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War, peace, and the size of countries

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Abstract

This paper studies the relationship between international conflict and the size distribution of countries in a model in which both peaceful bargaining and nonpeaceful confrontations are possible. We show how the size distribution of countries depends on the likelihood, benefits, and costs of conflict and war. We also study the role of international law and show how better defined international 'property rights' may lead to country breakup and more numerous local conflicts.

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1. Introduction

Defense and security have historically played a key role in the determination and redrawing of political borders. Plato stressed a link between the size of political units and defense when he wrote that "the number of citizens should be sufficient to defend themselves against the injustice of their neighbours," (*Laws*, Book V, translated by Jawett). Riker (1964) argued that the external military threats and the need for defense were the critical conditions that led to the consolidation of federal states starting from independent regions. In Riker's view, the political agents who give up some independence to form a

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federation "are willing to do so because of some form of external military–diplomatic threat or opportunity. Either they desire protection from an external threat or they desire to participate in the potential aggression of the federation." In other words, the incentives to form large political jurisdictions is a function of military "threats and opportunities." Along the same lines, Gilpin (2001) notes that: "The few examples of successful federal experiments have been motivated primarily by national security concerns. Indeed, the two most successful federal republics—Switzerland and the United States—were created in response to powerful external security threats."

While defense and security concerns may lead regions to form larger political unions, a reduction in the perceived probability of conflict should be associated with secessions and political disintegration: if larger unions are not necessary for defense, regions can become independent at lower costs. However, wouldn't a breakup of existing political unions (states, federations, alliances) be itself a source of conflicts and even wars? The end of the cold war has been followed by a spectacular increase in the number of countries and in the emergence of numerous regional conflicts. In 1985, close to the end of the cold war, there were 170 countries in the word (of which 34 in Europe); today there are 193 countries in the world (of which 44 in Europe).[1] Several commentators have argued that some of the past conflicts, for instance, those involving Iraq and Kuwait and the following tensions, the war between Ethiopia and the newly independent Eritrea, and the conflicts in the Balkans, would not have exploded in the bipolar word of the East–West conflict.[2] A related argument concerns the size of the "peace dividend;" that is, the reduction of military spending that has followed the end of the cold war. The size of the peace dividend has been less spectacular than one may have hoped, perhaps because regional instability has increased although the East–West tension has declined.

These observations motivate the following questions: How does the possibility of international conflict and warfare relate to the size distribution of political unions? Is it possible that a reduction in the probability of a global war can be associated with more widespread local conflicts? How does the "peace dividend" depend on changes in the probability of conflict when political borders are endogenous?

In this paper, we will explore how the size of political unions is influenced by the need for each government to protect the interests of its own citizens in the international arena. In the rest of this paper, we will refer to political unions as "countries." We will use the word "country" to mean any "sovereign state" or "tight federation/alliance of sovereign states" that has successfully centralized all defense capabilities.[3] In the presence of international conflict, the power of one's country matters. In turn, a country's power depends on defense spending and other sources of force that can be used to protect and foster the interests of the country's citizens. From each country's perspective, defense and national power are public goods, and, in principle, larger countries can provide better and cheaper security to their citizens. The basic idea of this paper is that a degree of international conflict decreases the incentives to form small political units. By contrast, a

[1] Interestingly, the process of European integration has not lead to unification of defense policy. See Alesina and Spolaore (2003) for more discussion.

[2] For instance, see Hobsbawn (1994).

[3] According to this definition the European Union would not be a political unit.

reduction in the need to use force internationally, by making defense less important, leads to political separatism.

Specifically, in this paper we provide a model where secessions, unifications, and wars are possible and derive implications that may help to shed some light on the above questions. This paper contributes to the economic literature on the size distribution of countries.[4] While in our previous work we emphasized benefits of size emerging from economy of scale in the provision of public goods and from the size of the market, in this paper we focus on the benefits of size that arise form considerations of international security. In a way, we build on an old tradition of political analysis: the trade-off between security and the ability to form a homogenous polis has concerned people at least since the times of classical Greece and Renaissance Italy.[5] In this paper, we focus on the formation and breakup of political jurisdictions when countries face a general conflict-resolution technology, in which both international peaceful bargaining and nonpeaceful confrontations between nations are explicitly modeled within a game-theoretical framework. The emergence and resolution of conflict is linked to the geographical distribution of regions. Such a framework allows us to analyze how some important changes in the international environment may affect the determination of political borders. In particular, we study the link between the rule of 'international law' and the incentives to form larger political unions.

Our work attempts to build a bridge between the literature on country formation and the literature on conflict resolution and arms races, pioneered by Schelling (1960), Boulding (1962), Olson and Zeckhauser (1966), and Tullock (1974, 1980).[6] Formal and empirical analyses of the relationship between wars and domestic institutions for given country borders are provided by Garfinkel (1994) and Hess and Orphanides (1995, 2001). The stability of empires in a model with conflict is studied by Findlay (1996). McGuire (2002) analyzes the configuration of sovereign states and the sustainability and stability of the world distribution of property. The economic literature on conflict and wars is only a fraction of the much larger political science literature on these topics. For instance, recent contributions within the field of political science and international relations are discussed in Brown et al. (1998) and Powell (1999).

The paper is organized as follows. In Section 2, we present the basic model of endogenous borders, defense, and conflict in a world of anarchy. In particular, we show how the number and size of countries depend on the probability, benefits, and costs of conflict and war. Section 3 explores an important extension: the introduction of some form of international law. In Section 4, we study the comparative statics of our model. In particular, we show how changes that make conflict between countries less probable or less important (smaller benefits from aggression, smaller probability of a violent war,

[4] Contributions include Friedman (1977), Casella and Feinstein (2002), Bolton and Roland (1997), Alesina and Spolaore (1996, 1997, 2003), Alesina et al. (2000), LeBreton and Weber (2001), Wittman (2000) and McGuire (2002).

[5] See Dahl and Tufte (1973).

[6] More recent contributions are surveyed in various chapters in Hartley and Sandler (1995). See also Thompson (1974), Hirshleifer (1989, 1991, 1995) and Skaperdas (1992). A related line of research focuses on domestic conflict and insurrections—for instance, see Grossman (1991) and Grossman and Kim (1995).

wider extent and efficacy of international law) may lead to more conflict and wars in equilibrium because of the endogenous breakup of countries. Section 5 concludes.

2. Equilibrium borders without international law

2.1. The basic setting

The world is inhabited by a (discrete) number of individuals. Individuals are divided in homogeneous populations. For simplicity, we normalize the number of individuals in each population to one.[7] Each population has the potential to control a specific land area (its "region"). The extent of a population's "region" is not predetermined but will depend endogenously on the formation of political unions ("countries") and on the resolution of conflict between neighboring countries. In other words, a "region" in our model does not denote a predetermined land area, but the area actually controlled by a specific population in equilibrium. As we will see, conflicts over land and borders will be solved either peacefully (through bargaining and negotiation) or militarily (through wars). In either case, the outcome will crucially depend on the relative military strength of the population's country. Countries are defined as independent political units, which may be formed by one or more populations.[8] Within countries, (a) defense is completely and credibly centralized; (b) a unified government takes decisions over bargaining and war strategies; (c) borders with the outside world are defined and enforced using the country's national defense; and (d) the returns and costs from conflict with the country's neighbors are distributed across its citizens.[9] The details of the multistage game that determines borders, defense, and resolution of conflict in equilibrium will be given below after we present the basic building blocs of our model.

2.2. Players, production and utility

We need a minimum of four populations (each occupying its endogenously determined region) to make our points; in fact, four is the minimum even number of regions such that unification does not necessarily imply total elimination of international conflict. We will assume that two populations are located in the "West" (W1 and W2), and two are located in the "East" (E1 and E2). Western populations live in contiguous regions and so do Eastern populations. To fix ideas, we assume that the four regions (one for each population) are centered around four equidistant points on a circle (Fig. 1) of perimeter L. The segment connecting the centers of each pair of regions measures the portion of world

[7] It can be easily shown that our results do not change if we allow for the number of individuals in each region to be equal to any strictly positive integer.

[8] In other words, populations cannot split by assumption, but populations can merge to form countries composed of more than one population.

[9] Therefore, in principle, tight supranational alliances could be classified as "countries" in our framework insofar as they satisfy our definition. In practice, states that join actual military alliances tend to retain sovereignty on most matters. The extension of the analysis to multinational alliances is left for further research.

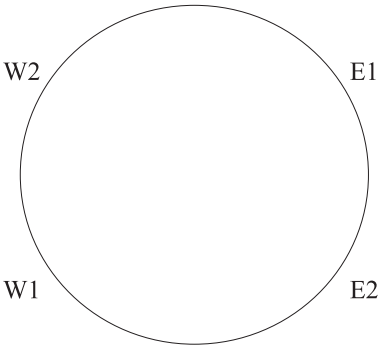

Fig. 1. The World.

surface (land, natural resources) to which the populations of the two regions have potential access. For example, potentially populated W1 could occupy all the land and natural resources located (clockwise) between E2 and W2, population W2 could occupy all the land and natural resources located (clockwise) between W1 and E2, etc.[10] As we will see, the land areas actually occupied by each population will be endogenous.

We assume a simple production function in which output Y_i in each region i is obtained as a function of population i's human capital (H_i) and the land effectively controlled by population i(L_i):[11]

$$Y_i = A_H H_i + A_L L_i \tag{1}$$

Consistently with the literature on country formation, we assume that the formation of a larger, less homogeneous country implies some "heterogeneity" costs.[12] Those costs can have multiple sources. They may be related to heterogenous preferences over public policies, coordination costs, and monitoring costs. In some cases, part of these costs may come from the expected losses associated with the possibility of a civil war or other major domestic upheavals due to high heterogeneity within a country. For simplicity, we assume that the heterogeneity costs of forming a country including both an Eastern and a Western population are prohibitive. By contrast, if populations E1 and E2 form a unified country, each individual in each population will bear a cost $0 \leq G_e < \infty$. Analogously, if populations W1 and W2 form a unified country, each individual in each population will bear a cost G_w. Without loss of generality, we impose $0 \leq G_w \leq G_e$.

We also assume that heterogeneity costs are the same for every member of a country, namely, they do not depend on the location of each individual within the country.[13]

[10] In order to simplify the analysis and for reasons of realism, each population's potential region is restricted to less than the whole world. Extending the analysis to the case in which each population could lay claim to the whole world would not change the main results but would complicate the algebra.

[11] This function can be viewed as a special case (ρ=1) of a CES production function $Y_i=(A_H H_i^{\rho}+A_L L_i^{\rho})^{1/\rho}$. The more standard Cobb–Douglas case would be given by the limit for ρ tending to zero. A similar specification is used, for example, in Spolaore (2001).

[12] See Alesina and Spolaore (2003) for more discussion.

[13] This assumption is simpler than the setup of Alesina and Spolaore (1996, 1997) where the heterogeneity costs depended on individuals' location on an ideological and/or geographical line.

The utility function for each individual i in region i is

$$U_i = Y_i - T_i - c_i - \delta_i G_i \tag{2}$$

where Y_i is the individual's income, T_i measures the individual's taxes, c_i measures the individual's costs from conflict, as specified below, δ_i is a binary index which takes a value of 0 if the individual lives in an independent region and a value of 1 otherwise. Finally, we have $G_i=G_w$ if the individual lives in a Western region, while $G_i=G_e$ if the individual lives in an Eastern region.

2.2.1. Defense, bargaining and wars

In this section we assume an "anarchic" world in which there is no third party enforcer of sovereignty, and all rights are enforced by a country's military might.[14] In such a world, all rights that the citizens of a country enjoy are only rights to the degree that the country's government can protect those rights in a state of anarchy. Specifically, in a state of anarchy, a country's lands, natural resources, forests, etc. are all subject to takeover unless the country puts up an adequate defense.[15] In Section 4, we extend our framework to allow for international law and internationally enforced control rights.

Let D_j denote defense in country j. One unit of defense costs one unit of income and is financed through taxation. Let S_j denote the set of individuals in country j. Then we have that

$$\sum_{k \in S_j} T_k = D_j \tag{3}$$

Defense is used to set potential conflicts with neighboring countries.

Defense spending, taxes, borders, and costs from conflict resolution are endogenously determined as equilibrium outcomes of an extensive game that we will specify below. Specifically, as mentioned above, we assume that the population in each region i, unless prevented by the use or threat of force, could seize and use all land lying between the centers of its neighboring regions. For example, population W1 could seize and use all land and natural resources between W1 and E2, therefore preventing population E2 from controlling that same land. In a world of anarchy, the resolution of the conflict between the two populations will depend on the relative military strength of the two populations' respective countries. In general, let L_{ij} denote all land between two neighboring regions—that is, all land between the center of region i and the center of region j. In an anarchic world, if the two regions belong to different countries, the allocation of land between them will be a function of their respective countries' military strengths—measured respectively by D_i and D_j. After conflict is resolved, the country that includes region i will have control over $\pi_{ij}L_{ij}$ units of land, while the country that includes region j will have control over $(1-\pi_{ij})L_{ij}$ units of land, where

$$\pi_{ij} = \frac{D_i}{D_i + D_j} \tag{4}$$

[14] We thank an anonymous referee for suggesting this perspective.

[15] This point has been stressed in a the literature on national defense and protection of property rights in a world of anarchy. Important contributions include Thompson (1974), Hirshleifer (1995), Skaperdas (1992) and McGuire (2002).

This specification closely follows the literature on conflict resolution where the relative spending on defense determines the likelihood of winning or the relative fraction of the splitting of the "pie."[16] In case of risk neutrality (which we assume), the two interpretations are identical in terms of expected utility.[17] Wars are costly: if country j goes to war, its aggregate cost is given by $C_j \geq 0$. For simplicity, and without much loss of generality, we assume that aggregate war costs are constant across countries, i.e., $C_i = C_j = C \geq 0$. As long as those costs are positive and are internalized by the governments of the two countries, both governments have an incentive to settle the conflict over land and natural resources peacefully, through bargaining and negotiation. Specifically, if we assume that governments maximize the aggregate utilities of their citizens, the net payoffs from going to war are

$$\Delta u_{ff}^{i} = \pi_{ij} A_L L_{ij} - C \tag{5}$$

$$\Delta u_{ff}^{j} = \left(1 - \pi_{ij}\right) A_L L_{ij} - C \tag{6}$$

If both governments choose to bargain, we adopt a Nash bargaining solution to share the pie. For the disagreement point, we choose, quite naturally, the war outcome. Under these assumptions, the Nash bargaining solution implies allocations shares $\alpha_{ij}^{*} = \pi_{ij}$ and $(1-\alpha_{ij}^{*}) = (1-\pi_{ij})$.[18] Hence, the net payoffs from bargaining are

$$\Delta u_{bb}^{j} = \alpha_{j}^{*} A_L L_{ij} \tag{7}$$

$$u_{bb}^{j\prime} = \left(1 - \alpha_{j}^{*}\right) A_L L_{ij} \tag{8}$$

[16] This specification is a special case of the more general "conflict resolution technology" in which country i's "probability of winning" π_{ij} is given by

$$\frac{\psi(D_i)}{\psi(D_i) + \psi(D_j)}$$

For example, see Tullock (1980) and Hirshleifer (1989, 1995).

[17] That is, π_{ij} can be interpreted as the probability that country i would win the war and seize the whole territory L_{ij} (in which case $\pi_{ij} L_{ij}$ is the expected land seized by country i before conflict starts). Alternatively, $\pi_{ij} L_{ij}$ can be viewed as the actual final allocation of land once military conflict is resolved ("cease-fire" borders). Without loss of generality, in the rest of this paper, we will adopt the second interpretation.

[18] By definition, α_{ij}^{*} is given by

$$\alpha_i^{*} = \operatorname{argmax}\left[\alpha_{ij} A_L L_{ij} - \frac{D_i}{D_i + D_j} A_L L_{ij} + C\right]\left[(1 - \alpha_{ij}) A_L L_{ij} - \frac{D_j}{D_i + D_j} A_L L_{ij} + C\right]$$

$$\text{s.t. } \alpha_{ij} A_L L_{ij} \geq \frac{D_i}{D_i + D_j} A_L L_{ij} - C, \qquad (1 - \alpha_{ij}) A_L L_{ij} \geq \frac{D_j}{D_i + D_j} A_L L_{ij} - C$$

which gives $\alpha_{ij}^{*} = \frac{D_i}{D_i + D_j}$. When the costs associated with open conflict are asymmetric, countries that are "weak" in terms of military strength but face low "war costs" may obtain more at the bargaining table than countries with bigger muscles but also larger war costs. Specifically, for $C_i \neq C_j$, we have

$$\alpha_{ij}^{*} = \frac{D_i}{D_i + D_j} + \frac{C_j - C_i}{2 A_L L_{ij}}$$

provided that both countries obtain through bargaining at least as much as they would through open conflict. In this paper we will not pursue this immediate extension and maintain the simplifying assumption that war costs are symmetric across countries.

For any $C>0$, the bargaining outcome Pareto dominates the fight outcome. If bargaining is a Nash equilibrium, one should expect that the two governments will coordinate on such outcome. In the rest of the analysis, we could assume that governments are always successful at achieving the Nash bargaining solution through peaceful negotiation. As we will see, inasmuch as the bargaining outcome is a function of each country's defense spending, our main results about economies of scale in defense and size of political unions, and most of our comparative statics results would not be affected by such extreme assumption. However, inasmuch as unfortunate wars and violent conflicts do take place in the real world, it seems useful and instructive to extend the model in order to allow for the possibility that peaceful bargaining might not occur in equilibrium. This raises the highly controversial and widely debated issue of why we observe wars.

In a recent contribution to this time-honored debate, Fearon (1995) has persuasively argued that only two mechanisms can claim empirical relevance as explanations for why rationally led states, in which governments fully internalize all war costs, may go to war; that is: "(1) the combination of private information about resolve or capability and incentives to misrepresent these, and (2) states' inability, in specific circumstances, to commit to uphold a deal."[19] Hence, a realistic and complete model of war outbreak would ideally include asymmetric information about other players' preferences and capabilities, and a detailed extensive form that specifies the commitment technology available to the different sides. In particular, governments could take intermediate steps towards negotiation and/or wars by using force unilaterally at different stages in order to improve their bargaining and/or military position. In this paper, we have chosen to summarize the potentially complex web of moves and decisions in two simplified steps: first, countries choose the level of their military capabilities; second, countries choose whether to go to war or bargain. In other words, "going to war" or "bargaining" identify two different strategies of the subgame that starts once countries have established their respective defense capabilities. Clearly, these are reduced forms for more complex games that may include a dynamics in which countries mobilize for war gradually while negotiating and/or start wars gradually (excalation) while reverting to negotiation when they find such option mutually beneficial. In our simplified framework, we assume that a simultaneous decision to go to war results in a costly war, with payoffs as specified above, while a simultaneous decision not to go to war results in the peaceful bargaining outcome, according to the above specified sharing rules. The central question, then, is what is the outcome when one country decides to pursue a warpath while the other country decides to pursue peaceful negotiations? Specifically, the key issue is whether a government faces positive incentives to go to war when the other side is bargaining. For example, a government may unilaterally start a war in the hope of taking advantage of some benefits from a "surprise attack." In general, those benefits will depend on the technology of such "surprise attacks." For example, the ability to set off rockets before the other side does might substantially increase the payoff from war for a "first striker" by increasing the probability of victory

[19] Fearon (1995), p. 409. Gartzke (1999) has criticized the second mechanism as a plausible explanation of rational wars in the absence of uncertainty and asymmetric information. More generally, an influential literature in international relations has plausibly argued that uncertainty and asymmetric information should play a central role in order to explain war outbreaks as rational outcomes. For a discussion of this literature, see Powell (1999).

and by reducing the expected length of war (and hence its costs). On the other hand, highly effective defensive technologies may reduce or eliminate a first striker's advantage.[20]

A reduced-form specification of the incentives to deviate from peaceful bargaining is given as follows. In general, we specify the payoffs for the outcome in which one country (say, country i) chooses to fight while the other country (say, country j) chooses to bargain as

$$\Delta u^{i}_{fb} = \pi_{ij} A_L L_{ij} + F_i \tag{9}$$

$$\Delta u^{j}_{fb} = \pi_{ij} A_L L_{ij} - e_j \tag{10}$$

where F_i captures all additional benefits (or costs) over bargaining from choosing to fight unilaterally, while e_j captures the costs from choosing bargaining over fighting when the other country chooses to fight.[21] In other words, F_i captures all net benefits (or costs) that a country could obtain by breaking up negotiations unilaterally and starting a war. As long as $F_i>0$, bargaining would not be a Nash equilibrium. What would determine the sign and size of F_i? In general, as mentioned above, F_i will depend on numerous factors, including the technology of a surprise attack and a first striker's ability to impose more favorable terms for a peace settlement after war has erupted. To our purposes, it will be sufficient to model F_i as a random variable, which will be fully revealed only after decisions over defense spending have taken place. Before defense capabilities are built up, governments do not know the exact future incentives to unilaterally deviate from peaceful bargaining in each country. Once defense is in place, all F_i's and e_i become common knowledge, and conflicts are resolved via peaceful bargaining or wars.[22]

2.3. Stages of the game

We assume the future timing:

(1) Populations decide whether to form political unions or remain independent.
(2) Countries choose their defense capabilities.
(3) Countries decide whether to bargain or fight with their neighbors. Conflict is resolved and final borders are set. Consumption takes place.

This timing makes sense within a dynamic framework by noting that (a) forming political unions is more costly than changes in defense spending and, in fact, are observed more rarely; and (b) building defense takes time.

We also assume that, when the formation of political unions and defense is decided, individuals do not know whether, should a conflict arise, it will be resolved through bargaining or through war. It seems appropriate to assume that the precise features of potential conflicts and their resolution are uncertain when borders and defense investments are decided. The alternative would be to assume that every time a secession or unification

[20] For a recent useful discussion of these issues, see Gatzke (2001). See also Van Evera (1998).

[21] In the rest of the analysis, we will assume $e_i>C$. That is, we will assume that if the other side has decided to fight, a country always benefits from choosing to fight as well rather than to bargain.

[22] The details of uncertainty resolution will be given below in the description of the multistage game.

is decided and defense spending levels are chosen, there is certainty about the incentives for armed conflicts and/or peaceful bargaining in future conflicts. To simplify our analysis, we assume that all international conflicts are bilateral, and involve disputes over the land between "regional centers" belonging to different countries.[23] This simplifying assumption rules out by construction international disputes involving three or more countries, and allows us to abstract from international alliances (coalitions among sovereign countries) and related issues, which are beyond the scope of this paper.

Specifically, we assume a three-stage game with the following structure:

In the first stage, populations in each region decides on whether they should form a unified country with the neighboring region (E1 with E2 and W1 with W2) or should form an independent country.[24] A unified country is formed if and only if citizens in both regions contemplating to form a country agree. That is, a unified East will emerge if and only if both E1 and E2 decide for unification. Analogously, a unified West will emerge if and only if both W1 and W2 decide for unification. Land and natural resources within a unified country are distributed equally among all citizens who can have access to them.[25] In stage two (i.e., after political unions have been decided), a government is selected in each country. After the election, the government acts as a unified "agent," namely, it is the unique player for each country in the following stages of the game. In countries formed by one homogeneous population, the government's objective function is identical to citizens' utility.[26] In countries formed by two populations, the government's objective is given by a weighed average of the utilities of the citizens in the two regions. The underlying idea is that the political process will reflect the relative political weights of the two populations. As we assume that the two populations have the same size and the same income per capita, it is natural to assume that their relative weights are identical.

In each country j, the government chooses the level of defense spending D_j, where $0 \leq D_j \leq \sum_{i \in Sj} Y_i$. Defense spending D_j can take any real value between zero and the maximum amount of resources available in the country.[27] As we will see, preferences over defense are identical across individuals within each country. Therefore, our assumption that defense is chosen by utility-maximizing governments is equivalent to having defense

[23] For example, if the West is divided, conflicts between country W1 and W2 are about the land between point W1 and point W2 (clockwise), while conflicts between country W2 and its Eastern neighbor are about the land between point W2 and point E1. If both the West and the East are unified, all conflicts between the two unified countries involve the land between point W2 and point E1 and the land between point E2 and point W1.

[24] We abstract from issues of preference aggregation within populations. In particular, any voting rule would deliver the same decision within each population. Therefore, we will refer to a "population" as an individual player in the rest of the analysis.

[25] In particular, this means that, in a unified East (West) all land between E1 and E2 (W1 and W2) is divided equally among the two populations. In other words, the "internal border" between region E1 and region E2 is set peacefully at the middle. This is equivalent to assume a Nash bargaining solution within each country, in which the two populations have identical bargaining power. Explicit civil wars are ruled out by assumption (although the heterogeneity costs could be interpreted as implicitly including the costs from civil conflict over land and natural resources).

[26] In other words, we assume that voters are able to elect an ideal "agent" as their government. We abstract from issues such as the ability of the government to extract rents from its own citizens. For a general discussion of alternative ways of modeling governments, see Grossman (2000).

[27] For simplicity, we assume that the constraint $D_j \leq \sum_{i \in Sj} Y_i$ is never binding in equilibrium.

chosen through direct voting within each country. However, it seems more realistic to assume that decisions over defense and, in the third stage, war or bargain, are taken by centralized governments rather than through direct-democracy referenda.

In stage three, after defense is decided, uncertainty is resolved, namely, the values of all parameters affecting conflict are revealed. In particular, to keep things simple, we assume that, with probability ρ, governments will face positive incentives to deviate from a peaceful bargaining outcome and start a war. That is, we will assume that, with probability ρ, $F_i>0$ for all i's. By contrast, with probability $1-\rho$, we will have $F_i\leq 0$ for all i's, which implies that bargaining will be the only Pareto-undominated Nash equilibrium.[28] In our model, F_i captures the incentives to unilaterally start a war. As mentioned before, those incentives will depend on technological, economic, and political factors known only when the location and the nature of the conflict are revealed.[29] The assumption that uncertainty is resolved at the beginning of stage three reflects the plausible view that building defense takes time, and by the time the existence and nature of specific conflicts are known, countries must have already invested in their own defense. In stage three, each government involved in conflict chooses fight or bargain in order to maximize the total utility of its citizens. The costs of wars are distributed equally among all citizens. Land and natural resources within each country's endogenous borders are distributed equally among all the country's citizens who can have access to them.

2.4. Equilibria

In our analysis, we focus upon subgame perfect Nash equilibria. When multiple equilibria exist, we will select (perfectly) coalition-proof Nash equilibria, as defined in Bernheim et al. (1987).[30] Our game has a unique (perfectly) coalition-proof Nash equilibrium, which can be derived as follows.

First, we restrict all possible pairs of governments to play Pareto-undominated equilibria in all two-player subgames of the terminal stage.[31] In other words, governments will play "bargain" if $F_i\leq 0$ and "war" if $F_i>0$.

We will then consider the subgames consisting of the terminal two-stage games. We will show that, given the payoffs supported by stage-three equilibria, for each possible configuration of countries, there exists a unique Nash equilibrium in which each government chooses a specific level of defense.[32] We will then consider the game played by the four populations in the first stage. Each population will play coalition-proof

[28] Note that we assume that $e_i>C$ for all i's.

[29] For simplicity, we do not model those factors explicitly. In a different framework, Hess and Orphanides (1995, 2001) explore a government's incentives to start an "avoidable war" as a function of economic and political conditions.

[30] When looking at coalition-proof equilibria, one needs to consider deviations by "coalitions" of players. It is important to note that the concept of "coalition," in this context, should not be confused with the concepts of "population," "country," or "government." In this paper, the word "coalition" will be used consistently with the technical definition of coalition-proof equilibria, i.e., as any subset of players.

[31] In two-players games, coalition-proof equilibria coincide with Pareto-undominated Nash equilibria.

[32] The unique Nash equilibrium in the terminal two-stage subgame is also coalition-proof.

equilibrium strategies. We will show that those equilibrium strategies characterize a unique equilibrium configuration of the world for given values of the parameters.

In summary, for a given vector of parameters (A_H, A_L, L, G_w, G_e, ρ, C) we can find unique values for (a) the equilibrium number and size distribution of countries; (b) the equilibrium distribution of defense levels per capita across countries; (c) the equilibrium borders of each country with respect to all other countries; and (d) the extent of international conflicts and wars.

We will now derive the equilibrium levels of defense spending and the equilibrium returns from conflict for each possible configuration of countries.

Lemma 1. *Equilibrium defense spending per capita in country i is given by*

$$D_i = \frac{A_L L}{8 s_i} \tag{11}$$

Proof in Appendix A.

This result shows that, by forming a larger union, equilibrium defense per capita is reduced. By defining "expected conflict returns" per capita as the per capita expected share of L minus expected war costs, we have the following.

Lemma 2. *For every configuration of countries and for every country of size s_I, expected "net conflict returns" per capita in equilibrium are given by*

$$\frac{A_L L}{4} - \frac{A_L L}{8 s_i} - \frac{\rho 2C}{s_i} \tag{12}$$

Because of Lemma 1, individuals living in a large country enjoy a benefit from size: their expected return comes "cheaper," i.e., at a lower cost in terms of defense per capita. In other words, a larger size brings about net economies of scale in defense. In addition, when wars are possible ($\rho>0$) and costly ($c>0$), a larger size reduces expected war costs. This analysis of equilibrium defense spending and equilibrium expected returns from conflict point to a scale advantage: larger countries can exploit economies of scale in defense. However, these benefits have to be weighted against the higher heterogeneity costs.

Proposition 1. *For all $0<G_w \leq G_e$, $C \geq 0$, and $0 \leq \rho \leq 1$ in equilibrium we will have*:

1) *Four independent regions ($N=4$) if and only if*

$$NCBU \leq G_w \tag{13}$$

2) *A unified West and two independent countries in the East ($N=3$) if and only if*

$$G_w < NCBU \leq G_e \tag{14}$$

3) *A unified West and a unified East ($N=2$) if and only*

$$NCBU > G_e \tag{15}$$

where NCBU denotes the "net conflicts benefits from unification" and is defined as

$$NCBU \equiv \frac{A_L L}{16} + \rho C \tag{16}$$

Proof in Appendix C.

The intuition for the above result goes as follows. As shown in the appendices, the "net conflict benefits from unification" (NCBU) stem from lower defense spending per capita (measured by $A_L L/16$) and lower expected costs from war (measured by ρC). This proposition states the intuitive result that, when the NCBU are below the lowest heterogeneity costs (G_w), independence is the equilibrium strategy in each region. If $G_w<(A_L L/16)+\rho C<G_e$, the NCBU are high enough to compensate Western regions for their (lower) heterogeneity costs but are too small to make unification worthwhile in the East where heterogeneity costs are assumed to be higher. If NCBU$>G_e$, unification is the equilibrium strategy everywhere.

Proposition 1 shows that, other things being equal, a world in which land and natural resources are important for production will have larger countries. The proposition also shows that the number of countries depends positively on the probability that conflict will be resolved through military confrontation (ρ) times the direct costs of military confrontation (C). A more "bellicose" world implies larger countries, while a reduction in the probability of war and/or its costs induces country break up.

3. Borders and international law

In the analysis above, we have assumed that the only a country's military capabilities can enforce its citizens' rights over land and natural resources. On the other hand, in a world of perfectly enforced international law and peaceful respect of international borders, a country's control of land and natural resources would be guaranteed by international rules, social norms, and possibly, a third party enforcer of sovereignty (for instance, a perfectly credible and effective United Nations). In such a world, defense spending would not be necessary, except possibly as a contribution to the third party enforcer's capabilities.

Even when wars have no costs (C=0), all expenses in defense are pure waste from an efficiency perspective. A more efficient solution would be for countries to agree in advance about a partition of the world in 'spheres of influence.' In particular, the first best could be achieved by having the four independent regions dividing the circle into four equal segments and spend nothing on defense. However, in the absence of some form of enforcement, each country has an incentive to deviate from such a solution, invest in its own force, and "invade" its neighbors' spheres of influence.

In general, we assume that each region i is able to fully control a set of land $(\xi/4)L$ around its "center" without the need for independent defense spending. In other words, we assume that enforced international law and/or respected social norms allow a "secure" area of size $(\xi/4)L$ around each region.[33] However, portions of "unsecured land" can be controlled by a country only by using its own military strength. If ξ=0, the world is completely anarchic, and all rights on land and natural resources in the world must be

[33] An alternative interpretation is that ξ is a technological parameter that reflects the effectiveness of "informal" defense of land and natural resources by local populations who do not have formal defense capabilities, but are protected by preexisting geographical barriers, and/or can repel foreign aggression by using assets that have no opportunity cost in terms of output (e.g., special knowledge and skills). In this paper we do not pursue this alternative interpretation.

backed by the use or threat of force. On the other hand, if $\xi=1$, the world is equally divided between the populations of the four regions, and no region needs to back its rights with military capabilities. In general, $0\leq\xi\leq1$.

In this world, our results can be immediately extended as follows. Now we will have

Lemma 1bis. *Equilibrium defense spending per capita in country i is given by*

$$D_i = \frac{(1-\xi)A_L L}{8s_i} \tag{17}$$

Proposition 1 can also be generalized to:

Proposition 1bis. *For all $0<G_w\leq G_e$, $C\geq0$, $0\leq\rho\leq1$, and $0\leq\xi\leq1$ in equilibrium, we will have the same results as inProposition 1, with NCBU now defined as*

$$NCBU\equiv\frac{(1-\xi)A_L L}{16}+\rho C \tag{18}$$

Therefore, an expansion of international control rights (higher ξ) reduces the importance of national defense and brings about the formation of smaller countries in equilibrium.

4. Comparative statics

We will now study the implied comparative statics for different values of the fundamental parameters. Propositions 1 and 1bis states that the equilibrium number and size of countries will endogenously depend on the relationship between importance of the conflict for production and consumption ($A_L L$); conflict is important, probability (ρ) and costs (C) of a war, extent of international law (ξ), and heterogeneity costs (G_e and G_w). For given heterogeneity costs, high $A_L L$, ρ, and C, and/or a small ξ tend to be associated with larger countries, while low $A_L L$, ρ, and C, and/or a high ξ are associated with smaller, more numerous countries.

Note that the probability of observing an actual international conflict (say, a war) depends not only on the probability that a war arises (ρ) but also on the number of countries, which depends endogenously on the parameters, including ρ. By the same token, changes in the parameters that make conflict and defense less important or less costly (lower $A_L L$, ρ, or C, higher ξ), by enducing the breakup of existing political unions, may be associated with (a) an increase of the extent of actual conflict and even wars over land and natural resources and (b) higher defense per capita in equilibrium.

For example, let χ denote the expected number of wars in equilibrium. By definition, it will be given by the probability of war times the existing pairs of countries.[34] Specifically, it will be $\chi=\rho$ for $N=2$ and $\chi=\rho N$ for $N=2, 3$. The number of countries itself is a function of ρ. Hence, a reduction in ρ will have a direct negative effect on χ (that is, a smaller ρ

[34] In our models, the probability of each war is not independently distributed. On the contrary, wars are correlated because we assume that the incentives to deviate from peaceful bargaining are perfectly correlated. Hence, ρ denotes the probability that all N countries will go to war.

means a smaller expected number of wars for a given number of countries). However, if a smaller probability of bilateral wars reduces the importance of wars and defense and therefore brings about a breakup of countries, more wars may result in equilibrium. Formally

Corollary 1. *For any* $G_w \leq G_e$ *such that* $\rho' > \frac{G_w}{C} - \frac{(1-\xi)A_L L}{16C}$, *consider a lower* $\rho'' < \frac{G_e}{C} - \frac{(1-\xi)A_L L}{16C}$. *Let* $\chi(\rho'') = \rho'$ *denote the expected number of wars associated with* $\{\rho', A_L L, G_e, G_w, C, \xi\}$ *and let* $\chi(\rho'') = 4\rho''$ *denote the ex pected number of wars associated with* $\{\rho'', A_L L, G_e, G_w, C, \xi\}$. *Then,* $\chi(\rho') > 4\rho''$ *if and only if* $\rho'/\rho'' > 4$.

In other terms, the above corollary states that, for every vector of parameters such that there exists two countries in equilibrium, there exists a range of smaller ρ's, such that, for the same other parameters, (1) four countries will result in equilibrium, and (2) the number of expected wars in the new equilibrium will be higher than in the equilibrium with the higher ρ.[35] The intuition is straightforward: while a smaller ρ reduces the probability of war for a given number of countries, the smaller chance that wars may arise reduces the incentives to form larger countries, and therefore, increases the number of countries in equilibrium. Therefore, some conflicts that would be resolved within domestic borders are now resolved through international confrontation and war. This indirect effect may offset the direct effect of a reduction in ρ and bring about an increase in the probability of observing an international war.

On the other hand, note that, with a lower ρ, international wars may be more numerous, but they will also be more local (in our example, each actual conflict will involve only half of the world rather than the whole world). By the same token, an increase in the extent of international law (ξ), while reducing the importance of military capabilities in the resolution of conflict for given number of countries, may lead to more international conflict and more wars if it brings about the breakup of existing political unions. For example, if a larger ξ leads to a break up of countries, so that the number of countries increases by 50% (say, from 2 to 3, following the break up of the unified East), the number of expected wars would triple (from ρ to 3ρ). Moreover, the extent of land and natural resources allocated through violence and military confrontation could also go up as a consequence of more effective international law, bringing about a breakup of political unions.

The endogenous reduction in the number and size of countries that may be brought about by a reduction in the importance of international conflict (for instance, because of higher ξ) can generate an additional paradoxical effect: a higher ξ may induce higher defense per capita in equilibrium. Certainly, defense per capita is decreasing in ξ for a given configuration of countries. Therefore, a higher ξ, for a given number of political units, induces a "peace dividend": lower importance of conflict would translate into lower defense per capita in each country. However, a higher ξ, by inducing a reduction in the equilibrium size of countries, may lead to higher defense per capita in equilibrium. Moreover, even when defense per capita does not increase because of a higher ξ, any endogenous reduction in size implies a level of defense per capita higher than the level one would observed should borders remain unchanged. In other words, the endogenous link between conflict, defense spending, and size of countries points to reasons why a "peace

[35] A similar corollary can be derived when the number of countries goes from 2 to 3 or from 3 to 4.

dividend" may be reduced or completely offset by a breakup of countries. Formally, we can state the following

Corollary 2. *For any* $G_w \leq G_e$ *such that* $\xi' < 1 - \frac{16(G_w - \rho C)}{A_L L}$, *consider a higher* $\xi'' > 1 - \frac{16(G_e - \rho C)}{A_L L}$. *ByLemma 1bis, we have that defense per capita at the higher level of* ξ *given by*

$$d(\xi') = \frac{(1 - \xi')A_L L}{16} \tag{19}$$

while defense per capita at the lower level of π *is given by*

$$d(\xi'') = \frac{(1 - \xi'')A_L L}{8} \tag{20}$$

Therefore, we have that $d(\xi') > d(\xi'')$ *if and only if* $(1-\xi')/(1-\xi'') > 2$.

Note that even when $d(\xi') > d(\xi'')$, the peace dividend that is associated with a breakup of countries is given by

$$\mathrm{PD}_{\mathrm{break}} = \mathrm{d}(\xi') - \mathrm{d}(\xi'') = \frac{A_L L}{16}[\xi'' - \xi' - (1 - \xi'')] \tag{27}$$

Such "peace dividend" is smaller than the peace dividend that would be observed in the absence of country breakup, i.e.:

$$\mathrm{PD}_{\mathrm{nobreak}} = \frac{A_L L}{16}[\xi'' - \xi']. \tag{28}$$

An expansion in the extent of international property rights, while reducing the level of international "anarchy" and the importance of defense, may lead to a breakup of countries, which may consequently bring about an increase in local conflicts and wars. In other words, an increase in the enforcement of international law that brings about a breakup of countries will also reduce conflict if and only if it is large enough. Otherwise, a more extensive enforcement of international law will, on balance, increase conflict and wars.

This result shows that, when borders are endogenous, 'improvements' in international law may increase conflict. This is a 'second-best' result. While a first-best world would emerge from perfectly defined international control rights, quite a different outcome may result when one considers extensions of international property rights that do not completely eliminate areas of anarchy and indeterminacy. The post-cold war world has seen both an increase in the coordinated attempts to enforce international agreements and 'control rights,' and an explosion of local conflicts and separatism. Our analysis suggests a possible explanation for the coexistence of the two phenomena.

5. Conclusion

Our model implies breakup of countries should go hand in hand with a reduction of international conflict, a lower probability of open warfare, and a strengthening of

international law. On the other hand, the actual number of international conflicts among smaller countries may increase as the result of the breakup of previously larger political unions. We also found that the size of the "peace dividend" is influenced by the process of country fragmentation.

These implications of the model seem consistent with the world events that have accompanied the "end of the cold war." Following the end of a major ideological and geopolitical confrontation between the Soviet Union and the West, we have seen a reduction in the threat of a global war and, possibly, a greater role for international institutions and the rule of international law. At the same time, we have observed a number of secessions not only in the former Soviet Union but also in Eastern Europe and other parts of the world. While some have been peaceful (Czechoslovakia), others have been followed by ethnic and religious conflicts and open international warfare between newly formed political units (former Yugoslavia, East Africa). Moreover, the decline in the probability of a foreign threat seems to have been accompanied by more vocal separatism and/or a trend towards more decentralization even in those countries where actual secessions have not taken place.

Also, while military spending as percent of GDP has decreased in most countries during the 1990s, the size of the peace dividend seems lower than one may have anticipated given the spectacular collapse of the Soviet Union and the drastic reduction of a threat of a total East–West war. Data from various sources differ because of differences in country coverage and definition of military expenditure. Data for 90 countries from the International Institute of Strategic Studies (IISS) show a decline in military spending of only 0.4% of GDP between 1990 and 1994. WEO data show a decline in military spending of 1.2% of GDP between 1990 and 1995. Even within the WEO data set, almost a third of the 130 countries maintained or increased their military spending as a percent of GDP over the period (see Clemens et al., 1997). In fact, in several countries, one has seen substantial increases in defense spending over the period.[36]

Of course, our simple model is not meant to provide a complete and realistic description of the world. In this paper, we have attempted to isolate one factor (international conflict) among the numerous factors that can affect the number and size of countries. And we have attempted to study such a factor within the simplest possible framework we could think of. In our analysis, we have abstracted from many dimensions and details of actual international relations and border formation, which should be taken into account when moving from theoretical predictions to the historical record.[37] However, we believe that our model captures some essential and relevant aspects of the relationship between international conflict and size distribution of political unions. In particular, we think that the following insight is more general than our specific model: Incentives to form larger political unions are likely to be

[36] For instance, in a study by Clemens et al. (1997), the 10 developing countries with the largest increases in military spending during 1985–1992 had an average increase of 2.7 percentage points of GDP.

[37] In particular, one should consider additional variables, from which we have abstracted in this paper, such as the role of international trade, democratization, etc. See Alesina and Spolaore (2003) for more discussion.

higher in a more bellicose, anarchic world, but a reduction in those incentives by inducing political fragmentation may bring about its own dose of actual international tensions.

We should emphasize a few possible extensions of our approach. First, we have ignored the role of multiple conflicts and alliances and the related problem of free riding in defense spending by smaller members. To some extent, as we have already mentioned, one can reinterpret the "country" of our model as a group of allied countries and view our model of country formation as a model of alliance formation. If we reinterpret the model this way, then we can also make sense of the fact that during the cold war, the NATO alliance and the Warsaw Pact became tighter alliances. At the apex of the cold war, military alliances with close coordination of defense capabilities did become the norm. In our model, a "country" is a political unit in which defense is completely and credibly centralized, and the "returns" from conflict are equally distributed across its citizens. Henceforth, our model in its present form is not designed to address issues of bargaining and free riding among allied countries. While those extensions, in principle, are not outside the scope of our framework, we leave them for future research.

Third, we do not explicitly study nondemocratic decision rules (nondemocratic country formation and/or nondemocratic decisions over defense spending, wars, divisions of spoils). One should notice that, within our framework, our results are robust to a large range of decision rules, as individuals within regions and across regions have homogeneous preferences over unification, defense spending, etc. However, the analysis of more complex models in which decision rules could make a crucial difference is left for future research. More complex political institutions may also give raise to additional reasons to engage in military conflict. For instance, Hess and Orphanides (1995, 2001) discuss the occurrence of wars chosen strategically by governments in order to signal their competence in military leadership, and therefore, to boost their chances of being reelected when faced with domestic problems.

A third extension that we do not pursue here is the introduction of ex ante income inequality within and across regions, as discussed for instance in Bolton and Roland (1997). This feature may play an important role in the actual evolution of conflict, peace, and the breakup of countries, and may be especially important when we want to interpret the end of the cold war and the breakup of the Soviet Union. More specifically, in our analysis, we have assumed that the "resource constraint" is not binding when defense is chosen within each country. However, one could extend the model to allow for asymmetries and/or shocks to national income that prevent one or more countries from achieving and/or maintaining the "equilibrium" level of defense, with possible consequences to the overall configuration of countries.

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Appendix A. Derivation of Lemma 1

In order to derive Lemma 1, we need to derive the equilibrium defense spending levels for each configuration of countries.

A.1. Two countries

Denote with d_i^* equilibrium defense spending in country i=1,2 when there are only two countries. The expected total payoff in country i=1,2 (where j=2,1) as a function of defense spending is given by

$$\frac{D_i}{D_i + D_j}\frac{A_L L}{2} - D_i \tag{A.1}$$

The Nash-equilibrium levels of defense D_i^* is defined as

$$D_i^* = \arg\max \frac{A_L L}{2}\frac{D_i}{D_i + D_j^*} - D_i \tag{A.2}$$

with i=1,2 and j=2,1 whose solutions imply

$$D_1^* = D_2^* = \frac{A_L L}{8} \tag{A.3}$$

As each country has a total population of size equal to 2, defense spending per capita in each country is

$$\frac{D_1^*}{2} = \frac{D_2^*}{2} = \frac{A_L L}{16} \tag{A.4}$$

A.2. Three countries

When a country formed by two regions (say, country 1) coexists with two independent regions (say, country 2 and country 3), the Nash-equilibrium levels of defense equilibrium defense D_i^* (with i=1, 2, 3, j=2, 3, 1, and j'=3, 1, 2) are given by

$$D_i^* = \arg\max_{D_i} \frac{A_L L}{4}\left[\frac{D_i}{D_i + D_j^*} + \frac{D_i}{D_i + D_{j'}^*}\right] - D_i \tag{A.5}$$

whose solution is:

$$D_{i1}^* = D_2^* = D_3^* = \frac{A_L L}{8} \tag{A.6}$$

As country 1 has a population size equal to 2, while countries 2 and 3 have population of sizes 2 and 3 each, we have a level of defense per capita equal to $A_L L/16$ in country 1 and equal to $A_L L/8$ in countries 2 and 3.

A.3. Four countries

When four independent countries (i=1, 2, 3, 4), each of size equal to 1, coexist, the Nash equilibrium is given by

$$D_i^* = \arg\max_{D_i} \left\{ \frac{A_L L}{4} \left[\frac{D_i}{D_i + D_j^*} + \frac{D_i}{D_i + D_{j'}^*} \right] - D_i \right\} \tag{A.7}$$

where j=4, 3, 2, 1 and j'=2, 1, 4, 3, whose solutions are

$$D_i^* = \frac{A_L L}{8} \tag{A.8}$$

which implies defense spending per capita equal to $A_L L/8$ in each country. Thus, for any possible configuration of countries, in equilibrium, we have that a country formed by two regions has defense per capita equal to $A_L L/16$, while a country formed by one region has defense per capita equal to $A_L L/8$. □

Appendix B. Derivation of Lemma 2

The expected returns from conflict (including potential conflict that is resolved within a country's borders) can be calculated as follows:

We have seen that in equilibrium, for every configuration of countries aggregate defense spending is the same. Hence, each region will always control a fourth of the land in equilibrium.

War costs per capita are $\rho 2C/2 = \rho C$ in a country formed by two regions (i.e., s_i=2) and $\rho 2C$ in a country formed by one region (i.e., s_i=1). Therefore, Lemma 2 holds.

Appendix C. Derivation of Proposition 1

Lemma 3. *Given heterogeneity cost h_k (k=w,e), and given the equilibrium payoffs associated with all possible configurations of countries (i.e., with all terminal two-stage subgames), individuals will (strictly) prefer to live in a two-region country rather than in an independent region if and only if*

$$\frac{A_L L}{16} + \rho C > h_k \tag{A.9}$$

Proof of Lemma 3. As shown above, the absolute level of defense in equilibrium is always $(A_L L)/8$. Individual utility in a country formed by two regions is

$$U_{\text{uni}} = A_H H + \frac{A_L L}{4} - \frac{A_L L}{16} - \rho C - h_k \tag{A.10}$$

while in a country formed by one region individual utility is given by

$$U_{ind} = A_H H + \frac{A_L L}{4} - \frac{A_L L}{8} - \rho 2C. \tag{A.11}$$

Therefore, unification is (strictly) preferred to independence if and only if

$$\frac{A_L L}{16} + \rho C > h_k \tag{A.12}$$

Proposition 1 is an immediate implication of Lemma 3. It is immediate to see that Proposition 1 characterizes a Nash equilibrium. Moreover, for any other Nash equilibrium, there will be a group of individuals who will be strictly better off by deviating and moving to the equilibrium characterized in Proposition 1.

First, consider the case $(A_L L)/16+\rho C<h_w$. In this case, voting for independence is a dominant strategy for each individual. For any equilibrium in which a majority has voted for unification, there exists a coalition of individuals (in fact, everybody) who would be better off by switching to independence. Hence, independence for all regions is the only outcome that can be sustained as a (coalition-proof) Nash equilibrium.

When $h_w<(A_L L)/16+\rho C<h_e$, any outcome in which the East is unified would be upset by a majority (in fact, all) Eastern individuals, who are better off when the two Eastern regions are independent. On the other hand, voting for unification is the dominant strategy in the West.

When $(A_L L)/16+\rho C>h_e$, voting for unification is the dominant strategy everywhere. □

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