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The Effects of Economic Sanctions on Target Countries over Time through Mathematical Models and Decision Making

Emad Rabiei *[1], Peyman Ahmadian [2]

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ABSTRACT: This study investigates the impact of economic and political sanctions on Governments over time. The objective of this paper is to determine the best strategy toward sanction through decision making methods. Some economists argue that it takes time to convince the sanction target. Others stress that economic adjustment will reduce incentives to comply. When it comes to international economic sanctions, the most frequent goal is regime change and democratization. Yet, past experiences suggest that such sanctions are often ineffective; moreover, quite paradoxically, targeted regimes tend to respond with policies that amplify the sanctions' harmful effects. These governments try to contain potential problems caused by sanctions by using three types of political rhetoric: appeasement, backlash, and surveillance. Negative sanctions cause the regime to use appeasement strategies (or calls for reforms and internal changes). It tends to use backlash rhetoric (or blaming the sanctioning powers) in response to, interestingly, positive sanctions. This paper also offers a political-economy model by using mathematical formulas which provides an explanation for these observations. As a result, we conclude if government utilize its own economic opportunities, there is a big chance that sanctions fail.

KEYWORDS: Sanctions, Economic Sanctions, Change Behaviour, Adjustment, Sanction Effects.

[1] B.Sc, Industrial Engineering, Faculty of Engineering, Islamic Azad University, Karaj Branch, Iran.

E-mail: e.rabiei92@gmail.com

[2] B.Sc, Industrial Engineering, Faculty of Engineering, Islamic Azad University, Karaj Branch, Iran.

E-mail: peyman70106@yahoo.com

1. INTRODUCTION

Over the course of the 20th century, international economic sanctions have become an increasingly important foreign policy tool. Since the outbreak of World War I, there have been a total of 187 sanctions episodes, about 66 of which started after the collapse of the Soviet empire (Hufbauer et al., 2007). Economic sanctions usually combine restrictions on international trade and investment and are generally viewed as an instrument to induce specific changes in a target country. In practice, sanctioning states have indicated a variety of goals but the most frequent by far is to promote democratization by pushing autocratic (or even despotic) regimes out of power.

Statistics have shown that majority of those foreign policy sanctions that have been successfully implemented in the past, have taken longer than one year to succeed. If the intentions of the imposing countries and the perceptions of the target country are known with certainty, the sanctions should either work directly or never at all (Bergeijk, 1989). The history of economic sanction instrument illustrates both sanctions that work directly and sanctions that never seem to work. Another peculiarity of economic sanctions is that the implementation of a sanction today does not necessarily imply that this sanction will be implemented in the next period as well (Carter, 1998). Indeed, according to the Hufbauer *et al*, about one out of three ineffective economic sanction lasted one year or less (Fig.1.). As the target of the sanction did not change its behaviour, the reason for implementing the sanction in the first place continued in these cases. Evidently then, continuation of a sanction is uncertain. This is why any theory of economy sanctions should not start from a deterministic setting (Acemoglu, D., 2009). First, it has to deal with the stochastic outcome of situations in which economic sanctions have been applied. Second, it has to acknowledge the impact of expectations and probabilities in the decision process. And the third, you need to introduce adjustment when probabilities are exogenous.

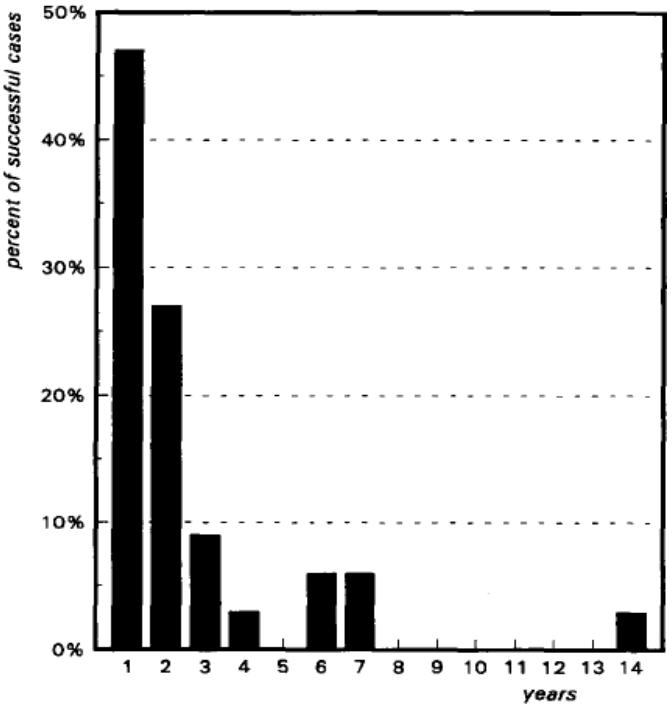

Fig.1. successful sanctions by duration (years)

Yet, despite their frequent use, our knowledge about how economic sanctions might foster regime change and democratization is very limited. There is a general notion that, as Mack and

Khan (2000) put it, "the pain inflicted by sanctions on citizens of target states will cause them to pressure their government into making the changes demanded by the sanctioning body." But very little analytical work has actually been devoted to the exact channels through which sanctions are supposed to promote democratization. As a result, our understanding of the factors determining the likelihood of success and failure is highly incomplete. It is the purpose of the present paper to make some progress in this regard by building a political-economy model which reflects some basic features of a typical target country. A closer look at the history of economic sanctions aiming at regime change and democratization corroborates the view that a better understanding of their use and consequences is required (Acemoglu, D., Robinson, J.A., 2000). In particular, past experiences with such sanctions offer a number of observations that are puzzling. One of these observations is that targeted regimes hardly try to dampen the negative economic consequences; targeted regimes rather tend to respond by pursuing policies which severely compound the sanctions' adverse effects on the economy (Acemoglu, D., Robinson, J.A., 2001).

2. LITERATURE REVIEW

Economic sanctions are common diplomatic tools for countries to achieve their political goals. Baldwin (1971, 1985) defines these tools as "statecraft", and argues that both positive and negative sanctions are instruments to exercise "power" (1985, p. 9). Power, in this case, refers to ability to alter the behaviour of others. More specifically, Baldwin (1971) argues that power influences one's decision-making process, and can be used to alter the behaviour of targeted countries/political entities. For this reason, this study defines economic statecraft, in accordance with Baldwin (1971), as the diplomatic tools used to change policy. Economic sanctions as a tool to alter the previous behaviour of the targeted regimes are largely two fold and include both negative and positive sanctions. According to Baldwin (1985), negative economic sanctions are imposed as forms of embargo, boycott, tariff sanctions, quotas, or license denial (p. 41). These diplomatic tools coerce the target by punishment. On the other hand, positive sanctions alter targeted behaviour by providing rewards. These include reductions of tariff, direct purchases, or trade subsidies.

Since negative sanctions punish the target by decreasing resources or restricting the opportunity for more resources, these types of sanctions fundamentally diminish the economic status of targets (Wood, 2008). However, Bueno de Mesquita et al. (2003) argues that autocratic countries survive longer than democratic countries, because dictators only need to appease a small number of political elites. For this reason, as Bolks and Al-Sowayel (2000) argue in their research on the duration of sanctions, autocratic countries that quickly make countermeasures to sanctions remain in power longer than democratic countries. Escribà-Folch and Wright (2010) also argue that the effectiveness of economic sanctions is dependent on the regime type, especially the capability of institutional or structural appeasement. If economic sanctions actually decrease the amount of resources that are essential for political leaders to mitigate potential dissenters, leaders will become more repressive. Personalistic regimes and monarchs are more sensitive to the loss of resources because they lack the institutions to appease dissenters.

The political-economy model we are proposing to look into these issues rests on three simple elements. First, consistent with the focus on regime change and democratization, we consider an autocratic target country, i.e., a country where the government has substantial leeway to implement its preferred policies but also to divert public resources for its own benefit. Second, the state plays an important role in the private sector of the economy: By providing public goods and services, the government can affect the productivity of private firms and hence the citizens' incomes. Third, challenging the regime in order to promote a transition to democracy

comes at an economic cost (Aidt, T.S., Albornoz, F., 2011): During periods of power transitions the public sector is paralyzed so that the economy as a whole becomes less productive.

3. HYPOTHESIS

We argue that negative sanctions have a positive impact on all types of rhetoric, while positive sanctions have limited impacts. Negative sanctions decrease resources, so that citizens who are excluded from the government's distribution will be dissatisfied with the regime. For this reason, a totalitarian regime tries to minimize dissent by adopting the appeasement rhetoric of economic development and better living standards. Moreover, since negative sanctions explicitly show an external enemy who is trying to sabotage the targeted regime's policy, the totalitarian regime uses the rhetoric of backlash to politically unify supporters. This will decrease the dissatisfaction of citizens because negative sanctions are perceived as an attack on the citizens, as well as the political leader (Bearce, David H., Tirone, Daniel C 2010). Finally, since negative sanctions increase the level of dissatisfaction in general because of economic hardship, a totalitarian regime uses the rhetoric of surveillance to minimize dissenters. This rhetoric of surveillance idolizes socialism and the political leaders, while emphasizing the education of political ideology. The first hypothesis exemplifies this assumption:

3.1. Hypothesis 1.

When there are negative sanctions, a totalitarian government increases the proportion of backlash, appeasement, and surveillance rhetoric used by the leadership in reaction (Friedrich, Carl J., Brzezinski, Zbigniew K1965). Positive sanctions affect the regime in various ways, especially in terms of economic distribution. For example, a totalitarian government can distribute the resources to political supporters, while it diminishes the amount to citizens or maintains previous levels of distribution. In this case, people will be dissatisfied with the difference of distribution. Since surveillance rhetoric focuses on ideological purity, loyalty, education, and unity under the direction of political leader, a targeted regime can use it to mitigate the discrepancies that result from the positive sanctions (Licht, 2009).

3.2. Hypothesis 2.

When there are positive sanctions, a totalitarian government increases the proportion of appeasement and surveillance rhetoric but not backlash rhetoric. As the second hypothesis denotes, it is expected that positive sanctions have positive connections to appeasement and surveillance rhetoric.(Galtung, Johan 1967) However, it is expected that positive sanctions do not have connections with backlash rhetoric because there is no attacker to blame.

4. DISCUSSION

The model presented in the following sections offers an explanation for why countries chose to compound the sanctions-induced hardship. This is not to say, however, that there could not be alternative explanations for why regimes sometimes magnify the sanctions' harmful effects. Alternatively, it could be that the sanctions-induced scarcity of vital import goods helps a regime extract enormous rents, so that the domestic economy becomes less important as an income source and gets neglected (Mueller, J., Mueller, K., 1999). Still, while all these alternative explanations may be relevant, it is not obvious how they would explain why a regime would actively diminish the productive potential of its economy.

5. THE MODEL

5.1. Agents, Preferences, and Economic Activity

We consider an infinite-horizon economy in discrete time. The society starts out with two different players, the ruling elite (E) and the citizenry (N). (Gentile, Emilio 2000) Both groups derive utility from consumption of a non-storable output good. Preferences are given by the intertemporal utility function.

$$U_{i,t}=E_t\{\sum_{s=0}^{\infty}\beta^s u(c_{i,t+s})\} \quad (1)$$

Where the instantaneous utility function, u (·), is assumed to be logarithmic; $c_{i,t}$ refers to consumption by player i is {E,N } in period t; and β is (0,1) denotes the discount factor. The good output is produced by the citizenry only. Specifically, the citizenry has access to a technology which generates a profit (i.e., output minus cost of inputs) of

$$Y_t=A_tG_t \quad (2)$$

Units of the output good. The first factor in Eq. (2), the productivity parameter A_t, is taken to reflect the "availability" of crucial foreign input factors. It also serves as the channel through which economic sanctions affect the domestic economy. More precisely, I assume that the imposition of trade sanctions increases the cost of foreign inputs and hence decreases their use which is mirrored in a lower profit.(Bull 1984) The second factor, G_t, refers to the level of the public good provided by the government. It captures in a simple way that the state plays an important role in promoting economic activity by, for instance, maintaining infrastructure, upholding law and order, or enforcing private contracts. Note that G_t reflects the level of the public good at the time production takes place. As described below, this level may be lower than the one provided initially as a result of damages associated with political turmoil.

5.2. Policy Choices and the Supply of the Public Good

In every period t, two policy variables have to be determined. First, there has to be a decision on the tax rate on the citizenry's income. The tax rate is denoted by $T_t \in [0,T^m]$, where $T^m<1$ refers to the maximum rate. The second policy choice is the supply of the public good, $X_t \in [0,X^m]$, where $0<X<\infty$, The associated per-unit cost (in terms of the output good) is given by $\emptyset A_t$, where $\emptyset<1$, An intuitive way of looking at this cost is to suppose that it reflects the number of government officials employed to produce the public good (Wintrobe, R., 1990). From this perspective, the cost can be interpreted as the public wage bill which moves in lockstep with private sector incomes. The assumption of a maximum supply, on the other hand, implies in a straightforward manner that there are decreasing returns in the production of the public good. The relationship between public expenses and the level of the good public is illustrated in Fig. 1. As mentioned above, the level of the public good available to the citizenry, G_t deviates from the one initially supplied by the government, Xt, in times of political turmoil. (Acemoglu 2005) More specifically, the relationship between X_t and G_t is given by

$$G_t=max\{X_t-\eta_t\chi,0\} \quad (3)$$

Where $\eta_t \in \{0,1\}$ is an indicator variable that takes on the value 1 if the elite exits the economy and χ refers to the size of the associated reduction. The exit of the elite may be the result of a popular revolt or, alternatively, due to a voluntary decision to flee the country. This assuming that the people of the country suffer in times of political turmoil is obvious. Myriad examples suggest that – when protesters clash with the regime or the regime abandons power abruptly – roads are blocked and law and order collapses. It is further natural to assume that, as implied by

Eq. (3), the relative size of the reduction is larger if the supply of the public good is lower. An underdeveloped traffic infrastructure, for instance, means that one blocked road may be sufficient to cause gridlock. Regarding the magnitude of χ:

$$\beta Xm < \chi < X^m \quad (4)$$

Finally, as to the relationship between the social benefit and cost of the public good, it is clear that $X_t = X_m$ maximizes the social surplus as the marginal cost of providing the public good, ϵA_t, is only a fraction ϵ of the marginal impact on the aggregate output, A_t. The elite is not interested in the social surplus but in the government budget surplus (which it can appropriate when in power). The marginal impact of X_t on the budget surplus is $(\tau_t - \phi)A_t$, where $\tau_t \in [0, \tau_m]$. In this regard, the formula was calculated as follows:

$$T_m > \phi \quad (5)$$

5.3. Political Regimes and the Transition of Political Power

There are two political regimes, dictatorship (R) and democracy (D), and the political state is denoted by $St \in \{R, D\}$. Under dictatorship, the state apparatus is captured by the elite, which means that the elite determines economic policies and is free to appropriate any fraction of the government budget surplus. Democracy, on the other hand, means that policies are determined by the citizenry. The economy starts as a dictatorship (S_0=R). However, as long as S_t=R, the elite's power is continuously threatened as the citizenry may revolt in any single period. The citizenry's decision in this regard is denoted by $\rho_t \in \{0, 1\}$, with 1 indicating a revolt. If the citizenry decides to revolt, democracy will be irreversibly established in the next period (i.e., $S_t + 1 = S_t + 2 = \cdots = D$). Moreover, in this case, the elite is immediately ousted. The result of such a forced exit is that the elite definitively loses all sources of income so that $U_{E,t} \to -\infty$.A revolt is not the only road to democracy; however, as the elite may seize an opportunity to voluntarily leave the country for exile abroad. Yet, because political circumstances in potential host countries may be in flux, the existence of such an opportunity is not assured but only emerges with an exogenous probability $p \in [0, 1]$ in each period. The state variable in this regard is denoted by $Ft \in \{0, 1\}$, with 1 meaning existence. If the elite seizes an existing opportunity, which is indicated by $\sigma_t = 1$, where $\sigma_t \in \{0, 1\}$, democracy will be again established irreversibly in the following period. Moreover, as of the current period, the elite's recurrent income is given by $\omega > 0$ so that $U_{E,t} = \ln(\omega)(1-\beta)^{-1}$. If the elite prefers to stay, though, the political state remains unchanged (i.e., $St = S_{t+1} = R$). Finally, note that the "exit" variable introduced above is defined by $\eta_t \equiv \max\{\rho_t, \sigma_t\}$.

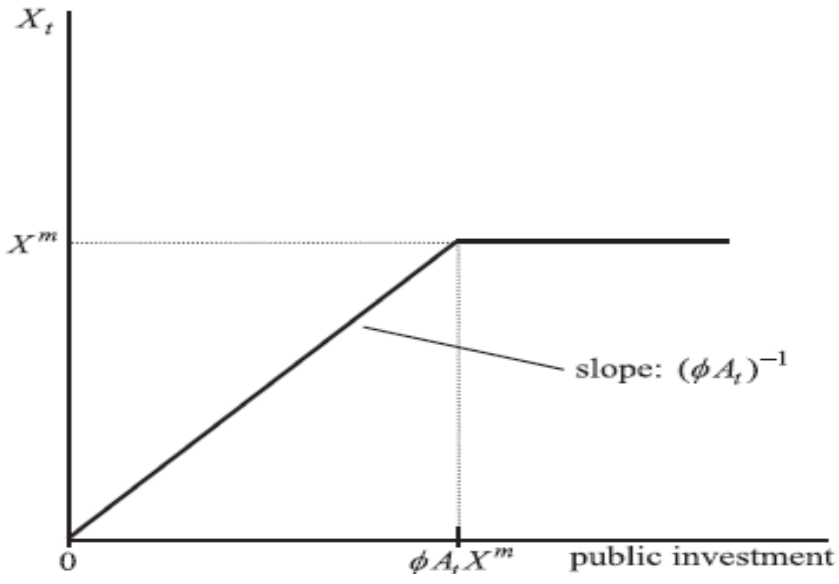

Fig.2. Public investment and the level of the public good

6. EXOGENOUS A PRIORI PROBABILITIES

Since we study the response of a target country to sanctions over time in previous parts, we have to discount (expected) future outcomes (or yields) that are the possible result of present decisions. The present discounted value of complying PDV(C) consists of the discounted future stream of normal pay offs y_N, which at the rate time preference *p* yields ($0<p<1$):

$$PDV(c)=\sum_{j=0}^{\infty}\rho^{j}y_N=\frac{y_N}{(1-\rho)} \tag{6}$$

Given the subjective a *priori* probability π that a sanction will be imposed, the net expected

Value of not complying in period 0 is:

$$(1-\pi)(y_F+S)+\pi\,(y_F-E-D) \tag{7}$$

We describe the development of damage over time in this model. Calculating the expected present discounted value of not complying PDV (NC) requires that we take both the sanction damage and the speed of adjustment into account. After t periods of adjustment, the gains from specialization have reduced to $\delta^t S$ and the transitory damage to $\delta^t D$. The discounted expected yield at t_0 of not complying is therefore:

$$p^t(1-\pi)(y_F+\delta^t S)+\pi\,(y_F-E-\delta^t D) \tag{8}$$

So provided $\pi D \geq (1-\pi)S$ (otherwise there is no expected gain in adjusting the economy), we may write:

$$PDV(NC)=\frac{y_F-\pi E}{1-\rho}-\frac{\pi D-(1-\pi)S}{1-\rho\delta} \tag{9}$$

The target will decide to comply if the present discounted value of compliance is larger than or equal with the present discounted value of non-compliance: PDV (C) ≥PDV (NC). Let for notational convenience $\eta \equiv (1-p)/(1-p,1)$ be the appropriate discount rate for adjustment items (D and S) in order to rewrite the condition for compliance as:

$$\pi(\eta D+E)\geq(y_F-y_N)+(1-\pi)\,\eta S \tag{10}$$

So the expected temporary damage and the forgone gains of exchange must be larger than or equal to the sum of the premium of non-compliance (y_F - y_N) and the expected gains from international specialization. So premium of non-compliance has to be balanced against the expected disutility of the sanction, taking adjustment into account. This requires that sanction damage is weighted by the subjective probability that a sanction will be actually implemented in the next period and that the transitory components are corrected for the speed of adjustment and the rate of time preference, respectively, as these terms are changing over time. The condition of equation (10) which describes the case of exogenous subjective probabilities is more likely to hold (and therefore the target is more likely to comply) if, other things equal, the premium of non-compliance decreases (either by a decrease of y_F or an increase of y_N), the rate of time preference increases (*p* decreases), the speed of adjustment decreases (δ increases), or sanction damage (D, E, and/or S) increases.

Although being instructive, this model in this section is unable to explain why economic sanctions take some time to work.

7. ANALYSIS

7.1. Equilibrium under Democracy

Suppose that St=D so that productivity is at its maximum level (At=1) and the elite is no longer part of the game. Under these circumstances, the budget constraint of the public sector is given by $\tau_t X_t \geq \phi X_t$. It is clear that this constraint must hold with equality: Imposing a tax rate higher than necessary to finance the public good is suboptimal. Therefore, in any single period, the citizenry prefers $\tau_t=\phi$, which is also feasible because of restriction (10). The current level of consumption by the citizenry is thus given by:

$$c_{N;t}=(1 - \emptyset)X_t \quad (11)$$

It is further obvious that maximizing the above expression requires $X_t=X_m$ so that $\Pi t=(\phi, X_m)$. Finally, since switching back to dictatorship is impossible, identical policies will be implemented in all future periods t+1, t+2, .. As a result, once the political state has switched to D, the uniform level of lifetime utility incurred by the citizenry is:

$$V(D)=\frac{In((1-\phi)Xm}{1-\beta} \quad (12)$$

Note that V(D) is the highest lifetime utility the citizenry can achieve because, in each period, it consumes the full social surplus (which, in turn, is at its maximum level). (Marshall 2008) So, as will become clear below, the end of sanctions is not the only benefit of a switch to democracy. Democratization also means that the citizenry is freed from rent-extracting elite that imposes high taxes and invests too little in public goods.

8. A MODIFIED SETUP

The modified setup rests on the obvious idea that the level of the elite's income in exile, **ω**, is not exactly known when the sanctions episode starts ; it is only disclosed over time as exile opportunities emerge (Oechslin, 2014). To mirror this idea in a simple way, assume that **ω** can take on two possible values, $\boldsymbol{\omega}^l$ and $\boldsymbol{\omega}^h$,where $\boldsymbol{\omega}^l < \boldsymbol{\omega}^h$ and $0 < q \equiv Pr[\boldsymbol{\omega}=\boldsymbol{\omega}^h] < 1$.While all actors are informed about the distribution of **ω** right from the beginning, they learn the actual realization of **ω** only with the emergence of the first exile opportunity. Suppose further that the "toughness" of sanctions is limited (Oechslin, M. 2010). Specifically, the sanctioning body is unable to push A below a certain lower bound, denoted by $\underline{A}$, where A satisfies.

$$\boldsymbol{\omega}^l \leq (T^m - \phi)\underline{A}\chi < (T^m - \phi)\underline{A}X^m \leq \boldsymbol{\omega}^h \quad (13)$$

Restriction (13) implies that the maximum sanctions intensity is insufficient to push the elite's equilibrium income below the lower of the two possible exile incomes, $\boldsymbol{\omega}^l$; on the other hand, the maximum sanctions intensity is sufficient to keep the elite's equilibrium income below the higher of the two possible values, $\boldsymbol{\omega}^h$. No other modifications are introduced. In this modified setup, the nature of the dictatorship equilibrium changes upon the revelation of the elite's exile income, $\boldsymbol{\omega} \in \{\boldsymbol{\omega}^l, \boldsymbol{\omega}^h\}$.

8.1. Dictatorship Equilibrium after the Disclosure of Ω

Suppose first that $\boldsymbol{\omega}=\boldsymbol{\omega}^l$. Then, Eq. (13) implies that the sanctioning body is unable to induce the destabilized-dictatorship regime described in pervious parts. Moreover, as discussed before

there is no stable-dictatorship equilibrium that involves the use of sanctions. Hence, the only equilibrium is stable dictatorship equilibrium with A_t= 1for all t so that the citizenry's value function is given by:

$$V(R|\omega=e^{lk})= \frac{In((1-Tm)Xm}{1-\beta} \quad (14)$$

9. FINDING

The present analysis offers a coherent perspective on past experiences with sanctions imposed to promote regime change and democratization. On one hand, it suggests an explanation for why targeted regimes – far from trying to mitigate the consequences for the general population – respond by taking measures which severely amplify the sanctions' negative effects on the economy. On the other hand, the model is able to match a pattern that has been many times observed, namely that sanctions are kept in place for a number of years but eventually abandoned although the desired result has not been achieved. In general long-lived sanctions can only have some positive utility if (i) the target is very stubborn, dull or disbelieving and (ii) permanent sanction damage is sufficiently large. Otherwise sanctions should only be implemented for a limited number of years.

10. SUMMERY AND CONCLUSION

This paper develops a political-economy model to study the use and impact of international economic sanctions aiming at regime change and democratization. The model suggests that, when countries were threatened by such sanctions, a dictatorial regime may use the supply of public goods and services as a tool of defense. The intuition is straightforward. The 1st hypothesis declares that imposition of negative sanctions make the target act with harmful behaviors; however, the 2nd one suggests that positive sanctions cause benefits for both sides. As intended, the imposition of sanctions makes a previously reluctant citizenry more inclined to revolt. Thus, to prevent an immediate ouster, the elite has to increase the cost of a revolt and it can do so by reducing the supply of public goods. A lower supply means lower incomes for the citizenry and hence more strain (i.e., a steeper fall in utility) associated with a revolt's destructive effects.

We model the decision by the sanction target to comply or to persist as an economic function adjustment. Our model distinguishes between sanction that (i) work directly, (ii) take some time to work and (iii) will never work. Delivering permanent damage increases the probability that the target will comply to learn from the sender’s determinedness. Obviously, the adjustment effect is more likely to exceed the learning effect so that compliance becomes less likely if the sanctions are announced some periods before they are implemented. It has shown through models that sanctions especially economic sanctions need some time to influence the target regimes. And the target need some time to realize that the economic sanction threat is real.

As mentioned above, although previous scholars suggest shot-term reaction to political and economic sanctions, we use modelling like exogenous sanctions intensity to predict more real reaction to all kinds of sanctions. In addition, the advantage of our model could be its efficiency for this era in which can be used in target countries. However, some of the theories like Mack and Khan (2000) and Baldwin (1971, 1985) got some reputation by its creativity through imposing sanction; it is now become useless because of changing in components of sanctioning. This point need to be considered that all provided methods including ours are not perfect and need enough time at least one year to put its effects on sanctions.

Two types of rhetoric (appeasement and backlash) are more the result of reactions to external sanctions, in which can cause popular uprising toward target country. As intended, the imposition of sanctions make a previously reluctant citizenry more inclined to revolt. Thus, to prevent a hasty response, we suggest the elite increases the cost of a revolt and it can do so by reducing the supply of public goods. A lower supply means lower incomes for the citizenry and hence more strain (i.e., a steeper fall in utility) associated with a revolt's destructive effects.

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ETHICAL CONSIDERATION

Authenticity of the texts, honesty and fidelity has been observed.

AUTHOR CONTRIBUTIONS

Planning and writing of the manuscript was done by the authors.

CONFLICT OF INTEREST

Author/s confirmed no conflict of interest.

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