Third party intervention in secessions

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Abstract

This paper provides a theoretical framework for secessions with third party interventions in ethnically divided countries. An ethnic minority of one country may want to engage in a secession in order to join its ethnic kind in the neighboring country. A secession is an explicit outcome of a conflict between the central government and the separatist region. A third party, the neighboring country, decides whether or not to support the separatist region in the conflict. Supporting a secession is punished with sanctions. The model shows that the third party will only intervene in the conflict if the benefits from annexation are large and if the separatist region's conflict technology is low. In these cases, the third party's support incentivizes the separatists into fighting harder.

1 Introduction

How do sovereign states form and how does the size of a country change over time? On the one hand, the size of countries are shaped by ethnic conflicts, regional separatism and other centrifugal forces which may lead to secessions. On the other hand, the size of countries are also shaped by conquests, annexations and other forms of integration. Research in economics has mainly focused either on peaceful separation and unification or on violent secessions and wars of conquest.

Various events in history show that there can be combinations of those two opposing forces. A region of one country may have an interest to actively enforce a separation in order to merge with a third player. Those movements towards secession can be accompanied by the third party's effort to enforce the unification.

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When Germany and its allies lost the World War I, the Sudetenland, a former part of Germany, became part of Czechoslovakia. These areas were primariliy inhabited by German speaking population which had strong ethnic ties with Germany. Political groups tried to separate the Sudetenland from Czechoslovakia in order to reunite it with Germany. These unsuccessful attempts were later supported by Nazi Gemany. Adolf Hitler organized the Munich conference with all European major powers. They signed the Munich agreement in order to legitimate german occupation of Sudetenland. In october 1938, the Sudetenland was relegated to Germany.

The dissolution of the USSR provides further cases in which both forces can be observed. When Moldova was created, the area near the border to Russia, Transnistra did not want to leave the Soviet Union. The Transnistria's population differs from the rest of Moldova's population with respect to its ethnic and linguistic composition. Russia is the mother tongue of many inhabitants n this region. The disagreements between the Moldovian government and Transnistria led to a military conflict. The Russian president Gorbatchev declared Moldova's fight illegal which was due to concers of instability. But in 2014, the head of Transnistria's parliament asked to join the Russian Federation. This reunification is still an open debate but Russia did not considered it an illegal act this time.

Another case is the Republic of South Ossetia. In 1990, South Ossetia declared independence from Georgia which led to open warfare. At that time, the declared motivation of South Ossetia was to become an independent state. It was supported by Russian Federation and received military and financial aid from the Russian Governemnt. In 2008, Georgia attacked South Ossetia which led to the intervention of Russian troops. In 2015, the president of South Ossetia and Russia signed an alliance and integration treaty which also includes the incorporation of military forces and which comes close to a full integration.

In winter and early spring 2014, pro-Russian separatists made effort to separate the Crimean from Ukraine in order to merge it with Russia. They were supported by Russia. Political struggle about the choice of Ukraine's political orientation, either to the European Union or to the Russian Federation, arose prior to this event. The pro-Russian separatists claimed ethnic affiliation as the central reason for their motivation and to justify their cause. The Crimean is primarily populated by ethnic Russians. A referendum under Russian supervision took place and the Crimean was annexed by Russia. The Ukraine crisis continued with ongoing separatist movements in the Donetsk and Lukansk regions in the eastern parts of Ukraine. Here too, ethnic affiliation is the stated reason to justify the cause of separation.

This paper provides a theoretical framework to better understand the underlying mechanisms of third party intervention in ethnically motivated secessions. One ethnic group is distributed between two countries and constitutes a political minority in one country. Ethnic groups have differing preferences for the implemented policy, and the ruling ethnic group only implements its preferred policy. Hence, the policy in the ethnically fractionalized country impose a low perceived utility for the political minority. This political minority can split from the country and merge with its ethnic kind in the other country. The motivation to split and to merge with its own ethnic kind is twofold. First, the ethnic bias in the public good provision is eliminated. Second, the tax base of the public good may increase by this unification. A secession is the explicit outcome of a conflict between the political minority and the central government. The political minority can be supported by its ethnic kind in the second country. This third party intervention is motivated by the potential gain of additional tax income.[1] Further, the model also includes sanctions which are imposed on the third party for intervening. The model shows that the separatist group is only supported by the third party if the secessionist group's conflict technology is too low from the third party's perspective. The model also shows that sanctions increase the two main conflict parties' conflict bids. The secessionist group has to compensate for the third party's reduced willingness to provide support. Furthermore, the model shows that secessions and annexations are more likely if ethnic heterogeneity is high and if sanctions are weak.

The theoretical foundations for the motivation to separate are adopted from the economic literature on the size of nations. Alesina, Perotti, and Spolaore (1995), Alesina and Spolaore (1997) provide an approach which centers around the tradeoff between size and heterogenous preferences.[2] Bolton and Roland (1997) provide a complementary approach which is also based on this tradeoff but which focuses on income distribution across regions and redistribution as the main reason for breakups of nations. Goyal and Staal (2004) provides a further complementary model which focuses on various features of regions like size, location, and the diversity within regions. Wittman (2000) presents a theory which provides a tradeoff between economies of scale of political systems and the costs of integrating preferences. Olofsgard (2003) analyze the incentives to split in the presence of mobile ethnic groups. Haimanko, Breton, and Weber (2005) allows for transfers which can be implemented in order to reduce

[1] A further motivation could be the prevention of the spread of conflict o its neighboring countres. See Idean Salehyan (2006) and Gleditsch (2007) for an analysis on the risk of transnational spread of civil war.

[2] See Bolton, Roland, and Spolaore (1996) for an overview on this literature.

the threat of a secession. Bordignon and Brusco (2001) analyze optimality conditions for allowing secessions which focus on the exante and expost benefits of these rules. A consent in this literature is that the size of a population leads to economies of scale for the provision of public goods due to low per capita costs. Alesina and Wacziarg (1998) show that smaller countries have a higher share of public spending in GDP. Size also provides advantages to protect against an outside enemy. See Alesina and Spolaore (2005) and Alesina and Spolaore (2006) on this topic. Different groups within a country can have differing preferences about the implemented policy. Preferences are determined by the ethnical or geographical distance between the group which provides the government and the group which constitutes a political minority. All citizens contribute equally to the public good provision through tax payments. The implemented policy reduces the perceived utility of the political minority.[3] This reduction in perceived utility can be sufficiently high for the political minority such that it becomes profitably to separate and to provide their preferred public good.[4]

A shortcoming of this literature is the neglection of secessions as the outcome of explicit conflict. Spolaore (2008) aims to fill this gap by providing an approach which incorporates the trade-off between size and heterogeneity in a framework of civil wars and secessions. Secessions are the outcome of explicit civil war in his model. He finds that economies of scale reduce the probability of secessions, whereas the size of the seceding region increases the probability of secessions. He also finds that external threats reduce the probability of secessions. Spolaore (2008) does not consider third party intervention in his model. The provided historical events of civil war illustrates that third parties can be motivated to intervene in a secession conflict. This paper takes third parties' motivation to interfere into consideration.

Third party intervention can often be observed in armed conflicts between states. Regan (2002) illustrates that two thirds of all civil wars between 1945 and 1997 experienced intervention by foreign countries or transnational organizations. There are three main issues which are crucial for third party intervention: The motivation to intervene, the choice of the ally and the nature of intervention.

There are several views on why third parties interven in conflicts. One perspective in the cur-

[3]The model abstracts from within group inequality. See Esteban and Ray (2011), who emphasize inequality within a group as a source of increasing conflict against the opposing ethnic group.

[4]Skaperdas (2008) provides an approach which takes geography, ethnic and social distance for sources of incomplete contracting which my lead to civil wars. See also Collier and Hoeffler (1998), Collier and Hoeffler (2004) and Collier, Hoeffler, and Rohner (2009) for potential sources of civil war, and Grossman (1991) for a general theory on insurrections. See Christopher Blattman (2010) for an excellent survey of the literature on civil conflict.

rent literature is the view that third parties intervene in order to reduce the level of conflict for its own sake. Siqueira (2003) provides a model in which the third party is neutral with respect to the conflict parties and whose goal is to reduce the existing level of conflict. Amegashie and Kutsoati (2007) provides a theory in which a third party maximizes a weighted welfare of the conflict parties and the population which is not directly involved in the conflict. Regan (1998) provides a further approach in which the third party's decision to intervene is influenced by internal political process of the intervening country. Another strand of the literature supports the view that third parties intervene if their national interests are influenced by the conflict. Chang and Sanders (2009) and Chang, Potter, and Sanders (2007) provide a model in which a third player's payoff is influenced by a conflict between two rival players.

The next issue is the third party's choice of her ally. Chang et al. (2007) use a sequential setting in which the third party moves first and choose her level of support. In one scenario, the third player supports the defending player. In the other scenario, she supports the attacking player.Amegashie and Kutsoati (2007) also endogenize the third party's choice of her ally while Amegashie (2014) treat the third party's choice of her ally as exogenously given.

The nature of intervention is also a crucial element of third party's intervention in conflict. Amegashie and Kutsoati (2007), Amegashie (2014), and Chang et al. (2007) provide a framework in which a third party reduce the cost of her ally while Chang and Sanders (2009) assume that third parties increase the cost of rebellion. Carment and Rowlands (1998) and Regan and Aydin (2006) further illustrates different form of interventions such as diplomacy and economic sanctions.

The theoretical foundations in this paper for third party interventions are closest to Chang et al. (2007). Intervention is motivated by extrinsic gains of third parties. They will only intervene in the conflict if they receive an extrinsic benefit from supporting one party in the conflict. Despite this similar view on the motivation of intervention, the approach in this paper differs in some crucial points from the model by Chang et al. (2007). First, the payoff structure differs. In Chang et al. (2007), the third party's evaluation of the conflict outcome is independent of the other player's evaluation. In this model, the third party's potential gain is the potential loss of the ruling ethnic group in the ethnically fractionalized country, and depends on the size of the seceded region. The political minority's gain depends on the size of the third party. Hence the payoff structures are interlinked between all three players. Second, this model uses a simultaneous setting.[5] Third, the third party's intervention has a

[5] This paper abstracts from a dynamic analysis of civil wars and secessions. See Gershenson and Grossman (2000) on this topic.

direct effect on the contest success function while the third party's intervention in the model by Chang et al. (2007) has only an indirect effect. Fourth, this model includes sanctions for the third party's intervention.[6]

2 The Model

There are two ethnic groups, ethnic group $\tilde{L}$ and $\tilde{R}$. Ethnic group $\tilde{L}$ only lives in country $\hat{L}$, while ethnic group $\tilde{R}$ is distributed across two countries, country $\hat{L}$ and $\hat{R}$. The members of ethnic group $\tilde{R}$ who live in country $\hat{L}$ live in a region which is close to the border between the two countries. This region is only inhabited by members of ethnic group $\tilde{R}$. There are three players $i \in \{L, M, R\}$. Player L is the representative agent of ethnic group $\tilde{L}$. Player M is the representative agent of ethnic group $\tilde{R}$ which lives in country $\hat{L}$. Player R is the representative agent of ethnic group $\tilde{R}$ which lives in country $\hat{R}$. To keep the analysis tractable, the model abstracts from collective action problems.[7] The follwing figure shows the distribution of ethnic groups across countries. The areas which are represented by the three players are denoted by S_i and are exogenously given. Without loss of generality, the size of region S_L is normalized to 1. Each player $i \in \{L, M, R\}$ has initial endowment y_i and pays taxes t_i which are both

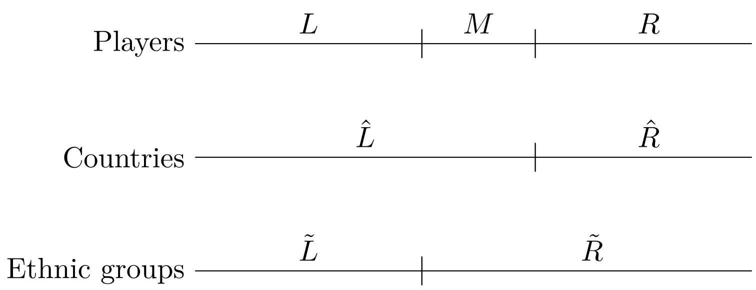

Figure 1: The distribution of ethnic groups.

exogenously given and identical for all players. The government collects taxes and uses the whole tax income to provide a public good in return. The player's utility from the public good depends on his ethnic affiliation. The provision of public good reflects ethnical preferences.[8] Country $\hat{L}$ is ruled by ethnic group $\tilde{L}$, while country $\hat{R}$ is ruled by ethnic group $\tilde{R}$. The public good provision befor e a secession is presented in the following figure. There is a conflict between player L and M in order to split region S_M from country $\hat{L}$ and to unify ethnic

[6]See Gershenson (2002) for a theoretical model on sanctions in conflicts.

[7]There is a large literature which looks at collective action problems. See for example Olson and Zeckhauser (1966) and Berkok (2006).

[8]An example would be language and culture which are taught at school in a country with two ethnic groups. Different ethnic groups may have different languages and cultural backgrounds. Hence, each ethnic group has a preference for their own language, culture and history in the education of their kind. The ruling ethnic group impose their preferred educational schedule which reduces the perceived utility of the other ethnic group.

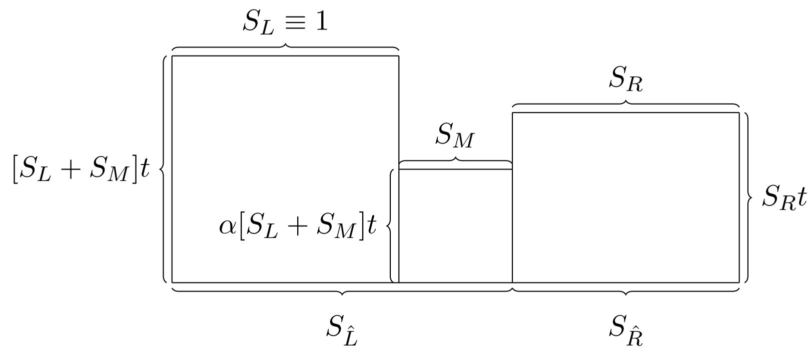

Figure 2: The public good provision.

group $\tilde{R}$ in country $\hat{R}$.[9] Player M can be supported by player R. Let b_i denote the conflict bid of player i. The characteristics of player i are common knowledge. The three players set their conflict bids b_i, and nature determines the outcome of the conflict. If player M wins the conflict, region S_M leaves country $\hat{L}$ and joins country $\hat{R}$. Country $\hat{L}$ remains unified otherwise. The probability $p \equiv p(b_L, b_M, b_R)$ that player M wins the conflict is given by the ratio-form contest success function[10]

$$p = \frac{(\lambda + b_R)b_M}{(\lambda + b_R)b_M + b_L}, \text{if} \;\; b_L + b_M > 0, \tag{1}$$

and the probability that player L wins by $1 - p$. The applied contest success function is characterized by $p(0, b_M, b_R) = 1$, $p(b_L, 0, b_R) = 0$, $\partial p/\partial b_M > 0$, $\partial^2 p/\partial^2 b_M < 0$, $\partial p/\partial b_L < 0$, $\partial^2 p/\partial^2 b_L < 0$ and $\partial p/\partial b_R > 0$, $\partial^2 p/\partial^2 b_R < 0$. Player M is characterized by conflict technology $\lambda \geq 0$. Player L's conflict technology is set equal to 1 without loss of generality. Player R can only provide additional conflict technology for player M. The applied contest success function $p(b_L, b_M, b_R)$ takes the form of a standard contest success function for the case $p(b_L, b_M, 0)$ which is commonly used in the literature.[11] Conflict bids can be considered as investments in the contest, and can take various forms. One can think of electoral or propaganda campaigns, military action or other investments which increase the probability of winning the contest. The advantage of this functional form is the possibility to consider both complementary and substitutional effects of third party intervention. Pure substitutes would lead to a free-rider situation, while pure complements would imply that player M could not

[9]This model assumes taht ethnic groups are not mobile. See Olofsgard (2003) for an analysis with mobile ethnic groups. This paper further abstracts from the possibility of transfers. The central government can not suggest transfers in order to avoid a conflict. See Haimanko et al. (2005) on this topic.

[10]See Hirshleifer (1989), Hirshleifer (1991) and Skaperdas (1996) for an analysis of contest success functions. See also Clark and Riis (1998) for a extension of the axiomatic analysis to unfair contests and Corchón and Dahm (2010) for an investigates of the foundations for contest success functions.

[11]The model in this paper does not allow for peacefull agreement in order to avoid conflict. This issue is a general weakness of the literature on conflict which use this specific functional contest success function rather than a specific weakness of the model in this paper.

win without being supported by player R.[12]

The player's expected payoffs are

$$V_L = y_L - t + pt + [1-p](1+S_M)t - b_L, \tag{2}$$

$$V_M = y_M - t + p(S_M + S_R)t + [1-p](1+S_M)\alpha t - \frac{b_M}{S_M}, \tag{3}$$

$$V_R = y_R - t + p(S_R + S_M)t + [1-p]S_R t - \frac{b_R(1+\Psi)}{S_R}. \tag{4}$$

If there is a successful secession player L's public good level depends only on the size of region S_L and is t. If there is no successful secession the public good level is financed by both ethnic groups, group $\tilde{L}$ and group $\tilde{R}$ which lives in country $\hat{L}$, and is $(1+S_M)t$. Player M joins country $\hat{R}$ with probability p. He pays taxes to country $\hat{R}$'s government, and receives a public good $t(S_M + S_R)$ in return. Player M remains in country $\hat{L}$ otherwise. In this case, the perceived utility of the public good is $\alpha t(1 + S_M)$ with $\alpha < 1$ and $S_R \geq \alpha$. Furthermore condition $(S_R+S_M)t - \alpha t(1+S_M) \geq 0$ holds.[13] The parameter α reflects ethnic heterogeneity or ethnic distance between the two different ethnic groups. Player R's public good level increases in the case of a successful secession by the additional tax base $S_M t$. The public good provision in the case of a successful secession is presented in the following figure. Furthermore, player R

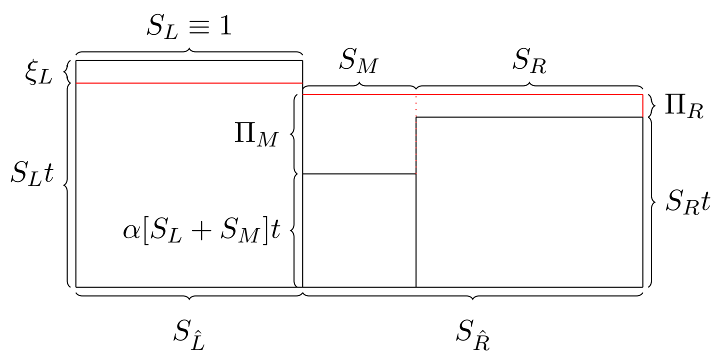

Figure 3: The public good provision after a successful secession.

has to bear costs from sanctions Ψ which depend on the amount of conflict support b_R. These sanctions are imposed by an exogenous fourth party. This fourth party is not explicitely modeled in this approach for reasons of tractability. One may think of the fourth player as supranational organizations or alliances which are able to impose effective sanctions on a country. For simplicity, the model abstracts from binding budget constraints.

[12]See also Garfinkel (2004a), Garfinkel (2004b) and Skaperdas (1998) for an analysis of alliances and group formation in conflicts.

[13]This assumption ensures that player M would get at least the same utility from merging with country $\hat{R}$ than remaining in country $\hat{L}$, in the absence of conflict costs.

The players simultaneously set their conflict bids, and the probability of a successful secession is determined. The game ends and the pay-offs are realized. The solution concept for this game is Nash equilibrium.

2.1 Best Response Functions

The first-order condition for player L is

$$\frac{\partial V_L}{\partial b_L} = -\frac{\partial p}{\partial b_L} S_M t - 1 = 0. \tag{5}$$

Player L's marginal benefit from increasing his conflict bid is the increased probability of not loosing the tax base from region S_M which is $\frac{\partial p}{\partial b_L} S_M t$ and which optimally equals the marginal cost of increasing the conflict bid. The second-order condition for player L is

$$\frac{\partial^2 V_L}{\partial^2 b_L} = -\frac{2b_M(\lambda + b_R)}{[(\lambda + b_R)b_M + b_L]^3} S_M t \Leftrightarrow \frac{\partial^2 V_L}{\partial^2 b_L} < 0, \tag{6}$$

which is sufficient for a maximum. The first-order condition for player M is

$$\frac{\partial V_M}{\partial b_M} = \frac{\partial p}{\partial b_M} [(S_M + S_R)t - (1 + S_M)\alpha t] - \frac{1}{S_M} = 0. \tag{7}$$

Player M's marginal benefit from increasing his conflict bid is the increased probability of merging with country $\hat{R}$ and receiving a public good without heterogeneity costs which is $\frac{\partial p}{\partial b_M}[(S_M + S_R)t - (1 + S_M)\alpha t]$ and which optimally equals the marginal cost of increasing the conflict bid. The second-order condition for player M is

$$\frac{\partial^2 V_M}{\partial^2 b_M} = -\frac{2b_L(\lambda + b_R)^2}{[(\lambda + b_R)b_M + b_L]^3} [(S_M + S_R)t - (1 + S_M)\alpha t] \Leftrightarrow \frac{\partial^2 V_M}{\partial^2 b_M} < 0, \tag{8}$$

which is sufficient for a maximum. The first-order condition for player R is

$$\frac{\partial V_R}{\partial b_R} = \frac{\partial p}{\partial b_R} S_M t - \frac{1 + \Psi}{S_R} = 0. \tag{9}$$

Player R's marginal benefit from increasing his conflict bid is the increased probability of gaining the additional tax base from region S_M which is $\frac{\partial p}{\partial b_R} S_M t$ and which optimally equals the marginal cost of increasing the conflict bid. The second-order condition for player R is

$$\frac{\partial^2 V_R}{\partial^2 b_R} = -\frac{2b_M^2 b_L(\lambda + b_R)}{[(\lambda + b_R)b_M + b_L]^3} S_M t \Leftrightarrow \frac{\partial^2 V_R}{\partial^2 b_R} < 0, \tag{10}$$

which is sufficient for a maximum. The following terms are used in the proceeding paper due to reasons of readability: Player L's potential loss from a successful secession is $\xi_L = S_M t$, player M's potential gain from a successful secession is $\Pi_M = (S_M + S_R)t - (1 + S_M)\alpha t$, and player R's potential gain from a secession is $\Pi_R = S_M t$. Player L's potential loss is equal to player R's potential gain from a successful secession.[14]

Using the first-order conditions, the best response functions of the three players can be summarized in the following lemma.

Lemma 1 *Player L's best response is $b_L(b_M, b_R) = \sqrt{(\lambda + b_R)b_M\xi_L} - (\lambda + b_R)b_M$ if $\xi_L > (\lambda + b_R)b_M$ holds, and $b_L(b_M, b_R) = 0$ otherwise. Player M's best response is $b_M(b_L, b_R) = \sqrt{\frac{b_L}{(\lambda+b_R)}S_M\Pi_M} - \frac{b_L}{(\lambda+b_R)}$ if $S_M\Pi_M > \frac{b_L}{(\lambda+b_R)}$ holds, and $b_M(b_L, b_R) = 0$ otherwise. Player R's best response is $b_R(b_L, b_M) = \sqrt{\frac{S_R}{1+\Psi}\frac{b_L}{b_M}\Pi_R} - \lambda - \frac{b_L}{b_M}$ if $\frac{S_R}{1+\Psi}\frac{b_L}{b_M}\Pi_R > (\lambda + \frac{b_L}{b_M})^2$ holds, and $b_R(b_L, b_M) = 0$ otherwise.*

Player L's best response increases with diminishing marginal rate with increasing potential loss.[15] The partial derivatives $\partial b_L(b_M, b_R)/\partial b_M$, $\partial b_L(b_M, b_R)/\partial b_R$ and $\partial b_L(b_M, b_R)/\partial\lambda$ are positive if and only if condition $4b_M < \xi_L/(b_R + \lambda)$ is satisfied. The potential loss from a secession has to be sufficiently high compared to the other player's conflict bids. The marginal cost of increasing the bid exceeds the marginal benefit of increasing the probability of winning the conflict, if player L's potential loss is small. And hence, he will reduce his conflict bid.

Player M's best response increases with diminishing marginal rate with increasing tax rate t, increasing size of region S_M and increasing size of country $\hat{R}$, which is S_R. Player M's best response function increases with increasing size of region S_M if and only if condition $S_M\Pi_M > 4b_L/(\lambda + b_R)$ is satisfied, i.e. if player M's potential gain from a secession, weighted by the effective conflict technology $(\lambda + b_R)$, is sufficiently high compared to player L's conflict bid. The marginal costs of increasing his conflict bid would exceed the marginal benefits if player L's incentive to prevent a secession is large compared to player M's incentive to split. Player M's best response function increases with increasing conflict technology and increasing conflict bid of player R if condition $S_M\Pi_M < 4b_L/(\lambda + b_R)$ is satisfied. If player M's potential gain from a secession is sufficiently high, such that he has a strong incentive to invest in

[14]Player L and R value region M equally. See Friedman (1977) for an alternative approach where the size of countries depends on the player's differing evaluations and usabilities of land.

[15]It can be shown that $\partial b_L(b_M, b_R)/\partial S_M > 0$,$\partial^2 b_L(b_M, b_R)/\partial^2 S_M < 0$, $\partial b_L(b_M, b_R)/\partial t > 0$ and $\partial^2 b_L(b_M, b_R)/\partial^2 t < 0$ hold.

conflict, player R's effective conflict support $(\lambda + b_R)$ allows player L to reduce his conflict bid without imposing any loss on himself.

Player R's best response function increases with diminishing marginal rate with increasing size of country $\hat{R}$, with increasing size of region S_M, and increasing tax rate t. It decreases with increasing sanctions Ψ. Sanctions reduce the benefit of an additional unit of conflict bid, and hence player R will reduce his support. Player R's best response function increases with increasing conflict bid of player L if and only if condition $S_R\Pi_R/(1+\Psi) > 4b_L/b_M$ is satisfied. Player R has a huge incentive to help player M winning the conflict if his potential gain from conflict is high, and if player M sets a high conflict bid. In this case, he will respond with an increase in conflict support if player L increases his effort. This result also reflects the complementary role of conflict support. This complementarity can also be found in player R's response to an increase in player M's conflict bid. b_R increases with increasing conflict bid of player M if and only if condition $S_R\Pi_R/(1+\Psi) < 4b_L/b_M$ is satisfied. This result also reflects player R's reduced incentive to provide support if his gain is low compared to player L's incentive to prevent a secession. The partial derivative of player R's best response function with respect to player M's conflict technology is $\partial b_R(b_L, b_M)/\partial\lambda = -1$. This result reflects the substitutional nature of conflict support. Player R's conflict bid and player M's conflict technology λ are substitutes. Hence player R can reduce his support by the same amount as λ increases without reducing his expected payoff.

2.2 Equilibrium

Using lemma 1, the following lemma can be formulated

Lemma 2 *Player R supports player M if and only if condition $\lambda < \lambda^\kappa$ with $\lambda^\kappa \equiv \frac{\Pi_R}{S_M\Pi_M}\left(\sqrt{\frac{S_R}{1+\Psi}S_M\Pi_M} - 1\right)$ is satisfied.*

Player M's conflict technology has to be sufficiently low in order to get support from player R. Player M's advantage in the conflict increases if his conflict technology is high. This will give a higher incentive for player M to invest in conflict, and hence player R can reduce his support without imposing a loss on himself. Or put it differently, player R incentivizes player M to fight harder if player M's conflict bid is too low, i.e. if his conflict technology is sufficiently low compared to player R's potential gain.

Furthermore, player R sets her conflict bid such that the term $(\lambda + b_R)$ always equals the critical value λ^κ. Hence, the critical conflict technology λ^κ can also be interpreted as player R's effective conflict bid $(\lambda + b_R)$. The critical conflict technology λ^κ increases with player R's gain from a successful secession Π_R. An increase of region S_M increases player R's potential gain from a secession and hence, player R is more generous with conflict support. Using lemma 2, the following proposition can be formulated.

Proposition 1 *There exists a unique Nash equilibrium for $\lambda < \lambda^\kappa$ with $b_L^* = (1+\Psi)\xi_L \frac{\lambda^\kappa}{S_R \Pi_R}$, $b_M^* = (1+\Psi) S_M \Pi_M \frac{\lambda^\kappa}{S_R \Pi_R}$ and $b_R^* = \lambda^\kappa - \lambda$.*
There exists a unique Nash equilibrium for $\lambda \geq \lambda^\kappa$ with $b_L^* = \lambda S_M \Pi_M (\frac{\xi_L}{\lambda S_M \Pi_M + \xi_L})^2$, $b_M^* = \frac{\xi_L}{\lambda}(\frac{\lambda S_M \Pi_M}{\lambda S_M \Pi_M + \xi_L})^2$ and $b_R^* = 0$.

For $\lambda < \lambda^\kappa$, all three player's conflict bids are their respective gains or losses, weighted by the ratio between the critical conflict technology and player R's gain from a successful secession. Hence, the ratios of the player's effective conflict bids in equilibrium are the ratios of their gains and losses from a successful secession. Using proposition 1, the following corollary can be formulated.

Corollary 1 *Given $\lambda < \lambda^\kappa$ and $\Psi = 0$, the effective per capita conflict bids in equilibrium for player L and R are identical, $\frac{\lambda + b_R^*}{S_R} = b_L^*$. Player L's effective per capita conflict bid is always larger than player R's effective per capita conflict bid if condition $\Psi > 0$ holds.*

This result follows directly from the symmetric payoff structure of player L and R if condition $\Psi = 0$ holds. The potential loss for player L, the tax base of region S_M, equals player R's potential gain. Hence, their marginal gain from increasing their conflict bid is identical in the case of $\lambda < \lambda^\kappa$, and their conflict bids are equal. This symmetry in payoff structure changes if there are sanction costs. Player R faces higher costs of increasing his conflict bid and hence he will invest less in conflict even though the potential gain for both players remains identical. Using proposition 1, the probability of a successful secession can be formulated in the following corollary.

Corollary 2 *The probability of a successful secession is*

$$p^* = \begin{cases} \dfrac{\lambda^\kappa S_M \Pi_M}{\lambda^\kappa S_M \Pi_M + \xi_L}, \lambda < \lambda^\kappa \\ \dfrac{\lambda S_M \Pi_M}{\lambda S_M \Pi_M + \xi_L}, \lambda \geq \lambda^\kappa \end{cases} \tag{11}$$

The probability of a successful secession is the ratio between player M's potential gain and the aggregate potential gain and loss from player L and M, weighted by their respective conflict technologies.

3 Comparative Statics

3.1 Size of region S_M

The comparative static results with respect to the size of region S_M are summarized in the following proposition.

Proposition 2 *Given $\lambda < \lambda^\kappa$, the comparative static results are $\partial b_L^*/\partial S_M > 0$; $\partial b_M^*/\partial S_M > 0$; $\partial b_R^*/\partial S_M > 0$; $\partial p^*/\partial S_M > 0$.*
Given $\lambda \geq \lambda^\kappa$, the comparative static results are $\partial b_L^*/\partial S_M > 0$; $\partial b_M^*/\partial S_M > 0$; $\partial b_R^*/\partial S_M = 0$; $\partial p^*/\partial S_M > 0$.

The conflict bids of all three players increase with size of region S_M for $\lambda < \lambda^\kappa$. The additional tax base for player R and hence his potential gain increase with increasing size of region S_M. For player L applies the same reasoning. The potential loss of tax base increases for player L with increasing size of region S_M. The marginal gains from conflict increase for both players and therefore their conflict bids increase. Player M's public good level in the case of a successful secession increases with increasing size of region S_M and hence his potential gain from conflict increases. Therefore, his conflict bid increases as well. The same reasoning applies for $\lambda \geq \lambda^\kappa$, except player R's non-participation.

3.2 Size of country $\hat{R}$

The comparative static results with respect to the size of country $\hat{R}$, which is S_R, are summarized in the following proposition.

Proposition 3 *Given $\lambda < \lambda^\kappa$, the comparative static results are $\partial b_L^*/\partial S_R > 0$ if $4/S_M S_R \geq \Pi_M/(1+\Psi)$ holds, and $\partial b_L^*/\partial S_R \leq 0$ otherwise; $\partial b_M^*/\partial S_R > 0$ if $(1+\Psi)\frac{S_M \Pi_M}{S_R \Pi_R} > S_M \frac{(\Pi_M - S_R t)^2}{4t}$ holds, and $\partial b_M^*/\partial S_R \leq 0$ otherwise; $\partial b_R^*/\partial S_R > 0$ if $(1+\Psi)\frac{S_R \Pi_R}{S_M \Pi_M} > S_M \frac{(\Pi_M - S_R t)^2}{4t}$ holds, and $\partial b_R^*/\partial S_R \leq 0$ otherwise; $\partial p^*/\partial S_R > 0$.*
Given $\lambda \geq \lambda^\kappa$, the comparative static results are $\partial b_L^*/\partial S_R > 0$ if $\lambda \Pi_M < t$ holds, and $\partial b_L^*/\partial S_R \leq 0$ otherwise; $\partial b_M^*/\partial S_R > 0$; $\partial b_R^*/\partial S_R = 0$; $\partial p^*/\partial S_R > 0$.

The size of country $\hat{R}$ has two effects. First, player M's benefit from a successful secession increases with increasing size of country $\hat{R}$. Hence, he will increase his conflict bid. Player L anticipates player M's incentive to inventment more resources in conflict and also increases his conflict bid in order to prevent a secession. If the size of country $\hat{R}$ is sufficiently high it will become too costly for player L to prevent a secession, and hence he will reduce his conflict bid. For player M and R, the effect of an increasing size of country $\hat{R}$ can be summarized in the following corollary.

Corollary 3 *Suppose condition $\frac{1+\Psi}{S_M t} > \frac{[S_M t-(1+S_M)\alpha t]^2}{4t^2}$ holds. Player R increases his conflict bid before player M increases his bid with increasing size of country $\hat{R}$. Player M increases his conflict bid with increasing size of country $\hat{R}$ only if condition $S_R > \frac{\frac{1+\Psi}{S_M t} S_M [S_M t-(1+S_M)\alpha t]}{S_M t \frac{[S_M t-(1+S_M)\alpha t]^2}{4t^2} -(1+\Psi)}$ is satisfied.*

This result shows that, for a critical value of S_R, players M and R simultaneously increase their conflict bids. This result reflects the complementary nature of conflict support. The impact of both players' bid increase with the other player's bid and therefore, the bids reinforce each other. Player M's and R's combined marginal increase in conflict bids exceed player L's marginal increase, and hence a secession will be more successful. It becomes too expensive for player L to prevent a secession if player M's incentive to split is high. The setting in the figure also shows the threshold for player R's willingness to provide conflict support and the complementary nature of player M's and R's efforts.

3.3 Heterogeneity α

The comparative static results with respect to heterogeneity α are summarized in the following proposition.

Proposition 4 *Given $\lambda < \lambda^\kappa$, the comparative static results are $\partial b_L^*/\partial\alpha > 0$ if $4/S_M S_R < \Pi_M/(1+\Psi)$ holds, and $\partial b_L^*/\partial\alpha \leq 0$ otherwise; $\partial b_M^*/\partial\alpha < 0$; $\partial b_R^*/\partial\alpha > 0$ if $4/S_R S_M < \Pi_M/(1+\Psi)$ holds, and $\partial b_R^*/\partial\alpha \leq 0$ otherwise; $\partial p^*/\partial\alpha < 0$.*
Given $\lambda \geq \lambda^\kappa$, the comparative static results are $\partial b_L^*/\partial\alpha > 0$ if $\lambda\Pi_M > t$ holds, and $\partial b_L^*/\partial\alpha \leq 0$ otherwise; $\partial b_M^*/\partial\alpha < 0$; $\partial b_R^*/\partial\alpha = 0$; $\partial p^*/\partial\alpha < 0$.

An increase in heterogeneity is reflected by a decrease of α. For $\lambda < \lambda^\kappa$, player L has a high incentive to prevent a secession if heterogeneity and the potential loss from a secession are high. This incentive is depicted in the threshold $4/S_M S_R < \Pi_M/(1+\Psi)$. This incentive also holds for player R. Player R will only provide support if player M's conflict bid is sufficiently high. Player M's incentive to separate from country $\hat{L}$ is reduced if heterogeneity costs decrease with increasing realizations of α. Player R will compensate for player M's fading incentive to invest in conflict by increasing his support. Player L anticipates player

R's willingness to incentivize player M to fight and also increases his conflict bid. Player R will reduce his support if player M's incentive to split is too low due to low heterogeneity. Player L anticipate player M's fading incentive to separate, and player R's fading incentive to provide support for high realizations of α and reduces his conflict bid. Player L reduce his conflict bid due to the weaker threat of a secession, while player R reduces his support because of the reduced effectivness of his support. This result is presented in the following figure for player L's and R's conflict bid in equilibrium for $\lambda < \lambda^{\kappa}$.

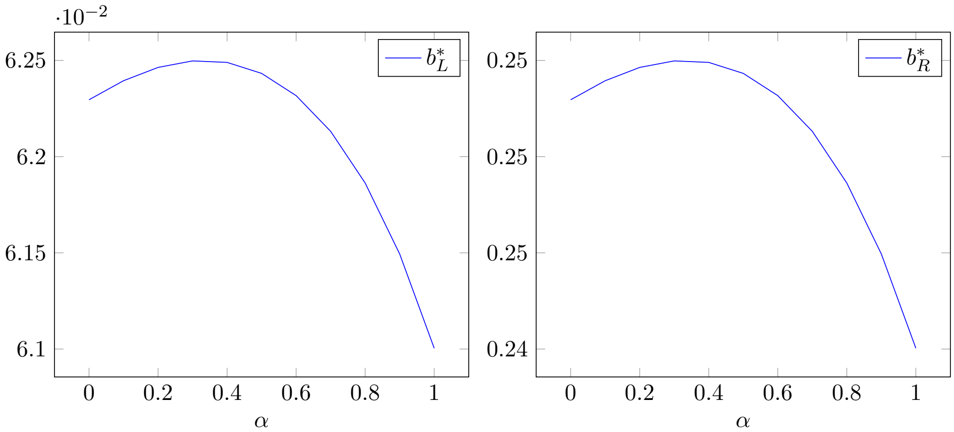

Figure 4: Player L's and R's conflict bids in equilibrium for different realizations of α for $\lambda = 0$, $S_R = 4$, $S_M = 0.5$, $t = 0.5$, and $\Psi = 0$.

The figures show that the two conflict bids in equilibrium follow the same pattern. Player M's conflict bid in equilibrium for $\lambda < \lambda^{\kappa}$ increase with increasing heterogeneity costs. The probability of a successful secession also increases with increasing heterogeneity costs. Player M's and R's combined marginal increase in conflict bids exceeds player L's response to an increase in heterogeneity and hence, a secession will be more successful. For $\lambda \geq \lambda^{\kappa}$, player L's conflict bid decreases with increasing heterogeneity if player M has a high incentive to invest in conflict. It becomes expensive for player L to prevent a secession. The probability of a successful secession increases with increasing heterogeneity. Player M's marginal increase in conflict bid exceeds player L's marginal increase and hence a secession will be more successful.

3.4 Tax rate

The comparative static results with respect to tax rate t are summarized in the following proposition

Proposition 5 *Given $\lambda < \lambda^{\kappa}$, the comparative static results are $\partial b_L^*/\partial t > 0$; $\partial b_M^*/\partial t > 0$; $\partial b_R^*/\partial t > 0$; $\partial p^*/\partial t > 0$.*

Given $\lambda \geq \lambda^{\kappa}$, the comparative static results are $\partial b_L^*/\partial t > 0$; $\partial b_M^*/\partial t > 0$; $\partial b_R^*/\partial t = 0$;

$\partial p^*/\partial t = 0$.

The conflict bids of all three players and the probability of a successful secession increase with increasing tax rate for $\lambda < \lambda^\kappa$. This result follows straight from the direct impact of the tax rate on gains and losses for the players. Player L's loss and player R's gain increase by the same amount and hence they increase their conflict bids. Player M's gain also increases and the combined marginal increase in conflict bids by player M and R exceeds player L's conflict bid. Hence, a secession will be more successful. For $\lambda \geq \lambda^\kappa$, the result differs in the comparative static result of the probability of a successful secession. The effect of the tax rate cancels out and hence the probability of a successful secession does not change with changing tax rate.

3.5 Conflict technology

The comparative static results with respect to player M's conflict technology λ are summarized in the following proposition

Proposition 6 *Given $\lambda < \lambda^\kappa$, the comparative static results are $\partial b_L^*/\partial\lambda = 0$; $\partial b_M^*/\partial\lambda = 0$; $\partial b_R^*/\partial\lambda = -1$; $\partial p^*/\partial\lambda = 0$.*
Given $\lambda \geq \lambda^\kappa$, the comparative static results are $\partial b_L^*/\partial\lambda > 0$ if $t > \lambda\Pi_M$ holds, and $\partial b_L^*/\partial\lambda \leq 0$ otherwise; $\partial b_M^*/\partial\lambda > 0$ if $t > \lambda\Pi_M$ holds, and $\partial b_M^*/\partial\lambda \leq 0$ otherwise; $\partial b_R^*/\partial\lambda = 0$; $\partial p^*/\partial\lambda > 0$.

Player M's conflict technology has no impact on player L's and M's conflict bids for $\lambda < \lambda^\kappa$. Player M's conflict technology only determinates player R's conflict bid. Player R sets her conflict support, such that the effective conflict technology $(\lambda + b_R)$ remains constant over the whole range of λ, keeping all other factors constant. The effective conflict bid of player R reflects his marginal benefit from a secession. Hence, player R reduces his conflict bid by the same amount as player M's conflict technology increases. The probability of a successful secession does not depend on player M's conflict technology. For $\lambda \geq \lambda^\kappa$, player L's conflict bid will increase with increasing conflict technology if player M's incentive to invest in conflict is sufficiently low. Player M chooses a high conflict bid if he has a high potential gain from a secession. It becomes more expensive for player L to prevent a secession and the marginal costs exceeds the marginal benefits from increasing his conflict bid. Player M's conflict bid increases due to a higher advantage in fighting. The marginal benefit for player M is larger than for player L and a secession will be more successful with increasing conflict technology λ.

3.6 Sanctions

The comparative static results with respect to sanctions Ψ are summarized in the following proposition

Proposition 7 *Given $\lambda < \lambda^{\kappa}$, the comparative static results are $\partial b_L^*/\partial\Psi > 0$ if $4/S_M S_R < \Pi_M(1+\Psi)$ holds, and $\partial b_L^*/\partial\Psi \leq 0$ otherwise; $\partial b_M^*/\partial\Psi > 0$ if $4/S_M S_R < \Pi_M(1+\Psi)$ holds, and $\partial b_M^*/\partial\Psi \leq 0$ otherwise; $\partial b_R^*/\partial\Psi < 0$; $\partial p^*/\partial\Psi < 0$.*
Given $\lambda \geq \lambda^{\kappa}$, the comparative static results are $\partial b_L^*/\partial\Psi = 0$; $\partial b_M^*/\partial\Psi = 0$; $\partial b_R^*/\partial\Psi = 0$; $\partial p^*/\partial\Psi = 0$.

Suppose condition $\lambda < \lambda^{\kappa}$ holds. In this case, player L and M will increase their conflict bids with increasing sanctions if group M's gain from a successful secession is sufficiently high. In this case, player M has a strong incentive to invest in conflict, even though player R is less willing to provide conflict support. Player M has to compensate for player R's reduced willingness to provide support. Player L anticipates player M's behavior and also increases his conflict bid. Player R's conflict bid decreases with increasing sanctions due to a reduced marginal benefit of conflict support. Player M's increase in conflict spending can not compensate player R's reduction in support, and hence the probability of a successful secession decreases. Sanctions have no impact on the equilibrium values if condition $\lambda \geq \lambda^{\kappa}$ holds. A reduction in sanctions lead to an increased value of λ^{κ}. Hence, a decrease of sanctions increases the chance of third party intervention.

4 Conclusion

This paper provides a simple framework to analyze third party interventions in secessions and annexations. Third party's support has a complementary and a substitutional effect on the outcome of the conflict. The secessionist group's conflict technology and conflict support are substitutes, while the third party's support and the secessionist group's conflict bid are complements. Hence, an increase in the secesionist group's conflict technology leads to a reduction in support by the same amount. Furthermore, the third party will only provide support if the secessionist group provides a sufficiently high level of conflict bid. Third party's conflict support is determined by his potential gain from a secession which is the additional tax base. Support is used to provide additional incentives for the secessionist group to invest in conflict if its conflict technology is low and if the third party's gain from a secession is high. The complementary nature of support is also reflected in the wilingness of both allies to compensate for each others fading incentives to fight. The third party provides additional support if the secessionist group's incentive to fight is reduced due to lower heterogeneity, while the secessionist group increases its conflict bid if the third party's incentive to provide support is reduced by higher sanctions. The model also shows that the size of the third party and the secessionist region increase the probability of a secession, while sanctions and more homogeneous ethnic groups reduce the probability of a secession.

Appendix

Proof of Lemma 1

The first-order condition from player L's optimization problem gives $b_{L,1}(b_M, b_R) = -\sqrt{(\lambda + b_R)b_M\xi_L} - (\lambda + b_R)b_M$ and $b_{L,2}(b_M, b_R) = \sqrt{(\lambda + b_R)b_M\xi_L} - (\lambda + b_R)b_M$. The best response function has to satisfy condition $b_L(b_M, b_R) \geq 0$, and hence $b_{L,2}(b_M, b_R)$ is the only possible solution. Solution $b_{L,2}(b_M, b_R)$ is only positive if condition $\xi_L > (\lambda + b_R)b_M$ is satisfied.
The first-order condition from player M's optimization problem gives $b_{M,1}(b_L, b_R) = -\sqrt{\frac{b_L}{(\lambda+b_R)}S_M\Pi_M} - \frac{b_L}{(\lambda+b_R)}$ and $b_{M,2}(b_L, b_R) = \sqrt{\frac{b_L}{(\lambda+b_R)}S_M\Pi_M} - \frac{b_L}{(\lambda+b_R)}$. The best response function has to satisfy condition $b_M(b_L, b_R) \geq 0$, and hence $b_{M,2}(b_L, b_R)$ is the only possible solution. Solution $b_{M,2}(b_L, b_R)$ is only positive if condition $S_M\Pi_M > \frac{b_L}{(\lambda+b_R)}$ is satisfied.
The first-order condition from player R's optimization problem gives $b_{R,1}(b_L, b_M) = -\sqrt{\frac{S_R}{1+\Psi}\frac{b_L}{b_M}\Pi_R} - \lambda - \frac{b_L}{b_M}$ and $b_{R,2}(b_L, b_M) = \sqrt{\frac{S_R}{1+\Psi}\frac{b_L}{b_M}\Pi_R} - \lambda - \frac{b_L}{b_M}$. The best response function has to satisfy condition $b_R(b_L, b_M) \geq 0$, and hence $b_{R,2}(b_L, b_M)$ is the only possible solution. Solution $b_{R,2}(b_L, b_M)$ is only positive if condition $\frac{S_R}{1+\Psi}\frac{b_L}{b_M}\Pi_R > (\lambda + \frac{b_L}{b_M})^2$ is satisfied.

Proof of Lemma 2

Lemma 1 gives $\frac{b_L[b_M(b_L,b_R),b_R]}{b_M[b_L(b_M,b_R),b_R]} = \frac{\xi_L}{S_M\Pi_M}$. Using this ratio in $b_R(b_L, b_M)$ gives $b_R^* = \frac{\Pi_R}{S_M\Pi_M}(\sqrt{\frac{S_RS_M\Pi_M}{1+\Psi}} - 1) - \lambda$. Defining $\lambda^\kappa = \frac{\Pi_R}{S_M\Pi_M}(\sqrt{\frac{S_RS_M\Pi_M}{1+\Psi}} - 1)$ Player R's conflict bid is only positive if and only if condition $\lambda < \lambda^\kappa$ holds.

Proof of Proposition 1

Suppose $\lambda < \lambda^\kappa$ and using b_R^* from lemma 2 gives $b_L^* = \frac{1+\Psi}{S_R}\frac{\xi_L}{S_M\Pi_M}(\sqrt{S_RS_M\Pi_M} - 1)$, $b_M^* = \frac{1+\Psi}{S_R}(\sqrt{S_RS_M\Pi_M} - 1)$. Conditions $\xi_L > (\lambda + b_R)b_M$, $S_M\Pi_M > \frac{b_L}{(\lambda+b_R)}$ and $S_R\frac{b_L}{b_M}\Pi_R > (\lambda + \frac{b_L}{b_M})^2$ have to be satisfied in equilibrium. These conditions follow directly from lemma 1. The best response functions are only defined for positive values of the three players' best responses. The three players's responses are onlypositive if these three conditions are satisfied. Using b_L^*, b_M^* and b_R^*, these conditions are satisfied. Suppose $\lambda \geq \lambda^\kappa$, and using $b_R = 0$ gives $b_L^* = \lambda S_M \Pi_M (\frac{\xi_L}{\lambda S_M \Pi_M + \xi_L})^2$, $b_M^* = \lambda \xi_L (\frac{\xi_L}{\lambda S_M \Pi_M + \xi_L})^2$. Conditions $\xi_L > (\lambda + b_R) b_M$ and $S_M \Pi_M > \frac{b_L}{(\lambda + b_R)}$ have to be satisfied in equilibrium. Using b_L^* and b_M^*, these conditions are satisfied.

Proof of Proposition 2

Suppose $\lambda < \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to the size of region S_M is $\frac{\partial b_L^*}{\partial S_M} = \frac{\{2(1-\alpha)S_M + (S_R - \alpha)\sqrt{S_M S_R [S_M + S_R - \alpha(1+S_M)]t}\}(1+\Psi)}{2 S_M S_R [S_M + S_R - \alpha(1+S_M)]^2}$, which is positive. The partial derivative of player M's equilibrium conflict bid with respect to the size of region S_M is $\frac{\partial b_M^*}{\partial S_M} = \frac{[S_M(1-\alpha) + S_M + S_R - \alpha(1+S_M)]t}{2\sqrt{\frac{S_M S_R}{1+\Psi}[S_M + S_R - \alpha(1+S_M)]t}}$, which is positive. The partial derivative of player R's equilibrium conflict bid with respect to the size of region S_M is $\frac{\partial b_R^*}{\partial S_M} = \frac{2(1-\alpha)S_M + (S_R - \alpha)\sqrt{\frac{S_M S_R}{1+\Psi}[S_M + S_R - \alpha(1+S_M)]t}}{2 S_M [S_M + S_R - \alpha(1+S_M)]^2}$, which is positive. The partial derivative of the probability of a successful secession with respect to the size of region S_M is $\frac{\partial p^*}{\partial S_M} = -\frac{(\alpha-1)S_M t - [S_M + S_R - \alpha(1+S_M)]t}{2(1+\Psi)\{\frac{S_M S_R}{1+\Psi}[S_M + S_R - \alpha(1+S_M)]t\}^{3/2}}$, which is positive.

Suppose $\lambda \geq \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to the size of region S_M is $\frac{\partial b_L^*}{\partial S_M} = -\frac{\lambda t\{2S_M + \alpha^2\lambda(1+S_M) + S_R + \lambda S_R(S_M + S_R) - \alpha[1 + (2+\lambda)S_M + \lambda(2+S_M)S_R]\}}{\{-1-\lambda[S_M + S_R - \alpha(1+S_M)]\}^3}$, which is positive. The partial derivative of player M's equilibrium conflict bid with respect to the size of region S_M is

$$\frac{\partial b_M^*}{\partial S_M} = \frac{-\lambda[S_M + S_R - \alpha(1+S_M)]\{3S_M + \alpha^2\lambda(1+S_M)^2 + S_R + \lambda(S_M + S_R)^2 - \alpha[1 + S_M(3 + 2\lambda + 2\lambda S_M) + 2\lambda S_R + 2\lambda S_M S_R]\}t}{\{-1-\lambda[S_M + S_R - \alpha(1+S_M)]\}^3},$$

which is positive. The partial derivative of the probability of a successful secession with respect to the size of region S_M is $\frac{\partial p^*}{\partial S_M} = \frac{\lambda(1-\alpha)}{1+\lambda[S_M + S_R - \alpha(1+S_M)]^2}$, which is positive.

Proof of Proposition 3

Suppose $\lambda < \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to the size of country $\hat{R}$, which is S_R is $\frac{\partial b_L^*}{\partial S_R} = \frac{(1+\Psi)\{-S_R - [S_M + S_R - \alpha(1+S_M)]\}\{\sqrt{\frac{S_M S_R}{1+\Psi}[S_M + S_R - \alpha(1+S_M)]t} - 2\}}{2S_R^2[S_M + S_R - \alpha(1+S_M)]^2}$, which is positive for $4/S_M S_R > \Pi_M/(1+\Psi)$ and negative for $4/S_M S_R < \Pi_M/(1+\Psi)$. The partial derivative of player M's equilibrium conflict bid with respect to the size of country $\hat{R}$ is $\frac{\partial b_M^*}{\partial S_R} = \frac{S_M S_R t[\alpha + (\alpha-1)S_M] + 2\sqrt{S_M S_R t[S_M + S_R - \alpha(1+S_M)](1+\Psi)}}{2S_R^2\sqrt{\frac{S_M S_R t}{1+\Psi}[S_M + S_R - \alpha(1+S_M)]}}$, which is positive for $(1+\Psi)\frac{S_M \Pi_M}{S_R \Pi_R} > S_M \frac{[\Pi_M - S_R t]^2}{4t}$ and negative for $(1+\Psi)\frac{S_M \Pi_M}{S_R \Pi_R} < S_M \frac{[\Pi_M - S_R t]^2}{4t}$. The partial derivative of player R's equilibrium conflict bid with respect to the size of country $\hat{R}$ is $\frac{\partial b_R^*}{\partial S_R} = \frac{-S_M[\alpha+(\alpha-1]S_M)[S_M+S_R-\alpha(1+S_M)]t+2\sqrt{S_M S_R t(1+\Psi)(S_M+S_R-\alpha(1+S_M))}}{2[S_M+S_R-\alpha(1+S_M)]^2\sqrt{S_M S_R t(1+\Psi)[S_M+S_R-\alpha(1+S_M)]}}$, which is positive for $(1+\Psi)\frac{S_R\Pi_R}{S_M\Pi_M} > S_M\frac{[\Pi_M-S_Rt]^2}{4t}$ and negative for $(1+\Psi)\frac{S_R\Pi_R}{S_M\Pi_M} \leq S_M\frac{[\Pi_M-S_Rt]^2}{4t}$. The partial derivative of the probability of a successful secession with respect to the size of country $\hat{R}$ is $\frac{\partial p^*}{\partial S_R} = -\frac{S_Mt\{-S_R-[S_M+S_R-\alpha(1+S_M)]\}}{2(1+\Psi)\{\frac{S_MS_Rt}{1+\Psi}[S_M+S_R-\alpha(1+S_M)]\}^{3/2}}$, which is positive. Suppose $\lambda \geq \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to the size of country $\hat{R}$ is $\frac{\partial b_L^*}{\partial S_R} = \frac{\lambda S_M\{-1+\lambda[S_M+S_R-\alpha(1+S_M)]\}t}{\{-1-\lambda[S_M+S_R-\alpha(1+S_M)]\}^3}$, which is positive for $\lambda\Pi_M < t$ and negative for $\lambda\Pi_M > t$. The partial derivative of player M's equilibrium conflict bid with respect to the size of country $\hat{R}$ is $\frac{\partial b_M^*}{\partial S_R} = \frac{-2\lambda S_Mt[S_M+S_R-\alpha(1+S_M)]}{\{-1-\lambda[S_M+S_R-\alpha(1+S_M)]\}^3}$, which is positive. The partial derivative of the probability of a successful secession in equilibrium with respect to the size of country $\hat{R}$ is $\frac{\partial p^*}{\partial S_R} = \frac{\lambda}{\{1+\lambda[S_M+S_R-\alpha(1+S_M)]\}^2}$, which is positive.

Proof of Corollary 3

Proposition 3 provides condition $(1+\Psi)\frac{S_R\Pi_R}{S_M\Pi_M} > S_M\frac{(\Pi_M-S_Rt)^2}{4t}$ which has to be satisfied for $\partial b_R^*/\partial S_R > 0$. Suppose $\frac{1+\Psi}{S_Mt} > \frac{[S_Mt-(1+S_M)\alpha t]^2}{4t^2}$ holds. Condition $(1+\Psi)\frac{S_R\Pi_R}{S_M\Pi_M} > S_M\frac{(\Pi_M-S_Rt)^2}{4t}$ yields condition $S_R > \frac{S_M\frac{(\Pi_M-S_Rt)^3}{4t^2}}{(1+\Psi)-}$

$.proposition3providescondition$$(1+\Psi)\frac{S_M\Pi_M}{S_R\Pi_R} > S_M\frac{(\Pi_M-S_Rt)^2}{4t}$ which has to be satisfied for $\partial b_M^*/\partial S_R > 0$. Suppose $\frac{1+\Psi}{S_Mt} > \frac{[S_Mt-(1+S_M)\alpha t]^2}{4t^2}$ holds. Condition $(1+\Psi)\frac{S_M\Pi_M}{S_R\Pi_R} > S_M\frac{(\Pi_M-S_Rt)^2}{4t}$ yields condition $S_R > \frac{\frac{1+\Psi}{S_Mt}S_M[S_Mt-(1+S_M)\alpha t]}{S_Mt\frac{[S_Mt-(1+S_M)\alpha t]^2}{4t^2}-(1+\Psi)}$. Assumption $S_Mt-(1+S_M)\alpha t \leq 0$ holds. Hence, the right hand side of condition $S_R > \frac{S_M\frac{(\Pi_M-S_Rt)^3}{4t^2}}{(1+\Psi)-}$

$isnegative, whiletherighthandsideofcondition$S$_R > \frac{\frac{1+\Psi}{S_Mt}S_M[S_Mt-(1+S_M)\alpha t]}{S_Mt\frac{[S_Mt-(1+S_M)\alpha t]^2}{4t^2}-(1+\Psi)}$ is positive.

Proof of Proposition 4

Suppose $\lambda < \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to heterogeneity α is $\frac{\partial b_L^*}{\partial \alpha} = \frac{(1+S_M)(1+\Psi)\{\sqrt{\frac{S_MS_Rt}{1+\Psi}[S_M+S_R-\alpha(1+S_M)]}-2\}}{2S_R[S_M+S_R-\alpha(1+S_M)]^2}$, which is positive for $4/S_MS_R < \Pi_M/(1+\Psi)$ and negative for $4/S_MS_R \geq \Pi_M/(1+\Psi)$. The partial derivative of player M's equilibrium conflict bid with respect to heterogeneity cost is $\frac{\partial b_M^*}{\partial \alpha} = -\frac{S_M(1+S_M)t}{2\sqrt{\frac{S_MS_Rt}{1+\Psi}[S_M+S_R-\alpha(1+S_M)]}}$, which is negative. The partial derivative of player R's equilibrium conflict bid with respect to heterogeneity is $\frac{\partial b_R^*}{\partial \alpha} = \frac{(1+S_M)\{\sqrt{\frac{S_MS_Rt}{1+\Psi}[S_M+S_R-\alpha(1+S_M)]}-2\}}{2[S_M+S_R-\alpha(1+S_M)]^2}$, which is positive for $4/S_RS_M < \Pi_M/(1+\Psi)$ and negative for $4/S_RS_M > \Pi_M/(1+\Psi)$. The partial derivative of the probability of a successful secession in equilibrium with respect to heterogeneity is $\frac{\partial p^*}{\partial \alpha} = -\frac{S_M S_R t(1+S_M)}{2(1+\Psi)\{\frac{S_M S_R t}{1+\Psi}[S_M+S_R-\alpha(1+S_M)]\}^{3/2}}$, which is negative. Suppose $\lambda \geq \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to heterogeneity is $\frac{\partial b_L^*}{\partial \alpha} = \frac{\lambda S_M t(1+S_M)\{1-\lambda[S_M+S_R-\alpha(1+S_M)]\}}{\{-1-\lambda[S_M+S_R-\alpha(1+S_M)]\}^3}$, which is positive for $\lambda \Pi_M > t$ and negative for $\lambda \Pi_M < t$. The partial derivative of player M's equilibrium conflict bid with respect to heterogeneity is $\frac{\partial b_M^*}{\partial \alpha} = \frac{2\lambda S_M(1+S_M)t[S_M+S_R-\alpha(1+S_M)]}{\{-1-\lambda[S_M+S_R-\alpha(1+S_M)]\}^3}$, which is negative. The partial derivative of the probability of a successful secession in equilibrium with respect to heterogeneity is $\frac{\partial p^*}{\partial \alpha} = -\frac{\lambda(1+S_M)}{\{1+\lambda[S_M+S_R-\alpha(1+S_M)]\}^2}$, which is negative.

Proof of Proposition 5

Suppose $\lambda < \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to the tax rate is $\frac{\partial b_L^*}{\partial t} = \frac{S_M}{2\sqrt{\frac{S_M S_R t}{1+\Psi}[S_M+S_R-\alpha(1+S_M)]}}$, which is positive. The partial derivative of player M's equilibrium conflict bid with respect to the tax rate is $\frac{\partial b_M^*}{\partial t} = \frac{\sqrt{S_M S_R t(1+\Psi)[S_M+S_R-\alpha(1+S_M)]}}{2S_R t}$, which is positive. The partial derivative of player R's equilibrium conflict bid with respect to the tax rate is $\frac{\partial b_R^*}{\partial t} = \frac{S_M S_R}{2\sqrt{S_M S_R t(1+\Psi)[S_M+S_R-\alpha(1+S_M)]}}$, which is positive. The partial derivative of the probability of a successful secession in equilibrium with respect to the tax rate is $\frac{\partial p^*}{\partial t} = \frac{1}{2t\sqrt{\frac{S_M S_R t}{1+\Psi}[S_M+S_R-\alpha(1+S_M)]}}$, which is positive. Suppose $\lambda \geq \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to the tax rate is $\frac{\partial b_L^*}{\partial t} = \frac{\lambda S_M[S_M+S_R-\alpha(1+S_M)]}{\{1+\lambda[S_M+S_R-\alpha(1+S_M)]\}^2}$, which is positive. The partial derivative of player M's equilibrium conflict bid with respect to the tax rate is $\frac{\partial b_M^*}{\partial t} = \frac{\lambda S_M[S_M+S_R-\alpha(1+S_M)]^2}{\{1+\lambda[S_M+S_R-\alpha(1+S_M)]\}^2}$, which is positive. The partial derivative of the probability of a successful secession in equilibrium with respect to the tax rate is $\frac{\partial p^*}{\partial t} = 0$.

Proof of Proposition 6

Suppose $\lambda < \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to player M's conflict technology is $\frac{\partial b_L^*}{\partial \lambda} = 0$. The partial derivative of player M's equilibrium conflict bid with respect to player her own conflict technology is $\frac{\partial b_M^*}{\partial \lambda} = 0$. The partial derivative of player R's equilibrium conflict bid with respect to player M's conflict technology is $\frac{\partial b_R^*}{\partial \lambda} = -1$. The partial derivative of the probability of a successful secession in equilibrium with respect to player M's conflict technology is $\frac{\partial p^*}{\partial \lambda} = 0$. Suppose $\lambda \geq \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to player M's conflict technology is $\frac{\partial b_L^*}{\partial \lambda} = \frac{-S_M[S_M+S_R-\alpha(1+S_M)]\{1-\lambda[S_M+S_R-\alpha(1+S_M)]\}t}{\{-1-\lambda[S_M+S_R-\alpha(1+S_M)]\}^3}$, which is positive for $t > \lambda \Pi_M$ and negative for $t < \lambda\Pi_M$. The partial derivative of player M's equilibrium conflict bid with respect to her conflict technology is $\frac{\partial b_M^*}{\partial\lambda} = \frac{-S_M t[S_M+S_R-\alpha(1+S_M)]^2\{1-\lambda[S_M+S_R-\alpha(1+S_M)]\}t}{\{-1-\lambda[S_M+S_R-\alpha(1+S_M)]\}^3}$, which is positive for $t > \lambda\Pi_M$ and negative for $t < \lambda\Pi_M$. The partial derivative of the probability of a successful secession in equilibrium with respect to player M's conflict technology is $\frac{\partial p^*}{\partial\lambda} = \frac{S_M+S_R-\alpha(1+S_M)}{\{1+\lambda[S_M+S_R-\alpha(1+S_M)]\}^2}$, which is positive.

Proof of Proposition 7

Suppose $\lambda < \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to sanction costs Ψ is $\frac{\partial b_L^*}{\partial\Psi} = \frac{\sqrt{\frac{S_M S_R t[S_R+S_M-\alpha(1+S_M)]}{1+\Psi}}-2}{2S_R[S_R+S_M-\alpha(1+S_M)]}$, which is positive for $\frac{S_M S_R \Pi_M}{1+\Psi} > 4$ and negative for $\frac{S_M S_R \Pi_M}{1+\Psi} < 4$. The partial derivative of player M's equilibrium conflict bid with respect to sanction costs Ψ is $\frac{\partial b_M^*}{\partial\Psi} = \frac{\sqrt{\frac{S_M S_R t[S_R+S_M-\alpha(1+S_M)]}{1+\Psi}}-2}{2S_R}$, which is positive for $\frac{S_M S_R \Pi_M}{1+\Psi} > 4$ and negative for $\frac{S_M S_R \Pi_M}{1+\Psi} < 4$. The partial derivative of player R's equilibrium conflict bid with respect to sanction costs Ψ is $\frac{\partial b_R^*}{\partial\Psi} = -\frac{S_M S_R t}{2(1+\Psi)^2\sqrt{\frac{S_M S_R t[S_R+S_M-\alpha(1+S_M)]}{1+\Psi}}}$, which is negative. The partial derivative of the probability of a successful secession in equilibrium with respect to sanction costs Ψ is $\frac{\partial p^*}{\partial\Psi} = -\frac{1}{2(1+\Psi)\sqrt{\frac{S_M S_R t[S_R+S_M-\alpha(1+S_M)]}{1+\Psi}}}$.

Suppose $\lambda \geq \lambda^\kappa$ holds. The partial derivative of player L's equilibrium conflict bid with respect to sanction costs Ψ is $\frac{\partial b_L^*}{\partial\Psi} = 0$. The partial derivative of player M's equilibrium conflict bid with respect to sanction costs Ψ is $\frac{\partial b_M^*}{\partial\Psi} = 0$. The partial derivative of the probability of a successful secession in equilibrium with respect to sanction costs Ψ is $\frac{\partial p^*}{\partial\Psi} = 0$.

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