FEAR SHOCKS, SUBSIDIES AND COVID-19 IN AN INTEGRATED MARKET

GOLPES DE MIEDO, SUBSIDIOS Y COVID-19 EN UN MERCADO INTEGRADO

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Abstract

In an imperfect competition model of trade a domestic and foreign country establish a cooperative or non-cooperative subsidy schedule. The optimal subsidies are positive but different in size depending of the firm's efficiency and the magnitude of the consumer market. After setting the subsidy, a fear shock in the domestic country caused by COVID-19 affects the domestic welfare depending on the subsidy schedule and firms' efficiency. The effect of a fear shock in foreign country depends on his patter of trade. Finally, when fear shock affects negatively the welfare, the best policy response is to reduce the subsidy.

Keywords: *Fear shock, integrated markets, subsidy, COVID-19, cooperative policies, emotions, cognitive bias, consumer decision, welfare analysis, international trade.*

JEL Classification: *D43, D91, F12, H30.*

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Resumen

En un modelo de comercio de competencia imperfecta, un país doméstico y foráneo establece un esquema de subsidios cooperativos o no cooperativos. Los subsidios óptimos son positivos pero de diferente tamaño según la eficiencia de las empresas, y tamaño de mercado. Establecida la política, un shock *de miedo causado por COVID-19 afecta el bienestar del país doméstico dependiendo del esquema de subsidios, y la eficiencia de las empresas. El efecto del miedo en el país extranjero depende de su patrón comercial. Finalmente, cuando el* shock *de miedo afecta negativamente el bienestar, la mejor respuesta de política es reducir el subsidio.*

Palabras clave: *Golpes de miedo, mercados integrados, subsidios, COVID-19, políticas cooperativas, emociones, sesgo cognitivo, decisión del consumidor, análisis de bienestar, comercio internacional.*

Clasificación JEL: *D43, D91, F12, H30.*

1. INTRODUCTION

Currently, there is a global challenge: the management of an infectious disease produced by the new coronavirus SARS-Cov-2, and the disease that this virus develops COVID-19. It is naive to argue about the great consequences of COVID-19 in the world. With a high rate of infection and mortality, COVID-19 is already a global concern, a pandemic. The impact of this pandemic on the world economy is as great as its health consequences.

The economic consequences derived from this pandemic are well documented: a drop in the Gross National Product (GNP), contraction of trade and investment, high unemployment rates, etc. (Baldwin and Weder di Mauro, 2020). The SARS-Cov-2 virus infects not only the world population, but also the markets. Given the obvious concern about the COVID-19 pandemic, economists identify and estimate the economic impact of the disease (for example, Atkeson, 2020; Barro, Ursua, and Weng, 2020; Gormsen and Koijen, 2020). However, our intention is not to delve into this topic. We intend to analyze, in a stylized model, one of the causes behind the crisis of the pandemic in the economy: fear.

According to Baldwin and Werder Di Mauro (2020), the economic impact of the pandemic comes from three sources. First, the impact of COVID-19 on health, which affects the labor market. Second, the economic impact of containment measures that negatively affect value chains, productivity, trade, etc. Third, those of a psychosocial nature. The first two are tangible and measurable, the third, on which this work focuses, is intangible.

Basically, the pandemic has generated a contraction in economic activity due to the drop in consumption. On the one hand, rising unemployment reduces income, at the end consumption and economic activity too. On the other hand, since confinement measures reduce economic activity and employment, there is existential loss, anxiety and terror that is evoked by the massive unemployment caused by the COVID-19 pandemic (Blustein and Guarino, 2020). The fear that occurs due to the possible loss of employment, and the fear of contracting SARS-Cov-2 reduce people's willingness to consume.

Therefore, we can argue that consumption is reduced both by the decrease in income given by the reduction in employment, along with the increase in fear of the possible scenario of job loss and contagion. In this work, we want to focus only on the second reason. While we recognize that unemployment is a fundamental variable in the explanation of the crisis, the analysis of fear, as an intangible variable, is relevant to explain the dynamics of the COVID-19 crisis. Fear includes unemployment as a catalyst for the anxiety. Fear changes individual behavior, and it depends on beliefs and cognitive biases. We argue that fear is a cognitive bias, and a relevant factor to explain the decline in the world economy due to COVID-19.

Fear is primarily an emotion stimulated by the perception of danger or threat, which causes changes at the physical and psychological levels as well as changes in behavioral ones. Likewise, fear is modulated by the process of cognition and learning. Therefore, fear is judged as rational or appropriate, and irrational or inappropriate. Fear in its cognitive process is related to anxiety (Öhman, 2008), and in its learning process, it serves for survival by generating adequate behavioral responses in its evolution (Olsson and Phelps, 2007). Moreover, it is shaped by its social relationships and culture, which guide their understanding of when and how much fear to feel (Gill and Burrow, 2017).

Humans create specific fears as a result of learning. Fear can be learned by experiencing or seeing a terrifying traumatic event on a personal and social level (Olsson, Nearing, and Phelps, 2006). The fear of Covid-19 arises mainly from a learning process encouraged by social networks, and generally with significant negative results as presented by Goyal *et al.* (2020), Li *et al.* (2020) as well as Zhou (2020). The distorted information on the factors related to the transmission of the virus, the consequences of the disease, along with the alarm generated by COVID-19 promote insecurity and fear in the population. These uncertainties not only have negative global consequences but also physical, psychological, and social implications for the population (Ornell *et al.*, 2020).

The level of fear caused by the pandemic is measured by Ahorsu *et al.* (2020). These authors develop and validate a scale that assesses fear of coronavirus: the COVID-19 fear scale (FCV-19S). In this work, fear is directly associated with its rate of transmission (rapid and invisible), as well as with its morbidity and mortality. Unfortunately, fear can amplify the damage of the disease itself. This further leads to other psychosocial challenges such as stigma, discrimination, and loss (Pappas *et al.*,

2009). With high levels of fear, people may not think clearly and rationally about COVID-19. The psychosocial aspect is not yet fully considered. With a higher level of fear, we have larger negative consequences on welfare.

Fear can change people's behavior based on the incentives they have to optimize their resources at critical moments (Harper *et al.*, 2020). Because fear is an adaptive emotion, behavioral change in times of COVID-19 affects all human dimensions such as social and economic. Particularly in the economy, fear affects consumer decisions. The higher the level of fear, the greater the impact on consumption. The outbreak of the pandemic generates drastic consequences in daily life. It increases the fear of the population and causes great economic uncertainty (Ortmann, Pelster and Wengerek, 2020). In the case of U.S. household consumption, the pandemic reduces consumption as analyzed by Baker *et al.* (2020). It has been proved in the literature that an increase in fear may reduce consumption by changing consumer behaviors (Hutjens, 2014).

According to Chen, Qian, and Wen (2020), the great uncertainty negatively affects consumers' willingness to consume as insecurity and anxiety (in the form of fear) can trigger fearful kinds of behavior even if there is no real economic threat. These authors conclude that there is a negative impact of COVID-19 on consumption after China's outbreak in late January 2020. The reduction in consumer demand, as a direct result of fear due to the pandemic, has a restrictive effect on the world economy. As a result, demand is weakened and the economic recovery would be delayed.

In a globalized context, the consequences of the pandemic on the economy are well documented. COVID-19 negatively affects trade, supply chains, and tourism, all of which have an impact on the global economy (Ahani and Nilashi, 2020). Globalization not only spreads the disease, but also inhibits efforts to control it (McKibbin and Fernando, 2020). In integrated economies, not only is international trade reduced, but also has a relative impact on the welfare of the countries (Baldwin and Tomiura, 2020). Since COVID-19 affects the supply and demand of international trade, the fear shocks affect demand. Therefore, it affects the international trade of goods and services.

The motivation for this article comes from the relationship between fear, such as a consumer shock due to COVID-19, and trade flows between two trading partners in an integrated market. The question we intend to answer is: what is the impact of a fear shock, given by COVID-19, on the welfare of two countries with integrated markets? In the context of non-cooperative and cooperative subsidy policies carried out by the countries, this work tries to analyze the optimal response against the negative economic impact of COVID-19 on the economy. Even when the effort made by European countries in order to set some cooperative polices has been notorious (Europen Council, 2020), there is an evident absence of international cooperative strategies for the rest of the world (Brown and Susskind, 2020). However, it was expected given by the reduction of the global trade integration, and the increase in the protectionism (Gunnella and Quaglietti, 2019).

The lack of cooperative strategies worldwide is not only at a medical level, but to an economic level as well. The European Union has made diagnoses on the impact of

Covid-19 on its productive structure and has chosen a set of subsidies for the rescue of its companies. However, there is no structured long-term plan for the economic recovery of the region (European Council, 2020). But in the rest of the world there are no cooperative international economic policies, either short or long term. Even in regions with some type of economic/trade agreement, there is, at most, some type of cooperation in terms of health strategies (Brown and Susskind, 2020). There are two reasons to explain the lack of economic cooperative strategies. First, the pandemic is likely so recent that the first step is to rescue the region's economy rather than boost the economy as a whole. Second, the grueling process of the trade war and the rise of populist protectionism inhibit any cooperation initiative.

On the other hand, according to the OECD (2020), the policy aimed at containing and mitigating the economic consequences of the pandemic, either as a national policy or as an international strategy (adopted by the European Union) has been the use of fiscal policy based on the granting of subsidies and in the acquisition of foreign debt by the countries. The subsidy policy is a self-reflexive act of policy makers in times of crisis. These subsidies are presented in most cases at the national level, but there is no evidence of international cooperation in this regard. Currently, the European Union has a subsidy scheme at the regional level, it is not the product of a cooperation process between countries but of previously established agreements given the nature of the integration of the area. In this work, we focus on considering subsidies as an economic mitigation policy against COVID-19.

We present a mathematical theoretical partial equilibrium model of trade in which two-countries, two-firms, with an integrated good market; establish origin-based subsidy policies. We determine the optimal subsidy policies between both countries when these policies are cooperative and non-cooperative. This equilibrium is similar to that analyzed by Keen, Lahiri, and Raimondos-Moller (2009).

However, different from the previous work, we analyze the impact of fear shock on trade flows, and consequently on the welfare of both countries. When this fear shock affects the welfare of a country negatively, the affected country reacts by using its policy of subsidies to compensate for the loss of welfare. Our main motivation is to present a theoretical model closer to the fact of how a demand shock caused by a global event, such as COVID-19, affects trade flows along with well-being between partner countries, and how to react to this shock of fear.

Assuming a partial equilibrium model of two countries and two firms helps not only to have a simple analysis, but also allows us to isolate the phenomenon of a fear shock in a specific market. In this model we are not considering a more general approach that allows us to include, among other variables, the problem of unemployment due to the pandemic. It is well known that the impact on employment is significant in consumer decisions. A general rather than partial approach would help us to relate the problem of employment with that of fear. However, we maintain a partial equilibrium model in order to have a more defined approximation of the impact of fear on consumer decisions, since the model could be enriched with a more general approach, but it would lose focus on the problem of fear.

Having only two firms allows the impact of fear shock to be incorporated into production in a simplified way. When more countries and more firms are included, the results are intuitively similar but less clear. On the other hand, in an integrated market without tariff barriers, it is expected that a fear shock may have different effects on welfare when governments have cooperative and non-cooperative subsidy policies. The aim is to analyze whether fiscal cooperation between countries produces different results than when countries establish an independent policy. In this way, we can have some intuition about whether fiscal cooperation reduces the impact of fear shock in the integrated market.

In the initial stage of the pandemic, this theoretical model is relevant since it allows us to infer some possible scenarios and results. The empirical relevance of this model comes from allowing us to establish perspectives on the impact of a fear shock on the welfare of countries in an integrated good market. In addition to technological differences (that is a common feature of rich and poor countries). As well as to estimate the impact of a fear shock on international cooperation agreements, or even to evaluate the impact of a fear shock on trade and consumption flows. A theoretical model of this type allows us enormous flexibility of analysis in different scenarios.

The model is spelled out in the following section. In section 3, we derive the properties of the optimal subsidy in a non-cooperative and cooperative equilibrium and the impact of fear shock. In section 4 some concluding remarks are made.

2. THE MODEL

Following Keen, Lahiri, and Raimondos-Moller (2009)'s basic framework, we are considering a partial equilibrium model and imperfect competition in the market for a homogenous good. In the background, we have a numeraire second commodity traded internationally in a competitive market. Both goods are produced using a single internationally immobile factor of production under constant returns to scale. So, the price of this factor gets tied down by the zero-profit condition in the numeraire sector. In the same sense, these assumptions tied down the average variable and marginal cost of production in the imperfectly competitive sector.

There are two trading countries, 'home' and 'foreign' (the latter, and all its variables, indicated by an asterisk), as well as a single representative consumer in each. Preferences may differ between the two countries. Indirect utilities in the two countries are assumed to be of the quasi-linear form

$$U(P,\mu) = \frac{P^2}{2} - \alpha P + \mu$$

$$U(P^*,\mu^*) = \frac{P^{*2}}{2} - \alpha^* P^* + \mu^*$$

where P and P^* are the consumer prices, and, μ and μ^* are the lumps-sum income or a reserve level of income, in both countries. Additionally α, α^* are positives and large enough to avoid the irrelevance result and to simplify our model. Given that the factor of production is inelastically supplied there is not the price of a factor in the argument of the indirect utility function. We get the linear demands Using Roy's identity in both countries, which are linear in prices and no income effect:

$$D = \alpha(\varepsilon) - P \qquad (1)$$

$$D^* = \alpha^* - P^* \qquad (2)$$

D and D^* are home and foreign demand respectively. α is a decreasing and linear function of a variable ε which we call "fear level" such that $\alpha'(\varepsilon) < 0$ and $\alpha''(\varepsilon) = 0$. Even when fear certainly may affect the foreign country as well, we analyze fear only in the home country for simplicity reasons as set in equation (1). The case in which we analyze fear in both countries does not affect the results found in this work since we always consider the net level of fear in a specific country. If we include the impact of fear in equation (2), the result depends on whether the foreign fear is greater or less than the domestic fear. The difference between foreign and domestic fear is the net level of fear. We can consider, without loss of generality, that the level of fear in the domestic country is higher than abroad. However, assuming only fear in the domestic country is a convenient assumption for simplicity.

Fear is a negative symptomatic emotion that produces extreme levels of emotional avoidance with specific stimuli (Perin *et al.*, 2015). It is associated with a social anxiety disorder and creates alterations in rationality and behavior (Krueger *et al.*, 2018). As such, widespread public fear, caused by pandemic diseases such as COVID-19, could lead to significant levels of mental distress at the population level. This distress can lead to exacerbated forecast decisions that may reduce consumption levels.

Fear does also motivate different kinds of behavior that reduce the participation in risky kinds of behavior, and excessive consumption may be risky kinds of behavior. A higher level of fear (ε) is correlated with a lower level of consumption given by anxiety produced by uncertainty about the future. Therefore, for our model, fear is a shock affecting consumer decisions.

The market for the homogenous good is internationally integrated, so the equilibrium requires:

$$D + D^* = x + x^* \qquad (3)$$

where outputs in the two countries are denoted by x and x^*. On the other hand, arbitrage then equates consumer prices across the two countries as

$$P_w = P = P^*$$ (4)

with P_w being the world price. This price is the same for both countries. From (1) to (4) we have the aggregate inverse demand function

$$P_w = \frac{a}{2} - \frac{(x + x^*)}{2}$$ (5)

Such that

$$a = \left(\alpha + \alpha^*\right) > 0$$

For simplicity, we assume a monopolistic firm in each country producing and trading a homogeneous good. Even when each firm has the average variable and the marginal cost as constant through the analysis, it may differ between firms. With arbitrage as described above, profits are

$$\pi = \left(P_w - k\right)x - F$$ (6)

$$\pi^* = \left(P_w - k^*\right)x^* - F^*$$ (7)

Where $k = c-s$, $k^* = c^*-s^*$, such that s and s^* are the subsidy per-unit of output given to home and foreign firm respectively, c and F are the marginal and fixed cost of the home firm. c^* and F^* are the marginal and fixed costs of the foreign firm. The marginal cost is the part of the unit cost that is determined by technological and factor market conditions and is taken to be constant. We consider that firms have technological differences expressed in their marginal costs such that $c \neq c^*$. When the marginal cost of one firm is greater than the cost of the other, the former is more inefficient than the latter. The technological difference between countries largely defines their economic capacity. Therefore, we can have an approximation that measures the wealth and poverty of a country. The first-order conditions of (6) and (7) are

$$d\pi = \left(P_w - k\right)dx + xdP_w$$ (8)

$$d\pi^* = \left(P_w - k^*\right)dx^* + x^* dP_w$$ (9)

From (5) we get

$$\frac{dP_w}{dx} = \frac{dP_w}{dx^*} = -\frac{1}{2} < 0 \tag{10}$$

Any increase in the output of firms unequivocally reduces the world price. Using (10) into (7) and (8) we have

$$\frac{d\pi}{dx} = (P_w - k) - \frac{x}{2} = 0$$

$$\frac{d\pi^*}{dx^*} = (P_w - k^*) - \frac{x^*}{2} = 0$$

From these expressions, we can obtain the firms' output as

$$x = 2(P_w - k) \tag{11}$$

$$x^* = 2(P_w - k^*) \tag{12}$$

Taking (11) and (12) into the aggregate inverse demand function (5) we get

$$P_w = \frac{a}{6} + \frac{k + k^*}{3} \tag{13}$$

Substituting (13) into (11) and (12), we get the optimal output as

$$x = \frac{2}{3}(\frac{a}{2} + k^* - 2k) \tag{14}$$

$$x^* = \frac{2}{3}(\frac{a}{2} + k - 2k^*) \tag{15}$$

The amount of output produced by each firm depends on their marginal cost and subsidies. Starting from zero subsidies, the more efficient firm produces more than the inefficient one. Such that

$$x - x^* = 2(c^* - c)$$

Substituting (14) and (15) in the profit functions we have

$$\pi = \frac{x^2}{2} - F \tag{16}$$

$$\pi^* = \frac{x^{*2}}{2} - F^* \tag{17}$$

Finally, it is assumed that the profit of each firm accumulates for the representative consumer of that country as a lump sum of income, as well as the subsidy expenses. Therefore, we omit any income restrictions. The utilities of the representative agent, the welfare function, in the two countries are them the sum of consumer and producer surplus plus (minus) subsidy expense:

$$W = CS + \pi - sx \tag{18}$$

$$W^* = CS^* + \pi^* - s^* x^* \tag{19}$$

Where the first, second, and third term at the right hand in (18) and (19) is the consumer surplus, producer surplus, and the cost for subsidizing each firm. Because it is a partial equilibrium model, it should be clear that welfare measures only the producer and consumer surplus of the homogeneous good. We are going to focus only on the impact of the fear shock on production, consumption and subsidy decisions in this market. From the consumer surplus we have

$$dCS = -DdP_w \tag{20}$$

$$dCS^* = -D^* dP_w \tag{21}$$

The equations (1) - (3) and (13)-(21) form the backbone for the following analysis.

3. OPTIMAL POLICY AND FEAR SHOCK

Having set the basic framework, we shall now determine the optimal subsidy policy set by both countries. This policy is an origin-based subsidy policy similar to Keen, Lahiri and Raimondos-Moller (2009), in the context of an integrated good market. We consider cooperative and non-cooperative subsidies. Later on, we analyze the impact of fear shock on welfare once a subsidy policy is set in both countries.

The optimal policy is the result of a two-stage game. At stage one, both governments set their subsidy policies to maximize welfare. At stage two, the firms behave optimally under Cournot competition. We use backward induction to solve

for the subgame perfect equilibrium. At stage two, the optimal output of firms was determined in (14) and (15).

At stage one, the governments set the optimal subsidy taking into account the subsequent reaction of the firms. To do so, we have to determine comparative statics of the effects of subsidies on the optimal output, consumer, and producer surplus.

Derivation of (14) and (15) respect to the subsidy we get

$$\frac{dx}{ds} = \frac{dx^*}{ds^*} = 4/3 > 0 \tag{22}$$

$$\frac{dx^*}{ds} = \frac{dx}{ds^*} = -2/3 < 0 \tag{23}$$

It is intuitively clear that an increase in the subsidy offered by a home (foreign) government gives a competitive advantage to the home (foreign) firm over the competing one. A subsidy increases the output of the subsidized firm and reduces the output of the other firm. This intuition applies for the producer surplus (16) and (17) such that

$$\frac{d\pi}{ds} = \frac{4}{3}x > 0 \tag{24}$$

$$\frac{d\pi^*}{ds} = -\frac{2}{3}x^* < 0 \tag{25}$$

$$\frac{d\pi^*}{ds^*} = \frac{4}{3}x^* > 0 \tag{26}$$

$$\frac{d\pi}{ds^*} = -\frac{2}{3}x < 0 \tag{27}$$

Unequivocally, a subsidy received by a firm increases its profits and reduces the profits of the competing firm. On the other hand, from (13) we get,

$$\frac{dP_w}{ds} = \frac{dP_w}{ds^*} = -\frac{1}{3} < 0$$

Any subsidy reduces the world price as more output is in the market. Consequently, from (20) and (21), we get the impact of the subsidy on consumer surplus as,

$$\frac{dCS}{ds} = \frac{dCS}{ds^*} = \frac{D}{3} > 0 \tag{28}$$

$$\frac{dCS^*}{ds^*} = \frac{dCS^*}{ds} = \frac{D^*}{3} > 0 \tag{29}$$

A subsidy, offered by any country, benefits the consumer surplus of both countries because of the reduction in the world price of the consumer good. The increase in production of the subsidized firm is greater than the decrease in the production of the other one, decreasing the world price.

On the other hand, we can derive the impact of fear shock on the welfare of both countries assuming subsidies as given. From (13), (14) and (15), we have

$$\frac{dP_w}{d\varepsilon} = \frac{\alpha'(\varepsilon)}{6} < 0 \tag{30}$$

$$\frac{dx}{d\varepsilon} = \frac{dx^*}{d\varepsilon} = \frac{\alpha'(\varepsilon)}{3} < 0 \tag{31}$$

First of all, a larger level of fear implies a reduction in consumption, and the world price goes down. The output of firms also decreases due to the reduction in consumption. Under these reasons, the profits of firms decrease as well. From (16) and (17), we have

$$\frac{d\pi}{d\varepsilon} = \frac{\alpha'(\varepsilon)}{3} x < 0 \tag{32}$$

$$\frac{d\pi^*}{d\varepsilon} = \frac{\alpha'(\varepsilon)}{3} x^* < 0 \tag{33}$$

The fall in production reduces the producer surplus. However, the reduction in the price affects the consumer surplus (20) and (21) as,

$$\frac{dCS}{d\varepsilon} = \frac{5D}{6} \alpha'(\varepsilon) < 0 \tag{34}$$

$$\frac{dCS^*}{d\varepsilon} = -\frac{D^*}{6} \alpha'(\varepsilon) > 0 \tag{35}$$

Initially, an increase in fear produces a downward shift of D as suggested (1) and decreases the world price as in (30). For the home country, the reduction in the demand is larger than the reduction in the market price such that the consumer surplus

decreases. On the other hand, for the foreign country, the quantity of goods available in the integrated economy is greater, and the price is reduced. So the consumer surplus of foreign country increases with the fear shock.

Once we have defined the comparative statics of subsidies and fear, we derive the impact of subsidies and fear on welfare. Total differentiation of (18) and (19), using (22) to (35) we get:

$$dW = A_1 ds + A_2 ds^* + A_3 d\varepsilon \tag{36}$$

$$dW^* = A_1^* ds + A_2^* ds^* + A_3^* d\varepsilon \tag{37}$$

Where

$$A_1 = \frac{D}{3} + \frac{4}{3}x - s\frac{4}{3} - x$$

$$A_2 = \frac{D}{3} - \frac{2}{3}x + s\frac{2}{3}$$

$$A_3 = \frac{\alpha'(\varepsilon)}{3}\left[x + \frac{5}{2}D - s\right]$$

$$A_1^* = \frac{D^*}{3} - \frac{2}{3}x^* + s^*\frac{2}{3}$$

$$A_2^* = \frac{D^*}{3} + \frac{4}{3}x^* - s^*\frac{4}{3} - x^*$$

$$A_3^* = \frac{\alpha'(\varepsilon)}{3}\left[x^* - \frac{D^*}{2} - s^*\right]$$

All coefficients seem ambiguous. Now, we determine the optimal subsidy policies and the impact of fear shock on welfare in two scenarios. These are the case of non-cooperative and cooperative policies.

3.1. Non-cooperative policies

In this case, both governments in each country determine the optimal pollution policy taking into account their welfare only. They do not pay attention to the other country's welfare. To determine the optimal non-cooperative policies, we set $\frac{dW}{ds} = 0$, and $\frac{dW^*}{ds^*} = 0$ such that A_1 and A_2^* in (36) and (37) should be equal to zero, and solving for each policy as

$$s^{NC} = \frac{1}{4}(D + x) > 0 \tag{38}$$

$$s^{*NC} = \frac{1}{4}\left(D^* + x^*\right) > 0 \tag{39}$$

The concavity conditions hold for both policies since

$$\frac{d^2W}{ds^2} = \frac{d^2W^{*2}}{ds^{*2}} = -1 < 0$$

Optimal subsidies are positive. These results are similar to those presented by Keen, Lahiri, and Raimondos-Moller (2009). The amount of subsidy depends on the efficiency of firms and the demand on each country. From (1), (2), (5), (14), (15), (38) and (39) we have

$$s^{NC} - s^{*NC} = \frac{1}{2}\left(\alpha - \alpha^*\right) + (c^* - c)$$

A larger subsidy is granted by the country with the most efficient firm, and the largest consumer market. We can formally say that

Proposition 1. *In a model of imperfect competition model of trade between two countries with an integrated market, the optimal non-cooperative subsidies established by each country are positive. However, the subsidy granted by the country with the most efficient firm, and the largest consumer market is greater than the subsidy granted by the other country.*

Intuitively speaking, subsidizing the local firm improves welfare since the increase in consumer and producer surplus is greater than the cost of financing the subsidy. On the other hand, it is intuitively clear that the country with the highest production efficiency and the largest consumer market size establishes a greater subsidy to satisfy its market and to get a competitive advantage. Each country is interested in a policy that benefits its welfare, establishing a subsidy is a policy measure that guarantees a certain level of competitiveness and provision of consumer goods.

Now, we shall consider the impact of fear shock on the welfare of each country once the optimal subsidies have been set. Substituting (38) and (39) into the coefficient A_3 and A_3^* we have

$$\left.\frac{dW}{d\varepsilon}\right|_{s = s^{NC}} = \frac{\alpha'(\varepsilon)}{4}[x + 3D] < 0 \tag{40}$$

$$\left.\frac{dW^*}{d\varepsilon}\right|_{s^* = s^{NC^*}} = \frac{\alpha'(\varepsilon)}{4}\left[x^* - D^*\right] \tag{41}$$

The effect of a fear shock on the welfare of the home country is unequivocally negative. The fall in producer and consumer surplus is greater than the fall in the cost of the subsidy. On the other hand, the effect of a shock of fear on the welfare of the foreign country is determined by the commercial profile of the country. In an integrated market of two countries, one country is the exporter and the other one is the importer.

According to (41), if $x > D$ home country is the exporting country, and the foreign country becomes the importing country so that $x^* < D^*$. In the foreign country, an increase in the level of fear reduces producer surplus, increases consumer surplus, and reduces the cost of the subsidy. Therefore (41) is positive regardless of the difference in the level of efficiency of the firms. In the event that the foreign country is the exporter, the opposite analysis applies. Formally, we can say

Proposition 2. *In a model of imperfect trade competition between two countries and a non-cooperative subsidy policy, an increase in the level of fear reduces the welfare of the home country. The welfare of the foreign country depends on the pattern of trade: if the foreign country is an importer, welfare grows, but if it is an exporter, welfare is reduced.*

For example, there is a reduction in most commodity prices due to the COVID-19 pandemic according to the World Bank Group (2020). A negative impact is expected for exporting countries of these goods, but a benefit for importing countries. Of course, the outcome may seem counterintuitive as the pandemic crashes markets and erodes people's incomes.

However, from the perspective of a partial equilibrium model, in which we measure welfare in terms of the tradable good, we can consider that the surplus of this good reduces the world price. Therefore, it improves the consumer surplus of the importing country. Due to the assumption of numeraire good, we are considering that people have an income reserve that allows a minimum level of consumption. Any change in the income of the people given by, for example, income-generating employment affects the consumption of the numeraire good.

Finally, to end this sub-section, when an increase in the fear level reduces the welfare of a home country, the local government attempts to correct this negative shock by employing policy instruments available. In this case, when the local government pursues an optimal subsidy policy, in what way should the local government respond to an increase in the fear level? The best policy response to this fear shock is through the change in optimal subsidy policy. From (38), we have

$$\frac{ds^{NC}}{d\varepsilon} = \frac{7\alpha'(\varepsilon)}{24} < 0$$

The best policy response of the home country is to reduce the subsidy since a reduction in the subsidy reduces the cost for subsidizing as well as increases the producer surplus of the foreign country. This strategy tries to compensate for the negative shock on consumption by reducing the cost of subsidy. Moreover, it offers a competitive advantage to the foreign firm. It is a counterintuitive result as the local government is promoting a competitive disadvantage to the local company. However, in an integrated market the consumer surplus is expected to improve by reducing the costly subsidy to be supplied by the foreign firm. Formally, we can say

Proposition 3. *In an imperfect competition model of trade between two countries with an integrated market, the optimal response of the home country to an increase in the fear level is to reduce the subsidy paid to the home firm.*

This strategy seems contradictory in pandemic times because many governments in the world promote the subsidy as an economic recovery strategy. However, when consumption falls, subsidizing firms becomes costly, and governments prefer to import cheaper goods. For example, in Mexico, the government removed restrictions on drug imports, removing government support for Mexican drug producers to have cheaper medicines. The Mexican government's argument is that the cost of medicines is high, and the cost of supporting local firms is greater than the loss in consumer surplus. Of course, it is not a generalized strategy as this policy strategy is limited to certain integrated markets where the benefit in consumer surplus is larger than the fall in production and employment.

However, the strategy adopted by the home country may adversely affect the foreign one. From the coefficient A_1^* in (37), and taking the optimal foreign firm subsidy as given, we have

$$\frac{dW^*}{ds}\Bigg|_{s^* = s^{NC^*}} = \frac{1}{2}\left[D^* - x^*\right]$$

In the event that the foreign country is an importer $\left(D^* > x^*\right)$, the reduction of the subsidy negatively affects the foreign country since the reduction of the home subsidy makes the imported goods more expensive despite the benefit of the foreign producer's surplus. When a foreign country is an exporter $\left(D^* < x^*\right)$, a reduction in the domestic subsidy improves the welfare of the foreign country through a greater producer surplus.

If the foreign country may expect a reduction in welfare due to the reduction in subsidy, then the best policy response to this home subsidy reduction is to increase the subsidy offered by the foreign government to the foreign firm. From (39), we have

$$\frac{ds^{NC^*}}{ds} = -\frac{1}{12} < 0$$

The increase in the subsidy increases the capacity to produce and therefore to consume the good. In this way, the foreign country is less dependent on imports. However, in this work, we are not interested in analyzing the dynamic interaction between subsidy policies, but we can see that if the governments of both countries react to the other's policy changes, both countries will seek a policy that compensates for their decline in welfare.

3.2. Cooperative policies

When both countries agree to cooperate with a particular subsidy policy, the policy set by each country is going to take into account not only the impact on his welfare but also the welfare in the other country. Each country's subsidy policy affects the consumer and producer surplus and the cost of the other country's subsidy. To do so, we solve the following system,

$$dW = (A_1 + A_1^*)ds + A_3 d\varepsilon \tag{42}$$

$$dW^* = (A_2 + A_2^*)ds^* + A_3^* d\varepsilon \tag{43}$$

We set $\dfrac{dW}{ds} = 0$, and $\dfrac{dW^*}{ds^*} = 0$, such that $(A_1 + A_1^*)$ and $(A_2 + A_2^*)$ in (46) and (47) are equal to zero and solving for each policy taking into account (14) and (15) we have

$$s^c = \frac{1}{2}\Big[D + D^* - x\Big] = \frac{1}{2}x^* = \frac{1}{4}a - \frac{1}{2}c^* > 0 \tag{44}$$

$$s^{c^*} = \frac{1}{2}\Big[D + D^* - x^*\Big] = \frac{1}{2}x = \frac{1}{4}a - \frac{1}{2}c > 0 \tag{45}$$

Where

$$x = \left(\frac{1}{2}a - c\right)$$

$$x^* = \left(\frac{1}{2}a - c^*\right)$$

The concavity conditions hold for both policies since

$$\frac{d^2W}{ds^2} = \frac{d^2W^{*2}}{ds^{*2}} = -\frac{2}{3} < 0$$

As in the non-cooperative case, both subsidies are positive. However, the amount of subsidy given by each country is different. From (14), (15), (44) and (45) we get

$$s^c - s^{c^*} = \frac{1}{2}(c - c^*)$$

The country with the most inefficient firm is offering the largest subsidy. Formally, we can say

Proposition 4. *In an imperfect competition model of trade between two countries, the optimal cooperative subsidies set by each country are positive. However, the subsidy granted by the country with the most inefficient firm is larger than the subsidy granted by the other one.*

The optimal pollution policy is to set a positive subsidy in both countries since the benefits in producer and consumer surplus of both countries are larger than the cost for subsidizing firms. Countries are taking into account the cost of subsidy and the consumer and producer surplus of the other country as well, so the subsidies that they agree to establish are oriented to achieve the maximum possible production to benefit consumers in both countries.

However, in case of a cooperative subsidy, the amount of the subsidy depends only on the efficiency of the firms. This amount is higher the lower the efficiency of the firm. When the subsidy is cooperative, both countries take into account the market of the other country, and therefore, the country with the most inefficient firm compensates its competitive disadvantage with a higher subsidy to adequately supply the market of the region. The subsidy is aimed at improving the efficiency and competitiveness of firms.

Now, as in the previous case, we shall consider the impact of fear shock on the welfare of each country once the optimal subsidies have been set. Substituting (44) and (45) into the coefficient A_3 and A_3^*, we have

$$\left.\frac{dW}{d\varepsilon}\right|_{s=s^C} = \frac{\alpha'(\varepsilon)}{6}\left[x + \frac{5}{2}D - \frac{1}{2}x^*\right] \tag{46}$$

$$\left.\frac{dW^*}{d\varepsilon}\right|_{s^*=s^{*C}} = \frac{\alpha'(\varepsilon)}{6}\left[x^* - D^*\right] \tag{47}$$

From the optimal outputs x and x^* defined above, when the foreign firm is equal to or less efficient than the home firm $(c^* \geq c)$, then $x^* < x$, and (46) is negative. That is, a fear shock reduces the welfare of the home country. On the contrary, when the demand from the home country (D) is small, and the home firm is sufficiently less efficient than the foreign one $(c^* \ll c$ then $x^* \gg x)$, a fear shock increases the welfare of the home country.

On the other hand, the impact of the fear shock in the foreign country is the same as in the non-cooperative case regardless of the difference in the level of efficiency of the firms. Again, the effect of a fear shock on welfare could be determined by the foreign country's commercial profile. When the home country is the exporting one and the foreign country is the importing one, (47) it is positive. When the home country is the importing one and the foreign country is the exporting one, (47) is negative. Formally we can say

Proposition 5. *In a model of imperfect trade competition between two countries and a policy of cooperative subsidies, an increase in the level of fear increases the welfare of the foreign country if this country is an importer. It reduces welfare if this country is an exporter. On the other hand, if the home firm is at least as efficient as the foreign firm, an increase in the level of fear reduces the benefit of the home country. Otherwise, when the foreign firm is sufficiently more efficient than the home company, and the size of the home demand is small, then an increase in the fear level increases the welfare of the home country.*

When the firm in the home country is at least as efficient as the foreign one, the producer surplus in the home country is large. A fear shock generates a fall in producer surplus of both firms, and a fall in home consumer surplus larger than the increase in the foreign consumer surplus. The net fall on consumer and producer surplus is larger than the reduction in the cost of the subsidy. But when the firm in the home country of is very inefficient and its demand is small, it means that the producer and consumer surplus in home country are small. A fear shock improves the welfare of the home country, since the reduction in the cost of the subsidy along with the increase in foreign consumer surplus are greater than the fall in producer surplus in both firms, and the fall in home consumer surplus. The intuition behind this result is that the cooperative subsidy policy is designed to compensate for the inefficiency of firms in the face of competition. Therefore, the more inefficient the firms, the higher the subsidy cost.

As in the case of non-cooperative subsidies, if $x > D$ home country is the exporting one, and the foreign country becomes the importing one so that $x^* < D^*$. In this case, an increase in the level of fear reduces producer surplus, increases consumer surplus, and reduces the cost of the subsidy. Therefore, (47) is positive regardless of the difference in the level of efficiency of the firms. In the event that the foreign country is the exporter $(x^* > D^*)$, the opposite analysis applies. It appears that the establishment of a cooperative subsidy does not affect the impact of a fear shock on

foreign welfare. The result is explained by the fact that we assume that the foreign country has not affected its consumption decision due to the increase in fear.

When an increase in the fear level reduces the welfare of a home country, the home government attempts to correct this negative shock by employing policy instruments available. The best policy response to this fear shock is through the change in optimal subsidy policy. From (44), we have

$$\frac{ds^C}{d\varepsilon} = \frac{\alpha'(\varepsilon)}{4} < 0$$

Again, the best policy response of the home country is to reduce the subsidy. The reduction in the cost of subsidy would be larger than the loss in home producer surplus and consumer surplus of both countries. This strategy tries to compensate for the negative shock on consumption by reducing the cost of the subsidy. Formally, we can say

Proposition 6. *In an imperfect competition model of trade between two countries and cooperative subsidy policy, the optimal response of the home country to an increase in the fear level is to reduce the subsidy paid to the home firm.*

As previously mentioned, this strategy seems contradictory in times of pandemic because many governments in the world promote the subsidy as an economic recovery strategy. However, the cost of subsidizing the home firm is greater as its productivity increases. The best strategy, regardless of the other economy's concern for a cooperative policy, is to reduce the subsidy.

On the other hand, it is expected that the shock of fear, due to COVID-19, generates unilateral decisions of the negatively affected country regardless of the agreements that it has had in terms of cooperation with other countries. Cooperation agreements are fragile in pandemic times. As mentioned above, a fear shock is not a predictable situation in any trade deal. The negative effect on the economy, and the unforeseen event, makes any trade deal relatively unstable. The countries, faced with a pandemic crisis like the current one, will determine policies that best suit their own interests, breaking previously established agreements. Trade agreements are unstable in crisis contexts such as the COVID-19 pandemic.

In a cooperative policy context, any change in policy by the home government simply breaks the rules of cooperation. The foreign government does not expect any cooperative reaction, even when this government benefits or not from the change in home policy. Breaking the cooperative rule is simply going back to the non-cooperative case unless a new agreement has to be formalized again. It is not useful to analyze the reaction of the foreign government. A new cooperative agreement must be signed instead.

4. CONCLUSIONS

It is naive to say that COVID-19 has not been an economic nightmare for economies around the world. One of the consequences of the pandemic is the change in consumer behavior caused by a fear shock. Fear is a distortion of the rationality typical of an environment of uncertainty that disturbs consumption decisions. It can shake the global economy. It is our interest to analyze the impact of a fear shock on the market equilibrium of a world of two countries.

We develop a partial equilibrium model between two trading partner countries, and a firm in each of them that competes in an integrated market. Each country establishes a subsidy in a non-cooperative way (competition subsidy) or in a cooperative way. Once the subsidy scheme is established, both countries face the emergence of a pandemic that upsets the balance in trade and welfare due to a change in consumer decision caused by a fear shock that restricts consumption.

With either a cooperative or a non-cooperative subsidy scheme, optimal subsidies are positive. However, the amounts of non-cooperative subsidies depend on the difference in the efficiency of the firms, and the size of the consumer market. Since each country is only concerned with maximizing its own profit, the country with the highest production efficiency and the largest market size establishes a greater subsidy to satisfy its market and obtain a competitive advantage over the other country. In the case of a cooperative subsidy, both countries also take care of the welfare of the other, so that the subsidies are oriented to reduce the inefficiency of the companies and maximize the welfare in both countries. In this way, the subsidy is higher when the company is less efficient to help it grow and supply the market in the region.

Once optimal policies are in place, a fear shock in the home country can distort the trade balance and affect the welfare of countries. This fear shock reduces both the producer surplus in both countries and the consumer surplus in the home country. Nevertheless, it increases the consumer surplus in the foreign country due to a reduction in the world price. When the subsidy is non-cooperative (competitive), the fear shock reduces the welfare of the home country. On the other hand, the foreign country can be an importing or an exporting country. When the country is an importer, a fear shock increases consumer surplus and thus welfare due to the fall in world price. For example, falling commodity prices can increase consumer surplus in importing countries with reduced economic impact from COVID-19. Otherwise, when the country is an exporter, the fall in the consumption of the home country negatively affects the welfare of the foreign country via the fall in its exports.

On the other hand, when both countries establish a cooperative subsidy, a fear shock negatively affects the welfare of the home country if the home firm is at least as efficient as the foreign firm as expected. But when the home country has a much more inefficient firm and its consumer market is very small, then a fear shock improves welfare, since the impact of the shock is minimal and the reduction in the cost of subsidizing an inefficient firm is high. In the presence of a fear shock, the

best strategy is not to subsidize the inefficient firms because of the high cost of their rescue. Finally, the impact of the fear shock in the foreign country is the same as that presented in the non-cooperative case since this country does not experience the fear shock in its demand.

What is the best response of the home country to the fall in its welfare due to a fear shock? The optimal answer is always to reduce the subsidy, and thus reduce the cost of financing the home business. Although this is counterintuitive result, in an integrated market the benefit is obtained by improving the consumer surplus with the goods produced by the foreign firm and at a lower cost. The improvement in the consumer surplus and the reduction in the cost of the subsidy are greater than the fall in the home producer surplus. With segmented markets the political reaction would surely be different. On the other hand, this policy of reducing subsidies is not sustainable when both countries establish a cooperative subsidy scheme. In this case, the fear shock makes the agreement untenable. Therefore, both countries decide their best option even if it prejudices the other country.

REFERENCES

AHANI, A. and M. NILASHI (2020). "Coronavirus outbreak and its impacts on global economy: the role of social network sites", *Journal of Soft Computing and Decision Support Systems 7* (2), pp. 19-22.

AHORSU, D. K.; C-Y. LIN, V. IMANI, M. SAFFARI, M- D. GRIFFITHS and A. H. PAKPOUR (2020). "The Fear of COVID-19 Scale: Development and Initial Validation", *International Journal of Mental Health Addiction*. September 1, 2020, <https://link.springer.com/content/pdf/10.1007/s11469-020-00270-8.pdf>.

ATKESON, A. (2020). "What Will Be the Economic Impact of COVID-19 in the US? Rough Estimates of Disease Scenarios", *NBER Working Papers* 26867, National Bureau of Economic Research. August 20, 2020, <https://www.nber.org/papers/w26867.pdf>.

BAKER, S. R.; R. A. FARROKHNIA, S. MEYER, M. PAGEL and C. YANNELIS (2020). "How does household spending respond to an epidemic? Consumption during the 2020 COVID-19 pandemic", *NBER Working Paper* 26949, National Bureau of Economic Research. August 1, 2020, <https://www.nber.org/papers/w26949.pdf>.

BALDWIN, R. and B. WEDER DI MAURO (2020). "Introduction", in R. Baldwin and B. Weder di Mauro, *Economics in the time of COVID-19*, CEPR Press, London, pp. 1-30.

BALDWIN, R. and E. TOMIURA (2020). "Thinking ahead about the trade impact of COVID-19", in R. Baldwin and B. Weder di Mauro, *Economics in the time of COVID-19*, CEPR Press, London. pp. 59-72.

BARRO, R. J.; J. URSUA and J. WENG (2020). "The coronavirus and the Great Influenza epidemic: Lessons from the 'Spanish Flu' for the coronavirus' potential effects on mortality and economic activity", *CESifo Working Paper* No. 8166. August 17, 2020, <https://www.cesifo.org/DocDL/cesifo1_wp8166.pdf>.

BLUSTEIN, D. L. and P. A. GUARINO (2020). "Work and Unemployment in the Time of COVID-19: The Existential Experience of Loss and Fear", *Journal of Humanistic Psychology* 60 (5), pp. 702–709.

CHEN, H.; W. QIAN and Q. WEN (2020). "The Impact of the COVID-19 Pandemic on Consumption: Learning from High Frequency Transaction Data", *SSRN*. August 1, 2020, <https://ssrn.com/abstract=3568574>.

EUROPEAN COUNCIL (2020). *COVID-19: the EU's response to the economic fallout*. The General Secretariat of the Council, Council of the Europe Union. November 20, 2020, <https://www.consilium.europa.eu/en/policies/coronavirus/covid-19-economy/>.

GILL, M. J. and R. BURROW (2017). "The function of fear in institutional maintenance: Feeling frightened as an essential ingredient in haute cuisine", *Organization Studies* 39 (4), pp. 445-465.

BROWN, G. and D. SUSSKIND (2020). "International cooperation during the COVID-19 pandemic", *Oxford Review of Economic Policy* 36 (1), S64–S76.

GORMSEN, N. J. and R. S. J. KOIJEN (2020). "Coronavirus: Impact on Stock Prices and Growth Expectations", University of Chicago, *Becker Friedman Institute for Economics Working Paper* No. 2020-22. August 3, 2020, <https://ssrn.com/abstract=3555917>.

GOYAL, K.; P. CHAUHAN, K. CHHIKARA, P. GUPTA and M. P. SINGH (2020). "Fear of COVID 2019: first suicidal case in India!", *Asian Journal of Psychiatry* 49, 101989.

GUNNELLA, V. and L. QUAGLIETTI (2019). "The Economic Implications of Rising Protectionism: A Euro Area and Global Perspective", *ECB Economic Bulletin Issue* 3.

HARPER, C. A., L. P. SATCHELL, D. FIDO and R. D. LATZMAN (2020). "Functional Fear Predicts Public Health Compliance in the COVID-19 Pandemic", *International Journal of Mental Health and Addiction*, 1-4. August 1, 2020, <https://link.springer.com/content/pdf/10.1007/s11469-020-00281-5.pdf>.

HUTJENS, M. (2014). "*The influence of fear on the buying behavior of consumers in case of an animal disease outbreak*", (MSc Thesis Marketing and Consumer Behaviour - Marketing and Consumer Behaviour). Wageningen University. May 20, 2020, <https://edepot.wur.nl/318026>.

KEEN, M.; S. LAHIRI and P. RAIMONDOS-MOLLER (2009). "Tax principles and tax harmonization under imperfect competition: a cautionary example", *European Economic Review* 46 (8), pp. 1559-1568.

KRUEGER, R. F.; R. KOTOV, D. WATSON, M. K. FORBES, N. R. EATON, C. J. RUGGERO, *et al.* (2018). "Progress in achieving quantitative classification of psychopathology", *World Psychiatry* 17, pp. 282–293.

LI, S.; Y. WANG, J. XUE, N. ZHAO and T. ZHU (2020). "The impact of COVID-19 epidemic declaration on psychological consequences: a study on active Weibo users", *International Journal of Environmental Research and Public Health* 17, 2032.

MCKIBBIN, W. J. and R. Fernando (2020). "The Global Macroeconomic Impacts of COVID19: Seven Scenarios", *CAMA Working Paper* No. 19/2020. July 20, 2020, <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3547729#>.

OECD (2020). "*Tax and Fiscal Policy in Response to the Coronavirus Crisis: Strengthening Confidence and Resilience*", OECD. November 15, 2020, <https://read.oecd-ilibrary.org/view/?ref=128_128575-o6raktc0aa&title=Tax-and-Fiscal-Policy-in-Response-to-the-Coronavirus-Crisis>.

ÖHMAN, A. (2008). "Fear and Anxiety: Overlaps and Dissociations", in M. Lewis, J. M. Haviland-Jones and L. F. Barrett, *Handbook of emotions*, The Guilford Press, New York, pp. 709–729.

OLSSON, A.; K. I. NEARING and E. A. PHELPS (2006). "Learning fears by observing others: The neural systems of social fear transmission", *Social Cognitive and Affective Neuroscience* 2 (1), pp. 3–11.

OLSSON, A. and E. A. PHELPS (2007). "Social learning of fear", *Nature Neuroscience* 10 (9), pp. 1095–102.

ORNELL, F.; J. B. SCHUCH, A. O. SORDI, K. PAIM and H. FELIX (2020). "'Pandemic fear' and COVID-19: mental health burden and strategies", *Brazilian Journal of Psychiatry* 42 (3), pp. 232-235.

ORTMANN, R.; M. PELSTER and S. T. WENGEREK (2020). "COVID-19 and Investor Behavior", *Finance Research Letters*, 101717.

PAPPAS, G. A.; I. J. KIRIAZE, P. GIANNAKIS and M. E. FALAGAS (2009). "Psychosocial consequences of infectious diseases", *Clinical Microbiology and Infection* 15 (8), pp. 743–747.

PERIN, C.; M. BEGHI, C. G. CERRI, F. PERONI, B. VIGANO and C. M. CORNAGGIA (2015). "Experience of group conversations in rehabilitative medicine: methodological approach and pilot study", *Journal of Medicine and the Person* 13, pp. 96–104.

WORLD BANK GROUP (2020). "*Commodity Markets Outlook, April 2020*", World Bank, Washington, DC. July 20, 2020, <https://openknowledge.worldbank.org/bitstream/handle/10986/33624/CMO-April-2020.pdf?sequence=9&isAllowed=y>.

ZHOU, X. (2020). "Psychological crisis interventions in Sichuan Province during the 2019 novel coronavirus outbreak", *Psychiatry Research* 286, 112895.