This paper investigated the complex interplay between governance structures, economic factors, and public health considerations in shaping COVID-19 policy responses. We explored three primary hypotheses, examining the relationships between economic development and remote work adoption, PPP per capita and public transportation restrictions, and empowered sub-national governments and regional-level policy.

The analyses of these hypotheses yielded low results. While the proposed relationships hold merit, definitive connections between the variables could not be established. This is likely in part due to the limitations of the country sample. Further research with more comprehensive data and a broader scope could clarify how governance, economic realities, and public health considerations influence policy decisions during pandemics. Additionally, qualitative studies exploring the decision-making processes within governments could offer valuable insights.

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