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Government Support and Institutions' Intermediation throughout Companies' Adaptation to the COVID-19 Crisis

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Abstract: The current health and economic crisis is an unprecedented event in the recent history of humanity. Given the lack of treatment and the rapid spread of the virus, several countries and/or local governments had to adopt measures of social distancing and movement restriction. The scenario set by the pandemic, therefore, brought up the need for quick adaptation and innovation, so companies could avoid liquidity and bankruptcy issues. Additionally, as a means to prevent firms' problems from generating a major macro-economic crisis, governments had to offer a range of support programs as ways to sustain employment and income. Given the dire need to find new ways to conduct businesses, this article sought to understand whether or not government support is a key factor for organizations to adjust or convert—totally or partially—their products or services. The applied methodology was logistic regression, and to solve eventual endogeneity problems, we applied the bivariate Probit model. More than 11,000 observations were included in the main model. The results showed that government support was an important element for companies to adapt their products and services during the first wave of COVID-19. Therefore, companies in countries with stronger institutional environments performed better than those in weaker settings.

Keywords: COVID-19; innovation; government support; institutions

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1. Introduction

The COVID-19 pandemic was and remains an unprecedented challenge for governments, companies and families. On top of the invaluable loss of thousands of lives, the disease has raised huge social and economic challenges. The absence of treatments and medicines effective in fighting the disease, on top of the quick virus spread, led several national and regional governments to adopt restricting measures to contain the spread. According to the World Health Organization [1], applying large-scale social distancing and mobility restriction measures, known as a "lockdown", are effective at reducing contamination rates; however, they come at a social and economic cost to society as they might lead to a complete cessation of economic activities.

In contrast to the lockdown strategy, some countries approached the COVID-19 problem through so-called "herd immunity". This model consists of allowing the virus to spread, that is, not adhering to restrictive measures [1,2]. Yet, the WHO [1] states that herd immunity is only possible through vaccination; therefore, this strategy is not effective. Sweden, according to Claeson and Hanson [2], implemented this measure ("herd immunity") to tackle COVID-19. Despite this, this country presented the worst pandemic management outcomes of all Nordic countries. Nonetheless, in economic terms, Sweden had a gross domestic product (GDP) reduction of 2.8%, similar to Denmark and Finland, which had reductions of, respectively, 2.7 and 2.8% [3]. We can see that though the effect size varied between countries, all in the region were negatively impacted; therefore, we can assert that pandemics bring about a series of economic limitations which go beyond each government's chosen strategy for withstanding the challenging times.

On top of the stress of adapting to the compulsory measures introduced by the government, the imminent risk of contracting the disease panicked many individuals and organizations, which has the effect of changing consumption patterns, thereby resulting in market anomalies [4]. With consumer behaviors changing fast, in a short period, the prevailing business model has been greatly impacted. Baker, et al. [5] highlighted how events that arose from the pandemic occurred extremely fast, and in the same line of thought, Al Ali [6] demonstrated how the pandemic announcement by the WHO accelerated the financial markets' decline.

The imminent economic and social collapse that threatened due to the pandemic led several governments to introduce measures to support individuals and organizations to face the challenges they encountered. Borio [7] highlighted how the economic crisis caused by COVID-19, uncharacteristically, lacked an economic origin, and it was entirely global. Baker, et al. [5] underlined how COVID-19, in its first stage, raised uncertainty, which in turn led economies to shrink or their growth to fall below that projected. On the ground, pandemic-generated uncertainty, along with restriction measures, impacted many organizations. In this context, governments had to intervene to prevent companies' financial collapse, massive unemployment, and further catastrophes related to the pandemic.

Under these circumstances, governments' actions and firms' need to reinvent themselves are elements worthy of analysis. Nonetheless, given that pandemics, and also measures to counteract them, are a sort of externality, any approach to analyzing related interventions—as proposed by Coase [8]—must consider how they were mediated by prevailing institutions. As such, institutions, which set the rules of the game [9], are vital to understanding whether or not government action to support firms brings about satisfactory results. Specifically, this article's major focus lays in analyzing whether government support was important for organizations to adapt to the COVID-19 pandemic and related measures that were imposed. Furthermore, this article investigates institutions' role in intermediating this adaptation.

2. Research Problem and Objective

The COVID-19 pandemic has been placing unprecedented pressure on the general population. From a macro-perspective, countries have been struggling with GDP reduction [10,11], and at the individual level, people have been suffering from unemployment and income loss [12]; as for companies, they fight cashflow issues brought by commercial restrictions [13]. Borio [7] highlighted how this crisis has been distinct when compared to other periods of adversity. For instance, it has been exogenous, that is, not resulting from a lack of economic/financial control. Furthermore, it has been truly uncertain, with many potential outcomes having depended on non-economic factors. Finally, this crisis has been global, with most countries worldwide having brought in restrictions.

Moreover, Baker, et al. [5] added that the COVID-19-inspired crisis spread fast. As an example, Italy had two confirmed cases on 31 January 2020; the first death was registered on 21 February [14] and the country went into national lockdown on 10 March [15]. Thus, in less than forty days, the business environment in Italy completely changed, with other countries following this pattern as the global spread ensued. In this context, when a pandemic sets in fast, companies need to (or should) be quick in adapting their businesses. Under such circumstances, companies must create new ways to conduct business, through innovation and adaptation, to avoid bankruptcy. Yet, on top of movement restrictions and other measures brought in to manage a pandemic, consumer behaviors change and firms must adapt their products and services accordingly. As examples from COVID-19, in-person shopping was replaced by online shopping as a safer way to make purchases; some sectors saw growing demand while others had their market size reduced and people's uncertainty about their income and employment further affected consumption patterns at large [16]. On governments' side arose the concern that restrictions brought by the virus would bring a wave of bankruptcies, layoffs, and income loss. Thus, many national and

local governments developed measures to mitigate problems caused by the pandemic. From this scenario emerges the research problem:

Is government support important for firms to adapt/adjust products and services during the pandemic?

Going beyond the main objective presented by the question/problem, this article also analyzes the conditions under which said government support is relevant in promoting innovation/adjustment. Specifically, whether or not institutional background acts as an important mediator on government's policy's results, as professed by Coase, therefore making it possible to analyze how government support and institutions influence the pace at which organizations adapted when facing the COVID-19 crisis.

In a nutshell, there is a gap this work aims to fill: the connection between government support and the process through which companies innovated and adapted to the contingencies caused by COVID-19 was scarcely explored. Moreover, we intend to analyze whether institutions are relevant mechanisms to explain the success of government support of companies' innovation. The novelty of this paper, therefore, resides in its econometric analysis covering connections among innovation, government support, and institutions in over forty countries during the pandemic.

3. Theoretical Background

3.1. State Capitalism and Government Support

The literature on State policy efficiency is controversial. On one side, a group advocates that the State is an agent capable of promoting policies that foster growth [17,18]; on the other, authors consider industrial policies as damaging. Krueger [19], for instance, calls attention to the fact that an industrial policy brings as a consequence the tendency of economic actors towards capturing State property rights, and that this rent-seeking behavior may be carried out through illegal means. Previous research, however, has not reached a clear answer to this question; the work by Criscuolo, et al. [20] indicates that there is a positive association between industrial policy and employment rate in some regions, yet total productivity does not change.

We present four varieties of State capitalism, according to Musacchio, Lazzarini and Aguilera [21]: In the first one, the State holds total control of property and companies are not quite transparent or autonomous; this form is required when private entrepreneurship is limited and there are social externalities connected to a given activity. In the second model, the State is the major investor, but part of the investment comes from the private sector—whose profit pursuit may be the answer to agency problems, when compared to fully State-controlled endeavors. In the third form, the State is a minor partner, holding stocks or debt; agency problems are minimized and State presence can reduce risks; conversely, State interference is likely. In the last model, known as Strategic State Involvement, the objective is to create new capabilities within a given industry or segment.

Under Klein, et al. [22] perspective on public entrepreneurship, the relationship between the public and private sectors involves four analysis levels. At the first one lay the rules of the game, and its primary task is defining normative structures to which private entrepreneurs are subjected. The second level hosts the creation of new public firms, as they are intrinsically exposed to property rights and agency issues, making both objectives and results hard to measure. The third layer is the creative management of public resources, which consists of reinventing existing State enterprises and agencies. The fourth and last analysis level is the spillover of private actions into the public domain, which happens when private entrepreneurs seek profit through public interest exploitation.

In Mazzucato's [17] vision, the State constitutes an important ally in generating knowledge. One of its major contributions is the readiness to take risks that the private sector is not willing to bear. Ultimately, the State helps to reduce the risks faced by the private sector. Moreover, the author observed that State action should go beyond being a mere market flaws corrector and evolve into a solid contributor to innovation development and products and services creation, for it is more prone to facing Knightian uncertainties throughout the

financing. For Mazzucato, too much weight is credited to private entrepreneurs when it comes to innovation processes, whereas the State—an extremely important actor—is left out. The author [23] further emphasizes that innovation is a cumulative and collective process, often financed by the State.

Within the pandemic context created by the novel coronavirus, States have responded to mounting challenges in several ways, and each of these responses was directly influenced by how the State apparatus is configured [24]. Furthermore, the degree of the financial burden stemming from the pandemic may lead to a higher level of State control with regard to the economy [24,25]. Policies adopted by the governments may be monetary, regulatory, or fiscal [26]. Cirera, et al. [27] demonstrate that government spending on fighting the crisis has reached 10% in terms of GDP in high-income countries; companies kept 40% of this amount.

One of the key characteristics of the COVID-19 pandemic was the need for quick coordination and reorganization to face demands that appeared as consequences of the fast spread of the virus. The time sensitivity and the scale in which this event could affect the economy required a rapid reaction to mitigate problems; if this does not happen, an even bigger intervention would be necessary. In other words, not using the tools the State has at its disposal may lead to the need of a major rescue program. Additionally, the considerable uncertainty brought by the pandemic slows down the pace and aptitude with which private agents respond to events [25].

Lazzarini and Musacchio [25] present five ways through which the State may act, aiming at reducing the impact of pandemics, operating on health and economy issues. The first one is accelerating infrastructure and production capacity investment, such as with hospital construction. The second way is through executing massive programs, such as testing. In the third avenue, the State incentivizes innovative technology development, such as vaccines; here, State action is paramount as any investment will face major uncertainty, and major social benefits may result from these investments. The fourth way of acting consists of supporting firms facing liquidity challenges arising from distancing measures, be it through credit concessions, the postponement of tax collection, etc. Finally, the State may promote actions to help companies—particularly small ones —that might see conventional sources of credit shrink face restrictions.

Other studies have already analyzed the effect of government support on companies. The research by Pu, et al. [28] has evidenced that government support has both direct and mediating effects on companies' sustainability, by analyzing the connections among finance innovation, technological adaptation, government support, and sustainability in small- and micro-companies in Bangladesh. The work by Chang, et al. [29] demonstrated that government support in the form of fiscal measures—amidst other types of intervention—was significant in explaining the stock market return. Gourinchas, et al. [13] concluded that government support prevented the number of bankruptcy processes from being 6.15% higher and jeopardizing 3.15% of jobs in eleven European countries.

There is, therefore, a solid and consistent indication that the State can be a key agent in economic development, enabling organizations to develop innovations and new capabilities, despite not sufficing by itself. In the pandemic context, in which uncertainties are high and there is an imperative need for fast decision making, the State can be a relevant instrument to overcome challenges. When facing economic difficulties, the State can act to preserve jobs, sustain income, and avoid bankruptcy. Firms indeed need to innovate and adapt, and in an environment characterized by considerable liquidity constraint, government support may be essential for them to do so. Therefore, the following hypothesis is presented:

Hypothesis 1 (H1). *Government support has a positive correlation with product and service adaptation performed by companies.*

3.2. Institutions

According to Hodgson [30], institutions can be defined as the collective of explicit or implicit rules that shape human beings' interactions. To North [9], they are the rules of the game, the structure outlined by society to limit and shape interactions among individuals. Similarly, Acemoglu, Johnson and Robinson [31] posit that institutions' importance for economic growth lays in the fact that they determine the incentives for economic agents. As a consequence, institutions are intimately connected to human and physical capital investment decisions. Thus, the key difference among countries' development stages is the heterogeneity of their choice of norms.

Among the wide variety of possible institutional rules, one of the most important is the definition of property rights. When property rights are clearly defined, market productivity and efficiency increase. Moreover, property rights enhance environment predictability [32]. In the same line of thought, Coase [8] states that an efficient resource allocation happens when property rights distinct definition has zero transaction costs. As asset's attributes are hard to measure and protect and property rights will never be unequivocally defined [33], individuals' willingness to provide appropriable assets depends on rules and on the availability of a third party to consistently and impartially process occasional disputes. This third-party role is mostly performed by the State [34].

Lessening uncertainty is essential and can be achieved through well-established institutions. Nonetheless, uncertainty will never be eliminated. Even so, institutions pose as a mechanism for individuals to exert tighter control over their own decisions, turning uncertainty into risk [32]. Similarly, Frølund [35] advocates that when solid institutions curtail uncertainty, they support decision makers' judgement, contributing to superior reasoning: entrepreneurs dodge investing on unviable businesses, and cease seeing profitable endeavors as unviable. In other words, the uncertainty diminishment that institutions promote increases productive entrepreneurship and reduces unproductive entrepreneurship.

Acemoglu, et al. [36] claim that countries with solid institutions display lower volatility in a crisis context. In the author's vision, nations with a background in extractive institutions have shown a higher probability of severe crises and major instability. Furthermore, macroeconomic problems are the result of the choice of game rules. From a micro-economic point of view, entrepreneurs choose sectors and activities in which capital withdrawal is easier, evading expropriation problems. Cavallo and Cavallo [37] argue that economic crises always have a long-term effect, which is milder when there is the support of solid institutions, having reached that conclusion through empiric studies. Correspondingly, when institutions are weak, crises' effects are amplified.

On top of the institutions' influence on countries' economic development [9,32], they are also important as State policy mediators [38–40]. According to Rodrik [38], much discussion surrounds the effectiveness of industrial policies and their deficiencies, and whether or not governments should implement them; yet, the debate on how to implement them should be over. At this point, each country's institutions shape these policies, and they may be able to eliminate occasional issues of information restriction and bureaucratic matters [38]. To Cimoli, et al. [39] there was not a case of economic development in human history without institutional conditions to bridge it.

In Warwick's [41] view, institutions and political systems are crucial elements to determine the success of a given industrial policy. For the author, government support tends to be steered by political connections rather than by a project's economic viability, with powerful economic groups being able to impose their will through the political system. From this perspective, Robinson [40] argues that industrial policies may be beneficial to economic development. For him, the difference between positive and negative results comes from political institutions, and these are determined by power balance. Most of these powerful groups tend to choose institutions that are prone to favor them, even if the result is not the most beneficial to the society as a whole. Therefore, the elaboration of a proper industrial policy requires political forces to be balanced and even reshaped. The next hypotheses derive from the above:

Hypothesis 2 (H2). *Institutions in which property rights are well defined have a positive correlation with firms' adaptation of products and services.*

Hypothesis 3 (H3). *Government action brings about a positive response through institutions.*

4. Methodology, Data and Variables

To meet the research objectives, we utilized the descriptive statistics in the first table and the logistic regression model in the second table, as the dependent variable is presented in a dichotomous way. For Cameron and Trivedi [42], when the dependent variable is binary, an OLS regression ignores the discreteness and does not limit the probabilities to zero to one interval, thus justifying the application of a logistic model. In this type of model, the estimated equation refers to success probability [43], that is, to the event occurrence probability. According to Gujarati [44], the equation, named cumulative logistic distribution function, is expressed by:

$$P_i = \frac{1}{1+e^{-Zi}} = \frac{e^Z}{1+e^Z}$$

where

$$Z_i = \beta_1 + \beta_2 X_i$$

Moreover, in order to solve occasional endogeneity problems caused by reverse causality and omitted variables [45], we implemented the bivariate Probit model (Biprobit command in Stata). We chose the Biprobit model because the dependent and endogenous variables are binary, making the model non-linear and traditional models of instrumental variable inappropriate, according to Greinee [46]. "This model is a recursive, simultaneous-equations model. Surprisingly, the endogenous nature of one of the variables on the right-hand side of the second equation does not need special consideration in formulating the log likelihood" [46], p. 816. The fit of the model was verified by the likelihood-ratio test presented at the end of the third table and the average marginal effects are reported in the fourth table. In practical terms, our estimations were based on the rationale below:

Equation (1):

$$\text{"Has received government support"}_i = \delta_0 + \delta_1 \text{"GDP per Capita (PPP)"} + \delta_2 \text{"Total Deaths per Million (Ln)"} + \delta_3 \text{"Government Expenditure (\% GDP)"} + \delta_4 \text{"Liquidity or cash flow decreased"} + \eta_i \quad (1)$$

The variable "Has received government support" is a dummy (binary) and is modeled as a function of "GDP per Capita (PPP)", "Total Deaths per Million (Ln)", "Government Expenditure (% GDP) and "Liquidity or Cash flow decreased". H_i is an error term.

Equation (2):

$$\text{"Has adapted products or services"}_i = \beta_0 + \beta_1 \text{"Has received government support"} + \beta_2 \text{"Property rights"} + \beta_3 \text{"Interaction–Government Support} \times \text{Property rights"} + \beta_4 \text{"GDP perCapita (PPP)"} + \beta_5 \text{"Sector–Manufacturing"} + \beta_6 \text{"Sector–Retail"} + u_i \quad (2)$$

Data were collected through the "COVID Survey" [47] conducted by the World Bank. The canvassing was conducted to analyze the impacts of the pandemic on firms throughout the first wave. For this research, companies from 42 countries were consulted. As for institutional and control variables, we applied data from "Heritage Foundation" [48] and "Our World in Data" [14]. Throughout the econometric model elaboration, all observations with missing data of any of the variables were deleted. Performed regressions had a significance level of 5%.

The dependent variable is "Has the firm adapted products or services?". It was measured through a dummy variable, whose value of 1 refers to companies having totally or partially adjusted or converted products or services, aiming at adapting to contingencies im-

posed by the pandemic. This makes it possible to validate the pace at which entrepreneurs sought innovation as a resource to dodge liquidity fall.

The independent variable is "Has the firm received government support?". It is a dichotomous measure, with 1 referring to firms having received government support. Through this variable, it is possible to assess if the government action (in the form of State capitalism) was relevant in enabling companies to adapt to the pandemic. In addition to this variable, we analyzed the type of support: "Payment suspension", defined as credit installments, rental, or mortgage postponement, or interest moratorium; "Credit", when the firm received any line of credit; "Fiscal exemption", in case of taxes payment waiver; and "Wage subsidies", when the government stepped in to cover part of the payroll.

The institutional variable utilized was "Property rights". According to Heritage Foundation [49], this indicator measures the likelihood of individuals accumulating property while backed by clear legislation and assured by the State through enforcement. Another variable considered is the interaction between Government Support and the Property Rights variable: a positive correlation is expected; that is, government support has better results when upheld by strong institutions.

Two control variables were included in the model as control variables: GDP per capita and sector of activity. The literature reports a significant and positive association between GDP and innovation: the higher the GDP, the larger the financial resources and knowledge inventory [50–53]. Therefore, the expectation is that the higher the GDP per capita, the stronger the company's ability to adapt/innovate in order to adjust itself to the environment imposed by COVID-19. Because Pavitt [54] indicates that the sector seems to be a relevant factor in explaining the differences of innovation levels, we selected manufacturing, retail, and other services as clusters, with the latter being the intercept.

In order to further regard the pandemic environment, a few variables were included to mediate the impact of COVID-19 on each country. "Regular Sales" is a dummy variable, for which 1 indicates that the company has maintained or increased its sales compared to pre-pandemic levels; the expectation is that companies that maintained their sales figures do not need to adapt products and services. "Total Deaths per Million" (Ln) and "Total Cases per Million" (Ln) are expected to induce the need for restrictions and hence the need for adapting products and services. Finally, government expenditure (% GDP) [48] and "Liquidity or cash flow decreased?" (1 if the firm had reduced liquidity or cash flow) were included [47] in the first stage of the bivariate Probit model.

5. Results and Discussion

Table 1 presents descriptive statistics results. Out of the companies in the sample studied, 34% performed some kind of product or service adaptation or alteration as a way to conform to the unfamiliar environment resulting from the pandemic. As for the government support to organizations, only 31% of companies received any type of State benefit. The type that stood out was wage subsidy, which was used in 67% of cases. Fiscal exemption has benefited 29% of the studied companies; payment suspension and credit, 27 and 19%, respectively. It is important to mention that the number of observations drops when the type of support is specified, as shown in Tables 2 and 3. Another relevant point is that 33% of companies did not see their sales figures change because of COVID-19. In the sample, 51% of companies were in the manufacturing sector, 20% in retail, and 29% (the balance) () were considered "other services".

We report the results of the logit model in Table 2. The Per Model (1), which analyzes only whether government support was received and the institutional indicator of property rights, it is noticeable that these variables are significantly and positively correlated, aligned with what is professed by the theory: companies that experienced government help were better adapted and showed higher innovation levels when facing COVID-19-imposed demands. Mazzucato's [17,23] vision is confirmed: according to the author, government help is of extreme importance for companies' innovation capabilities. With regard to the institutional variable "property rights", it was also verifiable that organizations had more

agility in their responses by adapting their products and services to the new context when property rights are well defined, therefore preventing bigger revenue losses and potential liquidity issues.

Table 1. Descriptive statistics.

Variable	Frequency Table (%)	Average	Variance	Min.	Max.	Expected Signal	Source
Has adapted products or services?	34%	–	0.23	0	1	Dependent Variable	[47]
Has received government support	31%	–	0.21	0	1	+	[47]
Property rights	–	57.36	148.17	26.7	81.5	+	[48]
GDP per Capita (PPP)	–	212,040.8	1.0×10^9	1164.09	41,944.78	Control Variable	[48]
Sector—Manufacturing	51%	–	0.25	0	1	Control Variable	[47]
Sector—Retail	20%	–	0.16	0	1	Control Variable	[47]
Regular sales?	33%	–	0.22	0	1	-	[47]
Total deaths per million (Ln)	–	3.43	4.21	−1.31	7.34	+	[14]
Total cases per million (Ln)	–	7.07	3.70	2.61	11.50	+	[14]
Payment suspension	27%	–	0.20	0	1	+	[47]
Credit	19%	–	0.15	0	1	+	[47]
Fiscal Exemption	29%	–	0.21	0	1	+	[47]
Wage Subsidy	67%	–	0.22	0	1	+	[47]

Source: Elaborated by the authors.

In Model (2), which encompasses all variables, a signal reversal between the variables of Model (1) came up. The correlation became negative due to the presence of a variable of interaction between them with positive sign. Therefore, there is a clear moderation between government support and strong institutions to explain the quick companies' adaptation to COVID-19 contingencies. This result leads to the inference that government support only produced the expected results when bolstered by institutions with clearly defined property rights.

Government support in this model, then, is not a sufficient condition for firms to innovate. Government support amidst weak institutions does not bring the same result as the same policy applied in an environment in which the institutional framework is more efficient; in other words, the results are not even. In econometric terms, the groups' line slopes are different. Such result converges with what Rodrik, [38], Cimoli, et al. [39], and Robinson [40] have shown. Thus, the response velocity imposed by the pandemic was more effective when the government had its actions supported by rules and norms that ensured lower uncertainty levels of property rights.

The effect of institutions as mediators of a State policy is the result of their influence on the environment uncertainty. The pandemic and the required measures to avoid transmission have caused an unprecedented situation. Additionally, the velocity at which events unfolded made the uncertainty level even higher. Nonetheless, institutions have somehow enabled entrepreneurs to perceive lower uncertainty levels and to act to avoid significant revenue drops, through fast reconfiguration and new ways to offer their products or services. This perception of a lower uncertainty level actually comes from understanding the gravity of the situation and realizing that there will be no return to normal circumstances in the short term.

As presented by Frølund, solid institutions help entrepreneurs' judgement by reducing Knightian uncertainty. The opposite is also true: when the rules of the game lack quality, the decision maker may be misled. Therefore, the fact that entrepreneurs do not decide to change their products or services may lead to a high uncertainty level, which takes away

the parameters required to actually decide. In other words, the environment uncertainty points to the non-investment option, to keep organizations' liquidity.

The analysis of products' and services' adaptations/innovations has also allowed us to infer the impact of governments' and institutions' actions on the velocity of the combination and recombination of attributes, the enablers of better firms' adjustment to contingencies. Such a claim is extremely blunt, as it explains the reason why firms and economies react faster to financial crises when embedded in a solid institutional environment. Therefore, productive entrepreneurship develops even in high uncertainty moments and large crises such as the pandemic. This issue is aligned with the work of Acemoglu, et al. [36], who point out that weak institutions are a determinant of higher macro-economic volatility and that countries with solid institutions show lower volatility indexes. Here, through a micro-economic analysis, it is corroborated that institutions are important for quick adaptation, and this could be the reason why countries with better institutions display a lower volatility. Despite struggling with the same externality, superior game rules have contributed to a quick rearrangement, enabling organizations to experience fewer ups and downs.

Model (1) thus confirms hypotheses 1 and 2, according to which government support and institutions have significant and positive correlation with quick adaptation/innovation by companies. However, as demonstrated by Model (2), government support is only positive when mediated by institutions with a clear definition of property rights. It is thence patent that government support of itself or institutions alone was not sufficient condition for firms to be able to adapt to the pandemic contingencies. On average, firms' probability of innovating increased when they received support and when they were inserted in the context of good institutions.

Regarding the control variables in Model (2), GDP per capita presented a positive and significant correlation to the probability of organizations adapting products and services, confirming what Pose and Crescenzi [50] and Fagerberg [51] found: GDP per capita brings about starting conditions that allow firms to innovate; specifically, the indicator represents the capital inventory destined for innovation and the quantity of available knowledge, as extensively reported. Thus, firms within a wealthier context have a higher innovation capacity. Another GDP-related variable is infrastructure. Many innovations during the COVID-19 pandemic were connected to e-commerce, apps for delivery, and remote work. Observing the differences among sectors, we note that in manufacturing firms there was no significant influence of GDP on innovation. The possible explanations for this are as simple as the inventory and the fact that innovations in this sector are intrinsically more complex than in retail or services, for instance. Not surprisingly, the retail sector is relevant to explain the adaptation level, as restriction measures in general have caused the biggest impact on this segment.

As expected, companies that have kept "Regular Sales" compared to pre-pandemic levels had a lower likelihood of adapting products and services. This variable is important for the model, as it is able to grasp the impact of the pandemic on organizations in a given segment of a given region. It also isolates the effect of firms that for any reason have not been impacted. The variable "Total Deaths per Million" was also significant and positive, indicating the probability of adaptation. Predictably, innovating has become more of an imperative in the countries most impacted by COVID-19 as a means to avoid potential bankruptcy. On its turn, "Total Cases per Million" was significant, but with the signal opposite to what was expected. One possible explanation for this is that the variable per se is a consequence of the higher number of tests performed, showcasing stronger control by a more concerned government, resulting in a lower need for adaptation. According to this line of thought, the number of cases per million would be a proxy for the commitment to fight the pandemic.

Table 2. Logit regression model result.

	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**	**Model (5)**	**Model (6)**
Variables	Has adapted products or services?	Has adapted products or services?	Has adapted products or services?	Has adapted products or services?	Has adapted products or services?	Has adapted products or services?
Has received government support	0.308 ***	−0.799 **				
	(0.0485)	(0.3510)				
Property rights	0.103 **	−0.893 ***	−1.227 ***	−1.212 ***	−1.207 ***	−1.218 ***
	(0.0451)	(0.1070)	(0.2110)	(0.2100)	(0.2110)	(0.2100)
Interaction –Government Support x Property rights		0.0158 ***				
		(0.00568)				
GDP per Capita (PPP)		0.000938 ***	0.001280 ***	0.001280 ***	0.001270 ***	0.001280 ***
		(0.000110)	(0.000218)	(0.000218)	(0.000218)	(0.000218)
Sector—Manufacturing		0.0714	0.0160	0.0184	0.0129	0.0209
		(0.0520)	(0.0850)	(0.0849)	(0.0851)	(0.0849)
Sector—Retail		0.1470 **	0.0293	0.0400	0.0446	0.0386
		(0.0633)	(0.1080)	(0.1080)	(0.1080)	(0.1080)
Regular sales		−0.369 ***	−0.478 ***	−0.482 ***	−0.461 ***	−0.480 ***
		(0.0496)	(0.0829)	(0.0827)	(0.0830)	(0.0831)
Total Deaths per Million (Ln)		1.018 ***	1.631 ***	1.631 ***	1.595 ***	1.666 ***
		(0.204)	(0.417)	(0.416)	(0.417)	(0.416)
Total Cases per Million (Ln)		−1.161 ***	−1.626 ***	−1.615 ***	−1.565 ***	−1.680 ***
		(0.203)	(0.458)	(0.458)	(0.459)	(0.458)
Fiscal Exemption			−1.359 **			
			(0.605)			
Interaction –Fiscal Exemption x Property rights			0.0245 **			
			(0.00986)			
Credit				0.208 **		
				(0.0912)		
Payment suspension					0.401 ***	
					(0.0823)	
Wages Subsidy						0.0985
						(0.0882)
Constant	−4.870 ***	29.040 ***	40.000 ***	39.110 ***	38.730 ***	39.770 ***
	(1.611)	(3.731)	(7.653)	(7.647)	(7.661)	(7.636)
Number of Observations	13,468	11,097	4054	4062	4064	4075
Fixed Country Effect	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$. In Model (1), only the "Government support" and "Property rights" variables were utilized, whereas in Regression 2 the full model was applied. In Models (3), (4), (5), and (6), specific forms of government support were used; thus, government help was measured, respectively, by "Fiscal Exemption", "Credit", "Payment Suspension", and "Wages subsidies". In these models, only the final model was reported. Countries analyzed through Models (1) and (2): Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Chad, Croatia, Cyprus, Czech Republic, El Salvador, Estonia, Georgia, Greece, Guatemala, Guinea, Honduras, Hungary, Italy, Jordan, Kazakhstan, Latvia, Lithuania, Malta, Moldova, Mongolia, Montenegro, Morocco, Nicaragua, Niger, Northern Macedonia, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Somalia, Zambia and Zimbabwe. Source: Elaborated by the authors.

In the following paragraphs, we analyze specific forms of government support. In Model (3), government intervention means "Fiscal Exemption", and we observe a behavior that is similar to Model (2)'s. Thus, when Fiscal Exemption took place, it was only effective

to help companies innovate as long as they were embedded in game rules with clearly defined property rights. Once more, government support was not enough to explain the dependent variable. So, the amount of the tax exemption and consequent additional cash flow have helped firms to create new ways to produce and sell their products and services. In low-institutional-quality environments, tax exemptions might have happened as a response to pressures, such as rent-seeking behavior.

Of the control variables of Model (3), GDP per capita showed a positive correlation with the probability of adaptation in organizations: the bigger the GDP, the higher the innovation level. There was no relevance of sectors in explaining the dependent variable: being in manufacturing, retail, or other services (intercept) made no difference. Here, companies that were not affected by COVID—measured by having "Regular Sales"—also had a lower probability of innovating. Total deaths per million elevated the likelihood of innovating, as it measures the gravity of the pandemic and the need to adapt to a new scenario. Total cases per million had a negative correlation, indicating again that companies felt a lower need to adapt in places where there was a higher commitment to controlling the pandemic.

Model (4), in which government support means credit concession, presents a positive and significant correlation to explain the adaptation of products and services. The model, therefore, aligns with the work of Mazzucato [17,23]: Firms that had credit availability were able to create new ways to market their products and services. The institutional variable was significant, but not with the expected signal. The interaction between government support and property rights was not significant, not being reported in the final model, whereas control variables and pandemic management variables presented the same level of significance and signal as in Model (3).

When government support takes the shape of Payment Suspension (Model (5)), specifically through credit installments, rent, or mortgage postponement, or interest payment suspension, it is positively connected to quick companies' adaptations. The ease in cash flow resulting from such measures has brought resources to organizations, enabling them to innovate. Institutional and interaction variables had the same response as in Model (4), as well as the other control measures.

Model (6) provides government support through Wages Subsidy, and it was the only model with no variable significance; that is, the fact that the government has covered part of the payroll did not have an effect on organizations adapting to COVID-19 contingencies.

We report the results of the bivariate Probit model in Table 3. This model's main objective is to verify the causality of the government support on firms' innovation.

Model (7) shows that government support and the institutional variable have a significant and positive correlation, thus allowing to us infer the causality of government support on firms' products and services innovation. However, when the variable of interaction between government support and property rights was input into Model (8), we found that government aid and institutions were not significant when isolated (at 5%) to explain companies' innovation. As the interaction variable was significant and positive, we can conclude that there is an institution mediation in the results. That is, the results of government support are more significant when surrounded by a solid institutional environment.

Model (9), where the government support is Fiscal Exemption, was negative and significant, while the institutional variable was not significant, contrary to expectations. Again, with the introduction of the interaction variable in Model (10), we noticed that when Fiscal Exemption was carried out in a strong institutional environment, government support was relevant in explaining firms' innovation. We found this same relationship in Models (13) and (14), when government support was provided through Payment Suspension.

(11) showed that the government support "Credit" plays an important role in firms' innovation. Contrary to what the theory advocates, the institutional variable here was not significant. In Model (12), in which we included the interaction variable, this was significant and positive, which corroborates the institutions' mediation in innovation. We find this same relationship in Models (15) and (16), where government aid is measured through Wages Subsidy.

Regarding the extension of government support, Model (17) (Table 4) shows in its main model that the probability of a firm innovating during the pandemic period increased by 29.3% when receiving government support. However, when such government assistance was provided through Fiscal Exemption, the probability of innovation decreased by approximately 43%, as shown in Model (20). When government support was provided through credit, the probability of innovation increased by 53.4% (Model (22)); payment suspension was reduced by 35.7% (Model (24)); Wages Subsidy increased by 28.5% (Model (26)).

Table 3. Bivariate Probit Regression model result.

Variables	7	8	9	10	11	12	13	14	15	16
Has received government support	0.848 ***	0.243	−1.310 ***	−1.277 ***	1.621 ***	1.679 ***	−1.044 ***	−1.016 ***	0.764 **	0.801 **
	(0.144)	(0.210)	(0.0848)	(0.0884)	(0.119)	(0.106)	(0.219)	(0.214)	(0.378)	(0.388)
Property rights	0.00529 ***	0.00310 *	0.00317	−0.000479	0.00590 **	0.000629	0.00464 *	−0.000138	0.00796 ***	0.00308
	(0.00155)	(0.00164)	(0.00225)	(0.00236)	(0.00246)	(0.00254)	(0.00271)	(0.00265)	(0.00277)	(0.00294)
Interaction—Government Support x Property rights	-	0.0101 ***	-	0.00355 ***	-	0.00462 ***	-	0.00443 ***	-	0.00452 ***
	-	(0.00247)	-	(0.000836)	-	(0.000898)	-	(0.000995)		(0.00105)
GDP per Capita (PPP)	-2.16×10^{-5}−05 ***	-2.17×10^{-5} ***	-8.44×10^{-6} ***	-8.10×10^{-6} ***	-6.06×10^{-6} **	-5.15×10^{-6} **	-9.05×10^{-6} ***	-8.48×10^{-6} ***	-1.12×10^{-5} ***	-1.06×10^{-5} ***
	(2.06×10^{-6})	(2.00×10^{-6})	(2.35×10^{-6})	(2.37×10^{-6})	(2.56×10^{-6})	(2.55×10^{-6})	(2.59×10^{-6})	(2.58×10^{-6})	(2.68×10^{-6})	(2.66×10^{-6})
Sector—Manufacturing	−0.00425	−0.00261	−0.0203	−0.0193	−0.0218	−0.0237	−0.0238	−0.0219	−0.0101	−0.0101
	(0.0276)	(0.0276)	(0.0340)	(0.0349)	(0.0384)	(0.0384)	(0.0383)	(0.0386)	(0.0451)	(0.0446)
Sector—Retail	0.104 ***	0.105 ***	0.0531	0.0469	0.0915 *	0.0796	0.0759	0.0668	0.111 *	0.0999 *
	(0.0340)	(0.0340)	(0.0442)	(0.0452)	(0.0490)	(0.0489)	(0.0514)	(0.0511)	(0.0568)	(0.0563)
Constant	−0.548 ***	−0.426 ***	0.103	0.114	−0.790 ***	−0.745 ***	−0.0976	−0.0655	−1.109 ***	−1.089 ***
	(0.0726)	(0.0781)	(0.131)	(0.132)	(0.126)	(0.125)	(0.184)	(0.178)	(0.275)	(0.277)
Step 1-Government Support										
GDP per Capita (PPP)	1.64×10^{-5} ***	1.59×10^{-5} ***	-1.21×10^{-5} ***	-1.24×10^{-5} ***	5.53×10^{-8}	4.51×10^{-7}	-1.34×10^{-5} ***	-1.36×10^{-5} ***	-6.91×10^{-6} **	-6.60×10^{-6} **
	(1.78×10^{-6})	(1.73×10^{-6})	(2.53×10^{-6})	(2.54×10^{-6})	(2.79×10^{-6})	(2.77×10^{-6})	(2.69×10^{-6})	(2.68×10^{-6})	(3.13×10^{-6})	(3.22×10^{-6})
Total Deaths per Million (Ln)	0.108 ***	0.109 ***	−0.0831 ***	−0.0830 ***	0.0348 ***	0.0322 ***	−0.0746 ***	−0.0735 ***	0.0534 ***	0.0541 ***
	(0.00743)	(0.00738)	(0.0121)	(0.0119)	(0.0114)	(0.0115)	(0.0115)	(0.0115)	(0.0138)	(0.0135)
Government Expenditure (% GDP)	0.0124 ***	0.0127 ***	0.0156 ***	0.0162 ***	−0.00902 ***	−0.00911 ***	0.0203 ***	0.0206 ***	0.0181 ***	0.0175 ***
	(0.00197)	(0.00192)	(0.00291)	(0.00286)	(0.00301)	(0.00298)	(0.00316)	(0.00313)	(0.00468)	(0.00491)
Liquidity or cash flow decreased	0.318 ***	0.316 ***	−0.134 ***	−0.138 ***	0.115 ***	0.116 ***	0.0960	0.0954 *	0.231 ***	0.235 ***
	(0.0262)	(0.0262)	(0.0349)	(0.0356)	(0.0414)	(0.0414)	(0.0584)	(0.0572)	(0.0442)	(0.0438)
Constant	−1.854 ***	−1.857 ***	−0.452 ***	−0.470 ***	−0.735 ***	−0.731 ***	−0.872 ***	−0.884 ***	−1.109 ***	−0.354 ***
	(0.0623)	(0.0617)	(0.0925)	(0.0932)	(0.0995)	(0.0989)	(0.113)	(0.111)	(0.275)	(0.126)
Observations	11,097	11,097	4054	4054	4062	4062	4064	4064	4079	4079
Rho	−0.418	−0.422	0.883	0.860	−0.857	−0.865	0.758	0.753	−0.418	−0.461
LR test of rho = 0	19.47	21.69	37.67	36.89	19.45	20.79	12.30	12.15	2.281	2.549
LR test of rho = 0 p > Chi2	0.00	0.00	0.00	0.00	0.00	0.00	0.0005	0.0005	0.1310	0.1104

Standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Models (7) and (8) are the general model (all kinds of "Government support"). In Models (9) and (10), "Fiscal Exemption" was used as government support; in Models (11) and (12), "Credit"; in Models (13) and (14), "Payment Suspension"; and in Models (15) and (16), "Wages subsidies". Source: Elaborated by the authors.

Table 4. Average marginal effects.

Variables	17	18	19	20	21	22	23	24	25	26
Has received government support	0.293 ***	0.0840	−0.441 ***	−0.431 ***	0.517 ***	0.534 ***	−0.368 ***	−0.357 ***	0.274 **	0.285 **
	(0.0438)	(0.0714)	(0.0230)	(0.0245)	(0.0285)	(0.0249)	(0.0681)	(0.0673)	(0.125)	(0.126)
Property rights	0.00183 ***	0.00107 *	0.00107	−0.000161	0.00188 **	0.000200	0.00163 *	−4.85e-05	0.00286 ***	0.00110
	(0.000536)	(0.000565)	(0.000761)	(0.000797)	(0.000792)	(0.000809)	(0.000975)	(0.000933)	(0.00100)	(0.00104)
Interaction–Government Support x Property rights	-	0.00349 ***	-	0.00120 ***	-	0.00147 ***	-	0.00156 ***	-	0.00161 ***
	-	(0.000861)	-	(0.000287)	-	(0.000295)	-	(0.000368)	-	(0.000398)
GDP per Capita (PPP)	-7.46×10^{-6} ***	-7.48×10^{-6} ***	-2.84×10^{-6} ***	-2.73×10^{-6} ***	-1.93×10^{-6} **	-1.64×10^{-6} **	-3.19×10^{-6} ***	-2.98×10^{-6} ***	-4.01×10^{-6} ***	-3.76×10^{-6} ***
	(6.36×10^{-7})	(6.25×10^{-7})	(7.95×10^{-7})	(8.03×10^{-7})	(8.26×10^{-7})	(8.19×10^{-7})	(9.37×10^{-7})	(9.24×10^{-7})	(9.57×10^{-7})	(9.46×10^{-7})
Sector—Manufacturing	−0.00147	−0.000901	−0.00685	−0.00649	−0.00695	−0.00754	−0.00839	−0.00769	−0.00363	−0.00360
	(0.00955)	(0.00953)	(0.0114)	(0.0118)	(0.0123)	(0.0122)	(0.0135)	(0.0136)	(0.0162)	(0.0159)
Sector—Retail	0.0360***	0.0361***	0.0179	0.0158	0.0292*	0.0253	0.0267	0.0235	0.0398*	0.0355*
	(0.0118)	(0.0118)	(0.0149)	(0.0153)	(0.0157)	(0.0156)	(0.0183)	(0.0181)	(0.0206)	(0.0202)
Observations	11,097	11,097	4054	4054	4062	4062	4064	4064	4079	4079

Standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. In Models (17) and (18), the general model is shown (all kinds of "Government support"). In Models (19) and (20), "Fiscal Exemption" was used as government support; in Models (21) and (22) "Credit" was used as government support; in Models (23) and (24) "Payment Suspension" was used as government support; and in Models (25) and (26), "Wages subsidies" was used as government support. Source: Elaborated by the authors.

Generally, the results of the bivariate Probit model allowed us to verify that government support is an important factor in explaining the innovation of firms in response to the contingencies brought by COVID-19 crisis, except when support comes as Credit and Payment Suspension. Moreover, the models that analyzed the interaction between government support and institutions allowed us to conclude that a given policy does not have the same effect in all countries. Government assistance yielded superior results when firms were in environments where property rights were well defined.

6. Conclusions

Health and economic crises are unprecedented events in the recent history of humanity. In addition to the lamentable loss of thousands of lives, COVID-19 brought a serious and imminent economic crisis. Given the lack of treatment and the rapid spread of the virus, several countries and/or local governments adopted measures of social distancing and movement restriction, as indicated by the World Health Organization (2020). The pandemic, therefore, caused a series of economic and social costs. In the macro-economic environment, there was a significant reduction in GDP [10,11]. As for individuals' concerns, there was a rise in unemployment and consequent income loss [12]. At the company level, liquidity issues increased [13]. Moreover, the exogenous shock caused by the virus [7] and the speed at which the pandemic set in brought about a disruption in business models and in the way organizations worked.

The scenario set by the pandemic, therefore, brought the need for quick adaptation and innovation, so companies could avoid liquidity and bankruptcy issues. Additionally, as a means to prevent firms' problems from generating a major macro-economic crisis, governments had to offer a range of support programs to sustain employment and income and help to mitigate the economic consequences of the pandemic. Given the dire need to find new ways to conduct business, this article sought to understand whether or not government support is a key factor for organizations to totally or partially adjust or convert their products or services to face the contingencies posed by COVID-19. To answer this question, a World Bank survey was scrutinized. In this survey, companies answered a

series of questions referring to the first wave of the pandemic. The applied methodology was a logistic regression, and in order to verify causality, we applied the bivariate Probit model. Over 11,000 observations were included in the main model.

The countless tools applied by the State to promote development are controversial. In Mazzucato's [17] vision, the State is indeed an important agent in promoting development and innovation, and its major contribution lays in the willingness to take risks that the private sector is not prone to take. Additionally, the author [23] emphasizes that innovation is a cumulative and collective process, often State financed. Nonetheless, a group of authors claim that State interference may have a negative side. Krueger [19], for instance, points out that an industrial policy brings along economic actors seeking to capture State property rights, and this rent-seeking behavior may be illicitly exercised. Even so, in a shock context like the pandemic, Lazzarini and Musacchio [25] indicate that government actions may be important to avoid even more significant interventions in the future.

As discussed, issues brought by the pandemic led the State using several types of adversity-attenuating policies. However, some authors assert that State policies only bring positive results when backed by solid institutions [38,39]. In North's [9] vision, institutions are the rules of the game, the structures chosen by society to limit and shape interactions among individuals. Specifically regarding the connection between institutions and State policies, Warwick [41] claims that institutions and the political system are crucial elements to determine the success of a given industrial policy. Along the same line of thought, Robinson [40] argues that the difference between industrial policy positive and negative results trace to political institutions, and that these are defined by power balance.

The results showed that government support was an essential element for companies being able to adapt their products and services during the first wave of COVID-19. Nonetheless, the institutional environment has had foundational relevance to explain positive results. In the bivariate Probit model encompassing all variables (Model (8)), Government Support and Property Rights were not significant due to the presence of a variable of interaction between them with a positive sign. Thus, there is a clear moderation between Government Support and strong institutions to explain the firms' quick adaptation when facing COVID-19 contingencies. Therefore, Government Support amidst weak institutions does not bring the same results of the same policy applied to environments in which the game rules are superior. Analyzing specific forms of government support, Fiscal Exemption and Payment Suspension only had positive results when mediated by good institutions. When State intervention was measured by Credit Concession and Wages Subsidy, government support was positive, but still firms in countries with stronger institutions performed better.

The proposed analysis has clear public policy implications, as companies that received government assistance had a higher level of product and service innovation. Finally, this work brings as its major limitation the fact that the survey did not show companies' profiles in more detail. As recommendation for future studies, it would be compelling to understand how State actions impacted other variables, such as employment rates, bankruptcy, and the perception of risk and uncertainty by entrepreneurs.

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