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Constitutions, federalism, and national integration

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ABSTRACT

This paper offers a model of endogenous constitutional design in a setting where culturally and economically distinct regions establish a national union and bargain over the form of the government. We examine two aspects: the type of legislative decision rule (consensus or majority rule) and the central government's power over the member regions (centralized or decentralized federalism). We show that (i) more centralized regimes emerge when the regions are culturally similar (e.g., same language or religion) and when the economic benefits derived from the union are high, (ii) if regions choose to govern by consensus rather than majority rule, the resulting legislation will produce higher centralization of power and thus lower regional autonomy, (iii) legislating by consensus, rather than by majority rule, produces more efficient unions but, under some circumstances, majority rule produces a more durable union. Our results carry insights into the historical evolution of nations, such as the inclusion of Scotland in Great Britain, and the current challenges facing the EU and other contemporary unions.

1. Introduction

Most nations and supranational unions in the world today join together many distinct cultures and economies under a common government. The regions' disparate cultures and economies are a source of strength for a nation, as there are economic gains to a union. But, combining disparate cultures and economies often brings tensions. Each region must decide how much of its autonomy surrenders to create a set of laws that will govern the union. These constitutional decisions have long-lasting consequences for the economic success and durability of the union (Alesina et al., 2017).

Extensive literatures in economics and political science have considered separately two distinct aspects of constitutions: federalism and legislative decision-making. Political scientists observe an empirical link between centralization and consensus (e.g., Rodden, 2004; Lijphart, 2012). Yet, little theoretical research has examined the connection between these two government features.¹ We examine the logic of constitution-making at the moment a union is formed and show that these features of the governmental design are integrally linked. Using a bargaining model, we analyze negotiations among culturally or politically distinct regions over a constitutional arrangement that defines the vertical and horizontal divisions of legislative power. The vertical distribution of power defines the degree of centralized federalism. Under centralized federalism, national law is supreme, and the national government holds the bulk of administrative power (Rodden, 2004). The vertical division of power may be thought of along a continuum from highly centralized to highly decentralized. The horizontal distribution of power describes the share of power assigned to each region within the national legislature.² In line with Lijphart (2012), we propose a classification in two

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E-mail addresses: sda@gov.harvard.edu (S. Ansolabehere), mps@uma.es (M. S. Puy).¹ Exceptions are Bolton and Roland (1997), De Figueiredo and Weingast (2005), and Flamand (2019), as discussed below.² Although the focus of this paper is on federal systems, the analysis has implications for nearly all systems of government, as all institutions, according to Ostrom (1990), are the result of negotiated agreements among previously disjoint units.

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forms of legislative decision-making: consensus and majoritarian. In consensus-based democracies, there is an effort to share power and seek compromises and decisions are arrived at with the consent of all parties, that is, by unanimity rule (Andeweg, 2000). In majoritarian democracies, the will of a majority makes legislative decisions.

The resulting bargain over the horizontal and vertical distribution of power will reflect the economic potential of a union and the cultural differences between regions. A fundamental insight of our analysis is that the power-sharing in the legislature acts as a form of commitment device that can make the union more efficient and, possibly, more durable.

Our model considers a single nation with two regions. The economy of each region achieves a certain level of income or utility if it is a separate nation on its own. Each region can achieve higher expected income or utility if it becomes part of a larger nation and its economy. For example, it is commonly believed that the countries of Europe have enjoyed better outcomes by virtue of being part of the EU (see, e.g., Alesina and Spolaore, 1997; Le Breton and Weber, 2003). There are, however, costs to the regions from joining the union. Specifically, the laws enacted by the national government can differ from what the region would have chosen on its own, and may even conflict with regional laws and customs. For example, if a region speaks a language very different from the national language, then adopting the national language to conduct business, education, and government transactions would be very costly to the region. Also, a region may have its own currency and banking institutions and want to manage monetary policy in a way that is attuned to the fluctuations in the local economy, rather than subject itself to the economic volatility and monetary policy favored by the rest of the nation. Such is the case with monetary policy and the EU.

We formalize the process of nation formation in three phases: the constitution stage, the legislation stage, and the integration stage. At the constitutional stage, regions bargain over the fraction of power transferred to their common legislative body and their division of legislative power within union members. Generalizing Bolton and Roland (1997), we allow the choice of vertical integration to be along a continuum, from highly centralized to highly decentralized. The choice of horizontal power is either majority rule or unanimity. The national law is enacted at the legislation stage, and regions decide whether to veto the national law. Finally, after the political process is complete and the benefits of forming a union are realized, regions remain or opt for exiting. We derive the equilibrium under the Weighted Nash Bargaining Solution and analyze the form of the constitution adopted and the resiliency of the union to future economic shocks.

Four key conclusions emerge from our analysis. First, the equilibrium level of centralization balances the economic potential of a union against the cultural and economic differences among member regions. Two culturally different regions will prefer a relatively low level of centralization. Two regions with high gains to an economic union will want high centralization. Second, the choice of horizontal distribution of power, unanimity or majority rule, determines the level of centralization that will be chosen. Nations whose cultural and economic circumstances make them more likely to adopt unanimity rule in the legislature are more likely to have centralized federal systems. Third, consensual democracies better exploit the potential of the benefits produced by federal unions. Thus, regimes using unanimity-rule Pareto-dominate majority regimes.³ Fourth, the efficiency of consensus or unanimity rule comes at the expense, in most circumstances, of the durability of the union. Majority rule produces more stability than unanimity rule when the member regions are culturally distinct and their scale economies are high. Otherwise, unanimity systems generate more stable unions. Intuitively, when the member regions adopt both consensus and centralization, the nation will be more exposed to significant economic losses produced by adverse economic shocks in the future. This insight is wholly new to this area of inquiry and suggests ways the EU and other evolving institutions can adjust their rules to improve their durability.

There is, of course, voluminous literature on federalism (Elazar, 1968, 1987; Amoretti and Bermeo, 2004), legislative decision-making (Miller, 1985), and constitutional economics (Voigt, 1997). Our contribution focuses on one specific problem — at the moment a constitution is formed, how can the member regions credibly commit to compensate those regions who may bear disproportionate future costs from joining the union? The answer, we propose, lies not only in the degree of centralization of the federal system, but in how a union constitutes the legislative function.

The literature on nation formation examines how cultural and economic differences across regions are obstacles to national integration. A nation imposes costs on local areas, which may be high when the regions are very different. If these costs are too high, the union either breaks apart or does not form (Bolton et al., 1996; Alesina and Spolaore, 1997; Alesina et al., 2000; Wittman, 2000; Chu, 2010; Flamand, 2019). According to Alesina and Spolaore (1997), the scale economies and the costs of heterogeneous preferences over public goods determine the size of a nation. Le Breton and Weber (2003) and Desmet et al. (2011) show that heterogeneity in preferences can lead to national dissolution. This literature has conjectured that nations solve dissolution problems through compensation: the costs imposed on each region by common federal laws are compensated with fiscal transfers (Bolton and Roland, 1997; Le Breton and Weber, 2003; Haimanko et al., 2005). However, *ex-ante*, the member regions of the union cannot credibly commit to making those fiscal transfers, as that is a matter of future legislation.

The extensive literature on federalism does not offer a ready answer. Decentralization allows tailoring policies to the particular preferences of the regions (Musgrave, 1959; Oates, 1972, 1999), provides better information to policymakers (Hayek, 1945; Dewatripont and Maskin, 1995; Qian and Weingast, 1997), increases political participation (Inman and Rubinfeld, 1997), produces the capacity to sustain an efficient system of markets (Weingast, 1995), adds flexibility in dealing with multiple ethnicities within a nation (Bednar et al., 2001), or enhances electoral accountability (Bardhan, 2002; Hindriks and Lockwood, 2009). Centralization is associated with benefits such as internalizing externalities among regionally specific projects (Oates, 1972; Lockwood, 2002; Besley and Coate, 2003) and reducing rent extraction (Boffa et al., 2016). Federalism itself does not ensure that no region does worse than it would have if it existed as a nation.

³ This result contrasts with Bouton et al. (2018), who show that majority rule produces Pareto superior outcomes in a context of incomplete information.

De Figueiredo and Weingast (2005) propose the idea of self-enforcing federalism in which the central government designs a coordination device with penalties to prevent regions from exiting. Such rules, however, are non-existent in actual constitutions and may themselves be unenforceable. Flamand (2019) argues that partial decentralization compensates regions for their costs, but there is still the problem that the national legislature will impose additional costs in the future. Following Flamand, our analysis incorporates a variable degree of decentralized federalism, but we explicitly examine the constitutional design of legislative institutions. Prior theoretical work by political scientists recognizes this connection between decentralization and legislative power (Riker, 1964; Filippov et al., 2004), which, as far as we know, has not been captured in economic models of federalism. In contrast to the prior federalism literature predictions, we find that more vertical integration and centralization will occur because the bargaining process allows for power-sharing in the legislature.

The structure of the paper is as follows. Section 2 presents the model. Section 3 provides equilibrium predictions for the case of unanimity and majority. Section 4 compares these equilibrium predictions. Section 5 proposes a discussion on the applicability of our results, and the last section offers the conclusion. All proofs are relegated to the Appendix.

2. A model of nation formation

There are two regions, k and l . The regions may be thought of as separate countries that might join together to form a federal union. The problem may be also thought of as the decision of a single region to join (or remain in) a country consisting of many other regions.

When forming a nation (or a supranational union), regions need to agree on a constitution that determines two features of the government: the decision rule in the central government's legislature and the degree of centralization or central government power.

The distribution of power in the legislature, or horizontal power, is denoted by $a \in [0, 1]$. The legislative power of region k is $a_k = a$, and the power of region l is $a_l = 1 - a$. One interpretation of a is the apportionment of seats in the parliament or congress, such as the equal apportionment of seats to states in the United States Senate or of seats to member states in the European Council. We analyze two possible decision rules, unanimity and majority-rule. For modeling purposes, we treat consensus as unanimity-rule. Unanimity rule requires agreement by both region k and region l . The specific policy chosen is a weighted average of the policies preferred by the regions, where the weights equal each region's legislative power.⁴ Under majority rule, the policy chosen is the one that receives the support of the most people. In this situation, the region with a majority of legislative power decides the national law. If, say, region k is the dominant region in the legislature, then $a = 1$. The European Council and Commission usually operates on consensus when defining the priorities and law proposals for the EU (Slapin, 2011). Majority rule is widely used in many legislative bodies, including the United States Congress as a notable example.

The degree of centralization or vertical division of power is denoted by $\beta \in [0, 1]$. The degree of centralization has two effects. First, β influences the economic gains that the regions can achieve. For example, more centralization can imply that all regions operate under a common national set of laws, resulting in a more integrated economy and better economic outcomes for both regions.⁵ Second, β indicates the degree to which the regions follow a common national law instead of their own laws.

The choice of centralization leads to one of three types of federalism:

A *centralized* system, in which the national laws have primacy over the regional laws. In this case, $\beta = 1$, and regions operate strictly under the nation's laws.

A *decentralized* federal system, in which national laws and regional laws are each in operation within each region, and the degree of decentralization is determined by the level of national control versus regional control. In this case, $0 < \beta < 1$.⁶

An *autonomous* system grants the primacy of the regional laws. In this case, $\beta = 0$, which means that regions operate under their own laws.⁷

The combination of a degree of centralization, a division of legislative power, and a legislative decision rule defines a *constitutional arrangement*.

The economic implications of nation formation

The economic benefits that the people in a region achieve depend on their relationship with the rest of the nation. We distinguish two types of economic benefits, fixed benefits and variable benefits. Fixed benefits reflect economies of scale due, for example, to reduced trade costs. Variable benefits reflect the benefits produced by the coordination of regional policy instruments. We assume that variable benefits are increasing in the degree of centralization. For each region, $F_j > 0$ denotes the fixed benefits or immediate

⁴ Unanimity implies that formal voting occurs, while consensus refers to the decision-making process that includes all negotiations and deliberations preceding the final decision (Törnudd, 1982). We interpret that consensus is the process to reach unanimity and that the regions' legislative powers determine what each part can obtain in their internal deliberation.

⁵ Empirical research has found that centralization enhances economic performance (Davoodi and Zou, 1998; Rodden, 2004).

⁶ Some unitary nations such as France or Spain are in the devolution process, which implies transferring national competencies to the regions. These regimes are not federations but, from our theoretical perspective, their degree of decentralization (or devolution) can be determined by our model.

⁷ Centralized systems are also called unitary nations. Examples of this regime are Colombia, China and Japan. On the other extreme, a confederation is a particular form of an autonomous system, where sovereign regions form a union as the first step towards a federal union. Switzerland and Germany are two examples of confederations that became federal unions.

benefits of being in the nation, and $g_j > 0$ denotes the variable benefits associated with the future benefits of being in the nation.⁸ The total economic gains achieved by each region j are denoted by Y_j and depend on the degree of centralization:

$$Y_j(\beta) = \underbrace{Y_j^0}_{\text{Regional income}} + \underbrace{F_j}_{\text{Fixed union benefits}} + \underbrace{\beta g_j}_{\text{Variable union benefits}}. \tag{1}$$

When $\beta = 0$, the regions operate autonomously within the nation. The benefits of the union are the sum of the regional income achieved in an autonomous way Y_j^0 plus the fixed benefits associated with their national alliance F_j . When $\beta = 1$, the regions achieve the highest possible economic benefits because they eliminate the cost of different laws in each region. The values of β between 0 and 1 represent different levels of integration of the region into the nation's economy.

The political implications of nation formation

Each region prefers laws that best suit the local culture and customs. The laws can be treated (but not restricted to) as a one-dimensional policy space, such as left versus right. Let Z be the space of laws, and let $z \in Z$ be a specific law. The values z_l and z_k denote the most preferred laws for each regional government. For example, if this is a matter of language policy, each region wants its language to be the national language. Other possibilities are fiscal and redistributive policies.⁹

When forming a nation, all regions join together in the national legislature and enact their national law $z^L \in Z$. Each region tries to influence this law towards its most preferred. The division of legislative power between the regions is part of the constitutional arrangement. Once a constitution is accepted by the regions, the national law that the legislature enacts is a combination of the regions' most preferred laws:

$$z^L(a) = f(a)z_k + (1 - f(a))z_l \text{ and where} \tag{2}$$

$$f(a) = a \text{ if unanimity, and } f(a) = \begin{cases} 0 & \text{if } a < \frac{1}{2} \\ 1 & \text{if } a > \frac{1}{2} \end{cases} \text{ if majority.}$$

In the case of unanimity, the national law is a weighted average of the most preferred laws of the regions, z_k and z_l , where the influence of each region on the national law is equal to its legislative power. The resulting law is a compromise between the regions' most preferred laws. This scenario resembles the decision-making process of the European Council, often divided along the line of the northern and southern countries. While this process does not include formal voting, we interpret that unanimity (or the absence of any objection by a member state) emerges from deliberation. Majority rule implies that the region with more legislative power selects its most preferred law as the national law.¹⁰ For example, the United States Congress decision rule is majority oriented, and it is often a reflection of the division between northern and southern states. For tractability, we study both systems in a unitary model and consider that majority rule restricts the divisions of power to either $a = 0$ and $a = 1$, i.e., either region l or region k possesses more influence and decides the national law.

The resulting law used by the regions depends on the degree of centralization approved in their constitution. In a centralized system, the regions implement the national policy. In a decentralized system, the regions implement a law that is the combination of the national law and the most preferred regional law for the region. Let z_j^L denote the enacted regional law that depends on the specific constitutional arrangement (β, a) :

$$z_j^L(\beta, a) = \beta z^L(a) + (1 - \beta)z_j. \tag{3}$$

Regions adjust their regional laws to accommodate the national law depending on the degree of centralization. When $\beta = 1$ the national law supersedes the regional laws, and, when $\beta = 0$ the regions ignore the national law and use their own regional laws. The higher β , the more convergence there is between the laws enacted in the regions.

Regional preferences

As with [Alesina and Spolaore \(1997\)](#), our model presents the choice facing the regions as a trade-off between the benefits of scale economies and the costs of heterogeneous preferences between regions.

We assume that regions know the fixed benefits derived from the union F_j and are uncertain about the variable benefits g_j . The variable benefits for each region j are distributed according to a distribution function with mean equal to $\bar{g}_j > 0$. The political cost is measured by the quadratic distance between the most preferred law for the region z_j and the enacted regional law z_j^L .¹¹

The preferences of the regions over constitutional arrangements (β, a) , are represented by the following utility function

$$u_j(\beta, a) = \underbrace{Y_j(\beta)}_{\text{Economic gains}} - \underbrace{(z_j^L(\beta, a) - z_j)^2}_{\text{Policy cost}} \text{ for all } j \in \{k, l\}, \tag{4}$$

⁸ [Campos et al. \(2014\)](#) measure the economic benefits of European integration using counterfactual analysis and show member nations with greater and smaller positive effects.

⁹ Following [Bolton and Roland \(1997\)](#), we can assume that these policies, z_l and z_k , are the most preferred of the median voter in each region.

¹⁰ Usually, under majority rule, an odd number of representatives in the legislative body eliminates the possibility of $a = .5$.

¹¹ Quadratic distances imply that each unit of political cost generates less disutility the closer it is to z_j . Quadratic distances, instead of city block distances, provide a continuous range of most preferred levels of centralization as a function of legislative power.

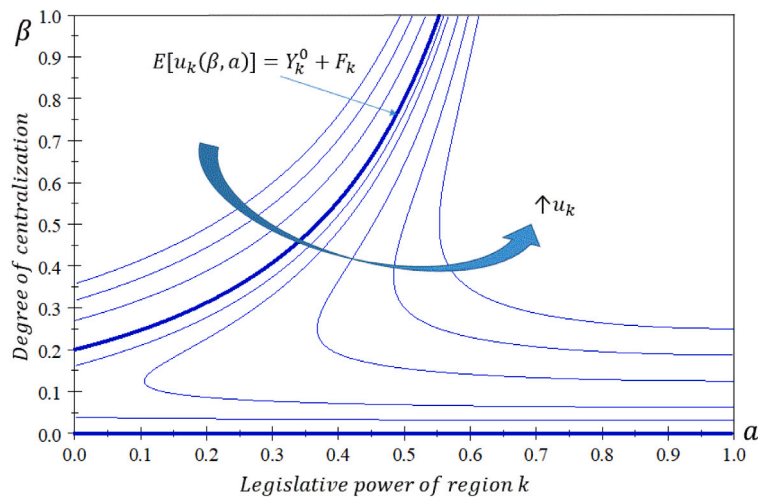


Fig. 1. Indifference curves of region k over legislative power a and centralization β .

where the level of economic gains and political cost are measured in monetary units, and the marginal cost of policy are normalized to one. One may also interpret that the economic benefits of the union are a function of specific policies, with each region benefiting more from a distinct policy. For example, European common bonds favor some member nations such as Greece or Italy and regional bonds favor Germany. In this case, the political cost in Expression (4) measures the extent to which a region does not benefit from all the economic gains produced by the union.

Substituting expressions (1), (2) and (3), the expected utility of each region in the case of unanimity is equal to¹²

$$E[u_j(\beta, a)] = Y_j^0 + F_j + \beta \bar{g}_j - \beta^2(1 - a_j)^2(z_k - z_l)^2 \tag{5}$$

and, in the case of majority rule,

$$E[u_j(\beta, a)] = \begin{cases} Y_j^0 + F_j + \beta \bar{g}_j - \beta^2(z_k - z_l)^2 & \text{when } a_j = 0 \\ Y_j^0 + F_j + \beta \bar{g}_j & \text{when } a_j = 1 \end{cases} \tag{6}$$

Expressions (5) and (6) reveal that the degree of centralization, β , has a positive effect on each region’s utility through higher economic performance, but a negative political cost since it increases the distance between the most preferred regional law and the national law. The legislative power affects the political cost of the federal union. In the case of unanimity, the higher a_j , the closer the national law is to the most preferred law for the region. In the case of majority rule, the region with a majority has no political cost, and the national law is the most preferred law for this region.

We illustrate in Fig. 1 the preferences of region k over levels of legislative power $a = a_k$ (horizontal axis), and degrees of centralization β (vertical axis).¹³ The thick arrow that crosses the indifference curves indicates higher utility levels. Note that preferences are monotonic in the level of legislative power a , but they are not in the degree of centralization β . Only when a region’s legislative power is sufficiently high, will that region prefer a more centralized federal system. The bold indifference curve represented in Fig. 1 provides the (expected) utility level $Y_k^0 + F_k$, and includes all the combinations of β and a such that the variable union benefits are equal to the political cost; $\beta = 0$ is a particular case.

In the case of unanimity, at each level of legislative power a_j , there is a unique most preferred degree of centralization for each region, denoted by β_j^* . This quantity is a corner solution when $\beta_j^* = 0$ and $\beta_j^* = 1$.¹⁴ In the case where $\beta_j^* = 0$, the variable benefits are too low relative to the (marginal) political cost and the region’s most preferred regime is an autonomous system. In the case where $\beta_j^* = 1$, the variable benefits are very high in relation to the (marginal) political cost and the region’s most preferred regime is centralization. For the remaining cases, the most preferred levels of centralization are interior solutions in which $0 < \beta_j^* < 1$ and such that¹⁵:

$$\beta_j^*(a) = \frac{\bar{g}_j}{2(1-a_j)^2(z_k - z_l)^2} \text{ for all } j \in \{k, l\}. \tag{7}$$

¹² First, substituting z_j^l yields $E[u_j(\beta, a)] = E[Y_j(\beta)] - \beta^2(z^L(a) - z_j)^2$. Second, note that $(z^L(a) - z_k)^2 = (1 - a)^2(z_l - z_k)^2$ and $(z^L(a) - z_l)^2 = a^2(z_k - z_l)^2$. By substituting $a = a_k = 1 - a$, we deduce Expression (5).

¹³ This figure considers the exogenous parameter values $\bar{g}_j = .4$, $[z_k - z_l]^2 = 2$.

¹⁴ When $\bar{g}_j < 2(1 - a_j)^2 [z_k - z_l]^2$, then $\beta_j^* = 0$ and, when $\bar{g}_j > 2(1 - a_j)^2(z_k - z_l)^2$, $\beta_j^* = 1$.

¹⁵ The second order condition when solving $\arg \max_{\beta \in [0, 1]} E[u_j(\beta, a)]$ satisfies $\frac{\partial^2 u_j}{\partial \beta^2} = -2(1 - a_j)^2(z_k - z_l)^2 < 0$ for $a_j \neq 1$.

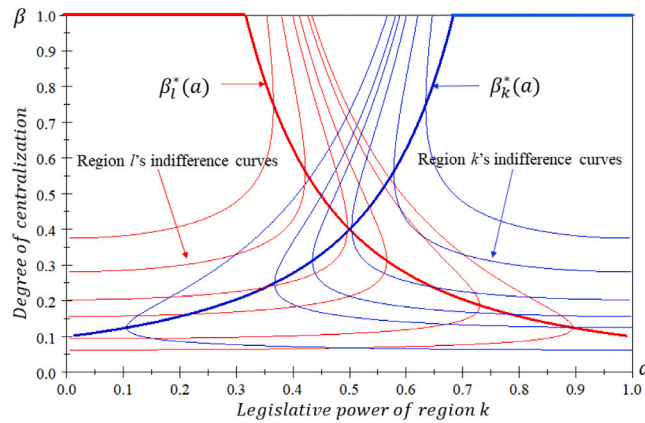


Fig. 2. The most preferred levels of centralization for each region, β_k^* and β_l^* as a function of legislative power.

More legislative power for one region implies less legislative power for the other. Generally, the demand of centralization by the regions may not align: the region with more legislative power prefers more centralization, and the region with less legislative power prefers less centralization.

In the case of majority rule, only $a = 0$ and $a = 1$ are feasible. Thus, the region with a majority prefers more centralization, while the region that is in the minority prefers low levels of centralization, as described by Expression (7) for the case of $a_j = 0$.

Fig. 2 illustrates the most preferred levels of centralization for each region. In this example, the term $\beta_k^*(a)$ is increasing in a and $\beta_l^*(a)$ is decreasing in a (or equivalently, increasing in $1 - a$). For the two regions, when their legislative power is sufficiently high, centralization is preferred over every other possible degree of federalism. For the case of majority rule, the example shows that the region with a majority prefers a centralized regime, $\beta = 1$, while its partner region prefers a low level of centralization, $\beta = .1$.

The mechanism of nation formation

The decision to join and integrate into a nation is based on the expected utility that the union provides to the regions. We divide the process of nation formation into the following three stages:

Constitutional Stage: at which regional governments negotiate the level of centralization together with a division of legislative power (β, a);

Vetoing Stage: at which the national law and the regional laws are enacted, and where regions have the option of vetoing the national law;

Integration Stage: at which regional governments observe the realization of the union benefits and decide whether to maintain or leave the union.

In line with De Figueiredo and Weingast (2005), at the vetoing stage, we add the possibility of non-compliance with or veto of the national law by one of the regions. When a region vetoes the national law, the union remains, but there is no national law and the regions enact their regional laws. If a region vetoes the national law, the nation does not benefit from the higher degree of economic integration achieved in a centralized or decentralized system.

The bargain struck in the constitutional phase depends on many factors, and different nations can follow distinct negotiation protocols. We use the Weighted Nash (bargaining) Solution as the equilibrium concept that specifies the agreement reached by the regions in a non-cooperative bargaining scenario.¹⁶ Formally, the *Weighted Nash Solution* provides the horizontal and vertical divisions of power for the regions (β^*, a^*) that solve

$$(\beta^*, a^*) \in \arg \max_{\beta, a \in [0,1]^2} (E[u_k(\beta, a) - d_k])^\alpha + (E[u_l(\beta, a) - d_l])^{1-\alpha},$$

where d_j is the disagreement or threat point and $\alpha, 1 - \alpha$ are the bargaining powers of region k and region l , respectively. In line with Slapin (2009, 2011), we link the bargaining power of each region to the threat that each region represents if vetoing the national law, and we associate the disagreement point with the maximal utility that a region can achieve when there is no specific division of power (and thus, $\beta = 0$).

Provided that the regions anticipate the possibility of its partner region vetoing the national law, we consider that each region *bargaining power* is directly proportional to the threat with which the region can influence the benefits of its partner region. Thus, the higher the expected union gains for a region compared to its partner region, the smaller its bargaining power.¹⁷ In other words,

¹⁶ This solution is a reduced form of an explicit strategic bargaining game, as shown by Binmore et al. (1986), Anbarci and Sun (2013). Besides, this solution is widely applicable in search models such as Mortensen and Pissarides (1994) or Rocheteau and Wright (2005).

¹⁷ For example, Baerg and Hallerberg (2016) show how the Member States with more euro-skepticism achieve better bargaining power in the EU.

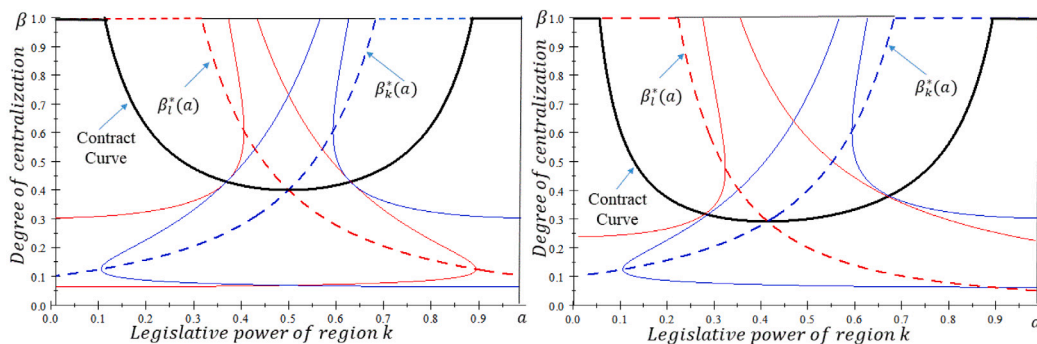


Fig. 3. The Constitutional Contract Curve when $\bar{g}_k = \bar{g}_l = .4$ (left panel), and when $\bar{g}_k = .4, \bar{g}_l = .1$ (right panel).

the power of each region in the negotiation is inversely proportional to the fraction of its gains when forming the union, namely, $\alpha = \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k}$ and $1 - \alpha = \frac{\bar{g}_k}{\bar{g}_l + \bar{g}_k}$, where the denominator is the sum of the maximal variable benefits that the regions obtain with their union.

It is useful to distinguish two reservation values. The first is the reservation value for the situation when the question is whether to be in or not be in a union. Each region’s reservation value equals its regional income Y_j^0 , when the region decides whether to join or whether or not to leave a union. The second is the reservation value when being in a union is not a question, but the choice of policy is at stake. This reservation value is higher and equal to $Y_j^0 + F_j$. Thus, the *disagreement point* is equal to the maximal of these values, i.e., $d_j = Y_j^0 + F_j$. We refer to d_j as the threat point since it defines, for every region j , the boundary between vetoing or passing the national law and no region accepts an agreement that provides an (expected) utility below $Y_j^0 + F_j$. While a utility below $Y_j^0 + F_j$ constrains the entry into a union, a utility below Y_j^0 provides enough incentives to dissolve the federal union. In other words, the criterion to enter the union is more restrictive than the criterion to exit. One interpretation of this is that, once in a union, a region can avoid a benefit below $Y_j^0 + F_j$ by vetoing the national law.¹⁸

Neither the division of bargaining power nor the disagreement point depends on the integration stage, i.e., on the possibility of exiting once the union is constituted. Indeed, provided that $F_j > 0$, the threat of exiting is not credible. The integration stage is relevant when evaluating the resilience or stability of the union. We explore this possibility in Section 4.

Note that, unlike Alesina and Spolaore (1997, 2005), we consider that moving out of a nation implies not benefiting from scale economies of the common public goods such as access to a larger market. This feature of our model, together with the possibility of decentralization, predicts more stable or durable unions.

3. Equilibrium analysis

In this section, we describe the constitutional arrangements that emerge when regions negotiate the terms of their union. We explore the two distinct legislative scenarios, unanimity and majority rule, and provide an equilibrium prediction for each case. At the end of the section, we elaborate a comparative statics analysis.

Under unanimity rule, every combination describing a degree of centralization together with a division of legislative power $(\beta, a) \in [0, 1]^2$ is a feasible constitutional arrangement. When legislating by majority rule, however, the division of legislative power is restricted to $a = 0$ and $a = 1$. In each scenario, we begin by calculating the set of (Pareto) efficient constitutional arrangements, with the Weighted Nash Solution being one of them (Roth, 1977). We later describe the constitutional arrangements achieved by the regions in equilibrium.

Unanimity rule

In the case of unanimity, we define the Constitutional Contract Curve as the curve that includes all the combinations (β, a) that are efficient. It contains all the constitutions characterized by the tangency between the slopes of the regions’ indifference curves (except the corner solutions, where $\beta = 1$). This curve provides insights into the trade-off faced by the regions when negotiating their constitution.

The analytical expression of the Constitutional Contract Curve is derived in Lemma 1 of the Appendix. The expression obtained is illustrated in Fig. 3. The thick U-shaped curves in the figure depict the Constitutional Contract Curves. The left panel represents the curve for the case of equal expected variable benefits for the regions, i.e., $\bar{g}_k = \bar{g}_l$ (and both equal to .4), and the right panel represents the case $\bar{g}_k > \bar{g}_l$ (where $\bar{g}_k = .4$ and $\bar{g}_l = .1$).¹⁹

¹⁸ Hirschman (1970) argues that when the members of a nation (or an organization) perceive that the nation is demonstrating a decrease in benefits, they can exit, or they can voice (in an attempt to improve the relationship). Thus, the interval $[Y_j^0, Y_j^0 + F_j]$ provides a *voice* to the region that can exert its right of repealing the national law.

¹⁹ In both panels, $(z_k - z_l)^2 = 2$.

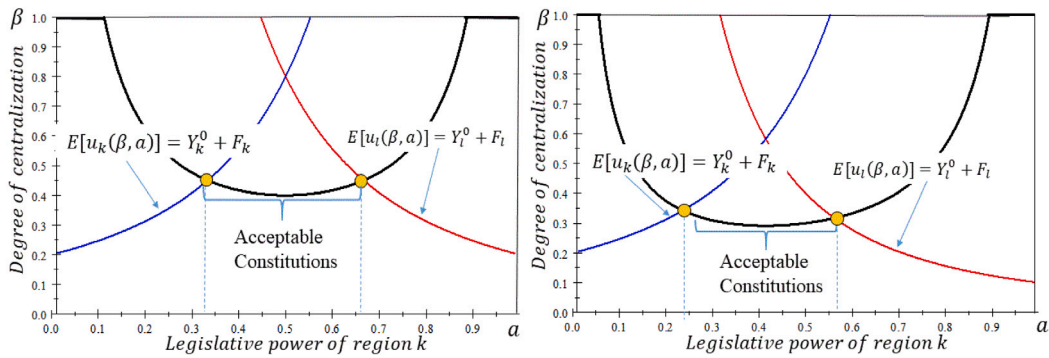


Fig. 4. Constitutional arrangements above the disagreement point when $\bar{g}_k = \bar{g}_l$ (left panel), and when $\bar{g}_k > \bar{g}_l$ (right panel).

The Constitutional Contract Curve lies in between the most preferred levels of centralization for the two regions (the dash lines in Fig. 3), as defined by the expressions $\beta_k^*(a)$ and $\beta_l^*(a)$. The right panel compared to the left panel reveals that some efficient constitutions can occur with lower levels of centralization. Thus, we deduce a relation between the lower economic gains that a region obtains with a union and the lower level of centralization that the regions are willing to accept. This point is further explored in the comparative statics analysis.

We determine the set of constitutions that provide a utility above the disagreement point, i.e., $E[u_j(\beta, a)] \geq Y_j^0 + F_j$. For the same parameter values of Fig. 3, the following Fig. 4 depicts the indifference curves associated with the threat point $Y_j^0 + F_j$. As already argued, no region accepts a constitutional arrangement above such indifference curve. Therefore, the threshold utility $Y_j^0 + F_j$ defines the subset of the contract curve containing those constitutions (β, a) that the regions can accept, with the Weighted Nash Solution being one of them. Fig. 4 shows the subset of acceptable constitutions, including several degrees of centralization and not too unequal divisions of legislative power. In the symmetric case (the left panel where $\bar{g}_k = \bar{g}_l = .4$), no region accepts a too low level of legislative power, whereas in the asymmetric case (the right panel where $\bar{g}_k = .4$ and $\bar{g}_l = .1$), the region with higher expected economic gains, region k , is willing to accept lower power in exchange for more centralization.

Provided that $\bar{g}_k, \bar{g}_l > 0$, for every division of legislative power $a \in [0, 1]$, we find that there is always a range of positive levels of centralization $\beta > 0$ such that both regions improve with their union (these ranges are located below the indifference curves $E[u_j(\beta, a)] = Y_j^0 + F_j$). In particular, for the case where $a = .5$, Flamand (2019) provides a similar result in a related model.²⁰ Unlike our model, Flamand does not incorporate the division of legislative power as an endogenous variable, and the national policy is always equal to the midpoint of the most preferred regional policies. We generalize her result to every value of $a \in [0, 1]$ and show that not every division of legislative power is accepted by the regions.

We calculate the constitutional arrangement obtained as the Weighted Nash Solution when the bargaining powers of the regions are inversely proportional to the fraction of its gains, and $Y_j^0 + F_j$ is the reservation value.

Proposition 1. Under unanimity rule, the Weighted Nash Solution to the proposed constitutional game provides a division of legislative power a^U and a level of centralization β^U equal to

$$a_k^U = \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k}, \quad a_l^U = \frac{\bar{g}_k}{\bar{g}_l + \bar{g}_k} \quad \text{and} \quad \beta^U = \begin{cases} \frac{\bar{g}_l + \bar{g}_k}{(z_k - z_l)^2} & \text{if } \frac{\bar{g}_l + \bar{g}_k}{(z_k - z_l)^2} < 1 \\ 1 & \text{otherwise} \end{cases},$$

and the associated expected utility for the regions is

$$E[u_j] = Y_j^0 + F_j + \frac{\bar{g}_l \bar{g}_k}{(z_k - z_l)^2} \quad \text{for } j = k \text{ and } j = l.$$

We deduce two technical observations. First, the equilibrium is the only fixed point of the Weighted Nash Solution; it provides a division of power equal to the initial bargaining powers of the regions.²¹ Second, in equilibrium, both regions increase their utility over their respective reservation value in the same quantity $\frac{\bar{g}_l \bar{g}_k}{(z_k - z_l)^2}$, which implies that the proposed Weighted Nash Solution coincides with the Egalitarian Solution proposed by Kalai (1977).

According to Proposition 1, the agreement reached by the regions defines an unexplored compensation mechanism by which lower relative economic union benefits for a region are compensated with additional legislative power, and this trade-off enables a positive level of centralization. Notably, the level of centralization increases with the sum of variable benefits but diminishes with the cultural and political distinctiveness between the regions.

²⁰ According to Flamand (2019), only when there is high resentment (that reflects an additional cost of coexistence), some regions prefer independence to decentralization.

²¹ Indeed, for every bargaining power below $\alpha = \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k}$, we find that $a \in (\alpha, \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k})$ and, for every bargaining power above $\alpha = \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k}$, we find that $a \in (\frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k}, \alpha)$.

Majority rule

Under majority rule, we restrict the feasible divisions of legislative power to $a = 0$ and $a = 1$, i.e., either region l or region k decides the national law. In Lemma 2 of the Appendix, we calculate the set of efficient constitutional arrangements for this case. If $\bar{g}_k \geq \bar{g}_l$, this set contains those constitutions where $a = 0$ with $\beta \geq \frac{\bar{g}_k}{2(z_k - z_l)^2}$ and $a = 1$ with either $\beta \geq \frac{\bar{g}_l}{2(z_k - z_l)^2}$ or $\beta > \frac{\bar{g}_k}{4(z_k - z_l)^2}$, depending on whether $\bar{g}_k \leq 2\bar{g}_l$ or $\bar{g}_k > 2\bar{g}_l$, respectively.²² That is, by efficiency, one or the other region can hold all the legislative power.

We calculate the Weighted Nash Solution when the bargaining powers of the regions are inversely proportional to the fraction of its gains, and the reservation value is equal to $Y_j^0 + F_j$.

Proposition 2. Under majority rule, the Weighted Nash Solution to the proposed constitutional game provides a division of legislative power a^M and a level of centralization β^M defined as follows,

$$\begin{aligned} \text{if } \bar{g}_k \geq \bar{g}_l \text{ then } a^M = 0 \text{ with } \beta^M &= \begin{cases} \frac{\bar{g}_k(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(\bar{g}_k + 2\bar{g}_l)} & \text{if } \frac{\bar{g}_k(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(\bar{g}_k + 2\bar{g}_l)} < 1 \\ 1 & \text{otherwise} \end{cases} \\ \text{if } \bar{g}_k \leq \bar{g}_l \text{ then } a^M = 1 \text{ with } \beta^M &= \begin{cases} \frac{\bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(2\bar{g}_k + \bar{g}_l)} & \text{if } \frac{\bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(2\bar{g}_k + \bar{g}_l)} < 1 \\ 1 & \text{otherwise.} \end{cases} \end{aligned}$$

Besides, the equilibrium expected utility for the regions is

$$\begin{aligned} E[u_k] &= Y_k^0 + F_k + \frac{\varphi \bar{g}_k}{(\bar{g}_k + 2\bar{g}_l)^2}, E[u_l] = Y_l^0 + F_l + \frac{\varphi}{(\bar{g}_k + 2\bar{g}_l)} \text{ when } a^M = 0 \\ E[u_k] &= Y_k^0 + F_k + \frac{\varphi}{(2\bar{g}_k + \bar{g}_l)}, E[u_l] = Y_l^0 + F_l + \frac{\varphi \bar{g}_l}{(2\bar{g}_k + 2\bar{g}_l)^2} \text{ when } a^M = 1 \end{aligned}$$

where $\varphi = \frac{\bar{g}_k \bar{g}_l (\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2}$, and the region with a majority derives more utility (over its reservation value).

By Proposition 2, the proposed bargaining scenario defines a compensation mechanism by which lower economic union benefits for a region (say k) are compensated with the majoritarian legislative power ($a = 1$), and this trade-off enables a positive level of centralization. Interestingly, the region expecting lower benefits, \bar{g}_j , ends up with higher utility (over $Y_j^0 + F_j$) due to its higher bargaining power and the impossibility of providing an equitable division of legislative power.

Our results contrast to those of Bolton and Roland (1997). Bolton and Roland consider three scenarios, unification ($\beta = 1$), autonomy ($\beta = 0$) and independence, but ignore the possibility of federal unions with a degree of centralization in the interval $\beta \in (0, 1)$. They predict unification when both heterogeneity among regions is low and efficiency losses from separation are high (in our model, high-efficiency losses are equivalent to high \bar{g}_j). Such a result is embedded in our previous Propositions 1 and 2. Bolton and Roland predict independence when there is high heterogeneity and low-efficiency losses, a scenario for which we show that the regions agree on a low level of centralization. Thus, when incorporating a much broader set of constitutional arrangements, there is more integration and less independence than that predicted by these authors.²³

Comparative statics

The equilibrium predicted by the model is a function of the expected variable benefits and the political distinctiveness between the regions. We say that a region in the union is economically more advantaged when its expected variable gains \bar{g}_j are above those of the other region, to which we refer as the less advantaged.

Proposition 3 (Illustrated in Fig. 5). (i) Higher expected economic union gains for a region translates into higher centralization under both unanimity and majority rule (unless it is the less advantaged region in a majority system that increases its expected economic union gains), and lower legislative power under unanimity rule.²⁴ (ii) Lower political distinctiveness between the regions always translates into higher centralization.

Higher expected benefits from joining a union predict more centralized federal systems. Majority regimes present an exception to this rule since a rise in the expected benefits of the economically less advantaged region translates into lower centralization. Intuitively, this region has a legislative majority, and it is willing to give up some power in exchange for more centralization. This deal, however, is not feasible under majority rule, and the regions opt for a constitution with less centralization that reduces the political cost of the region with a legislative minority. We also find that lower cultural and political distinctiveness between the

²² For instance, if $\bar{g}_k > 2\bar{g}_l$, the constitution where region k holds a majority and β is too low is not efficient. Note that both regions improve in another constitution where region l holds a majority and where β is higher; region l eliminates its political cost and region k , which has more than twice the variable economic benefits of its partner region, benefits from a higher level of centralization (even when supporting higher political cost). A symmetric statement provides the set of efficient constitutions when $\bar{g}_k \leq \bar{g}_l$.

²³ Besides, Bolton and Roland (1997) assume that the regional median decides whether to maintain or exit the union. Instead, we consider that as long as the union produces utility gains, there are no incentives to leave the union (no matter how these gains are distributed across the population).

²⁴ In majority systems, it is generally the case that the division of legislative power remains the same when expected economic union gains vary. There is an exception to this rule when the more advantaged region becomes the less advantaged, in which case, the whole legislative power is assigned to the new less advantaged region.

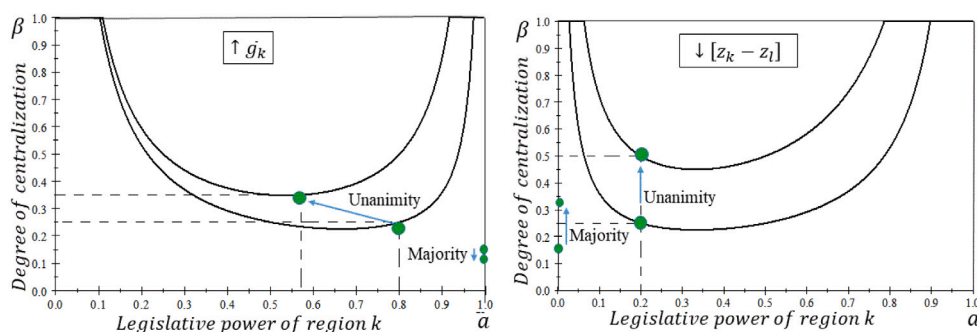


Fig. 5. The Weighed Nash Solution under unanimity and majority when (i) the expected variable union gains increase for the region in economic disadvantage (left panel) and (ii) the regions reduce their political distinctiveness (right panel).

regions implies that the regions will reduce the political cost associated with their union and accept higher levels of centralization. Hence, there is more convergence between the policies enacted by each member region. Finally, we find a new trade-off by which the region that increases its expected economic benefits, is willing to reduce its legislative power in exchange for more centralization. Such a trade-off is not feasible in majoritarian regimes unless the less advantaged region becomes the more advantaged.

Under unanimity rule, the Constitutional Contract Curve moves upwards when the variable union gains of a region increase. The left panel in Fig. 5 shows an initial situation where $\bar{g}_k = .1$ and $\bar{g}_l = .4$, and a final one where $\bar{g}_k = .3$ and \bar{g}_l does not change. In both cases, region l is the economically more advantaged region in the union. The selected points in the Constitutional Contract Curve are the Weighted Nash Solutions. We observe how the division of legislative power becomes more equitable, and the two regions agree on a higher level of centralization. Under majority rule, instead, for the same shift in variable benefits, the division of legislative power remains the same, and the level of centralization slightly moves down (as illustrated in the left panel of Fig. 5). Finally, the right panel of Fig. 5 shows the consequences of reducing the political and cultural distance between the regions. Both decision rules, unanimity and majority, produce a new equilibrium with a higher degree of centralization and no change in their division of legislative power.

4. Comparing unanimity and majority rule

This section compares the two legislative scenarios, unanimity and majority in terms of efficiency and stability or durability of the produced union.²⁵

Analysis of efficiency

In every comparison between unanimity and majority described in Fig. 5, we observe how the level of centralization is higher under unanimity rule. The following result explores the extent to which this is a general result and compares the two equilibria in terms of efficiency.

Proposition 4. For every given variable benefits \bar{g}_k and \bar{g}_l , and most preferred regional laws z_k and z_l , the level of centralization under unanimity is above the one under majority, i.e., $\beta^U > \beta^M$. Besides, both regions obtain higher expected utility under unanimity rule.

Interestingly, we find that, ceteris paribus, unanimity when compared to majority produces more centralization. Intuitively, a more equitable division of legislative power in the case of unanimity rule reduces the political cost of the regions and enables higher centralization. As a side effect, we show that majority rule produces efficiency losses when compared to unanimity or, in other words, the equilibrium under unanimity Pareto dominates the one under majority rule. On the one hand, this result is not surprising since unanimity implies that the legislative power splits among the member regions, and this additional negotiation tool provides a more profitable deal. On the other hand, we expected the member region with a legislative majority to obtain higher utility under majority than under unanimity. We find, to the contrary, that such a region needs to compensate its partner region, and eventually, it achieves lower utility. We conclude that unanimity systems, rather than majority systems, better exploit the potential benefits of forming a federal union.

In both scenarios, we find that the possibility of vetoing the national law or seceding does not translate into high levels of centralization. The reason being that regions try to avoid the possibility of veto or secession by their partner by setting a low level of centralization.²⁶

²⁵ There is a related literature that studies the desirability of the legislative decision rules from different perspectives. Aghion et al. (2004) propose that behind the veil of ignorance, individuals select the majority required to pass legislation. Barberá and Jackson (2006) analyze constitutional decision rules that once approved, the society will not vote to change it.

²⁶ Unilateral insurances associated with the possibility of veto or secession incentivize risky decisions (as predicted by the gambling for resurrection theory). When forming a union, however, the incentives to make risky decisions are counterbalanced by the veto or secession of its partner region.

Analysis of stability

A final comparative static concerns the union itself, and its durability. We propose a concept of stability based on the resilience of a union to adverse economic shocks and analyze whether unanimity or majority rule systems are more prone to dissolve in response to negative economic shocks.

According to the expected utility in Expression (5), the regions maintain the union when $F_j + \beta g_j \geq (z_j^l(\beta, a) - z_j)^2$; otherwise, a region opts out. There can be cases where the realization of economic benefits that a region obtains with the union are below expectation and does not compensate for the political cost of joining heterogeneous units. In this situation, the federal union breaks up.

Let ε be the magnitude of a negative economic shock that equally affects both regions, where ε is distributed (ex-ante) according to a continuous distribution function. We can express the realization of the union gains as a function of ε and the mean value \bar{g}_j so that $\hat{g}_j = \bar{g}_j - \varepsilon$. For every acceptable constitutional arrangement (β, a) , we define a threshold shock $\bar{\varepsilon}_j > 0$ below which region j maintains the union and above, region j finds it better to exit.²⁷ This threshold is expressed as a function of (β, a) , and it is implicitly defined by

$$F_j + \beta(\bar{g}_j - \bar{\varepsilon}_j) - \beta^2(1 - a_j)^2(z_k - z_l)^2 = 0. \tag{8}$$

Note how the higher $\bar{\varepsilon}_j$, the less likely it is that the region secedes. Thus, a union is more resilient to secession when the constitutional arrangement accepted by the regions provides high $\bar{\varepsilon}_j$ values for the two member regions.

The following result compares the resilience of unanimity and majority rule systems to adverse economic shocks. We assume equal fixed union benefits for the regions $F_k = F_l$, and we refer to $z = z_k - z_l$ as the political distinctiveness between the regions.²⁸

Proposition 5. *Let region k be the region with higher expected economic gains, i.e., $\bar{g}_k \geq \bar{g}_l$, and let $\delta = \frac{\bar{g}_l \bar{g}_k^2}{2(2\bar{g}_l + \bar{g}_k)}$. Then,*

- if $F_k z^2 > \delta$ majority is more stable than unanimity, and*
- if $F_k z^2 < \delta$ unanimity is more stable than majority.*

Besides, under majority rule, the region with higher expected variable benefits is more exposed to a shock and thus more likely to leave the union an, under unanimity rule, both regions are equally likely to exit.

The main implication of this proposition is that no system outperforms the other in terms of stability. There is a threshold above which majority rule systems are more resilient to economic shocks, and below which unanimity rule systems are more resilient. That threshold depends on the fixed benefits, F_k and the political distance between the regions, z , in relation to the magnitude of the expected variable economic gains.

Two different separate forces make unanimity and majority rule systems vulnerable to dissolution. Unanimity rule systems are susceptible to the fact that their economy is highly integrated and responsive to adverse economic shocks. Unanimity produces higher centralization, and, in equilibrium, every decrease in variable benefits g_k has a higher impact on the level of economic growth that the union attains. Majority rule systems are susceptible to the departure of the less powerful regional partner. Unlike unanimity, majority systems have an unequal division of legislative power, with one of the two regions bearing all the political costs. The unequal division of power places a bigger burden on the less powerful region, making it more likely to leave. Whether majority or unanimity is more stable depends on which of these two effects is stronger. Proposition 5 suggests the following:

First, under majority rule, if both the fixed benefits of the union and the political distinctiveness between the regions are high, the member region that bears all the political cost will not opt-out. In this case, decreases in g_k have a low impact on the benefits of region k due to the low level of centralization. Because the fixed benefits are very high, the overall economy provides sufficient buffer against secession. Majority systems, in this scenario, produce more stable unions.

Second, if the fixed economic benefits are small and political distinctiveness is low, the member region that bears all of the political cost under majority rule may have an incentive to opt-out. In such a system, there will be relatively high levels of centralization because of the low political distinctiveness of the two regions. Large, negative realizations of g_k will, then, have a high impact on the utility of the less powerful region, making this region likely to leave. Under these circumstances, unanimity produces more stability.

Finally, under majority rule, the region with the higher expected variable benefits, region k , is more exposed to negative economic shocks and more likely to leave, even when $F_k > F_l$, as we show in the Appendix. The reason is that this region compensates its partner with legislative power and, as a result, it eventually derives lower utility. Regarding unanimity, both partner regions possess equal incentives to leave the union when $F_k = F_l$. However, as we show in the Appendix, if $F_k > F_l$, this region l has more incentives to secede, while $F_k < F_l$ implies that this region k that has more incentives to exit. Thus, under unanimity rule, the partner obtaining lower fixed benefits is the one that has more incentives to opt-out. Under majority rule, it is the region that expects higher variable gains that has additional incentives to dissolve the union.

²⁷ We could generalize our result by assuming that the economic shocks do not equally affect the regions and, for instance, $\varepsilon_k = t\varepsilon_l$ where $t > 0$.

²⁸ We show in the Appendix that the main insights to our result are valid for the case where $F_k \neq F_l$.

5. Some illustrative examples

In this section, we discuss two illustrative real-world examples. First, the historical context that gave rise to the merger of Scotland and Great Britain exemplifies the legislative arrangements made in order to maintain such a union and the effects of economic shocks in the durability of unions. Second, the EU, especially in contrast to the US, provides an important contemporary case in which to consider the predictions of our model concerning the political arrangements that make for more resilient unions.

Scotland and the United Kingdom

Scotland provides an exemplary case of the formation of a union. Scotland formed its political union with England in 1707. Scotland and England had a dual monarchy until then, and sometimes the Scottish King was the King of England, as was the case with William I and II. The complete political union of the two nations followed the catastrophic famines, caused by unusually cold weather, in the 1690s that gripped northern Europe, from Estonia to Scotland. Scotland lost an estimated 10 to 15 percent of its population at this time. Although the Scots had a distinct language and culture, Scotland was increasingly dependent on the much stronger English economy for trade. The English Navigation Acts limited Scotland's shipping, and the relatively small Royal Scots Navy had no capacity to respond.

The precipitating event to form a political union with England was the failure of efforts to establish colonies in the New World, especially in the Isthmus of Panama. To bolster its sagging economy, the Scottish leaders hoped to follow the Dutch and English models of colonization and trade. Opposition to this from England forced Scotland to raise capital for the venture, called the Darien Scheme, internally and from elsewhere in Europe. When the enterprise failed in 1699, approximately 20 percent of the Scottish wealth was lost. The resulting debt crisis deepened the economic disaster unfolding in Scotland. The Scottish nobles saw that their best chance to partake in the global economic expansion lay in being part of majority power, namely England (Young, 2007).

The Acts of Union merged the Parliaments of England and Scotland into a single parliament, bringing the two nations together as Great Britain. England was by far the more powerful economic and military partner in the arrangement, and it had a far larger population. The political merger with England ended the Scots debt crisis. The Acts were carefully negotiated to find the right balance of local autonomy. The Scots maintained control of their education system, legal system, and municipal governments and the establishment of the Church of Scotland (Keating, 1998; Whatley, 2014). Finally, the Acts set the number of Scottish seats in the Parliament at 45 (about 8 percent of MPs). In line with our model, Scotland had more to gain with the union, which justifies that the legislative majority in the Westminster Parliament remained for England. Besides, cultural disparities between Scottish and English translated into a low level of centralization. As predicted in Proposition 5, the Scottish that had more to win with the union have shown more incentives to exit.

Recent attempts to gain full independence of Scotland failed in a 2014 referendum, in which the No vote prevailed, 55 percent to 45 percent. One of the chief arguments against independence was the economic cost of isolation of Scotland within Europe were it to leave the UK, when a member of the EU. The UK's exit from the EU has renewed the movement in Scotland to break with the UK. This is completely consistent with our analysis. We can interpret that the Brexit reduces the fixed benefits of Scotland, represented by F_j in the model, and it diminishes the magnitude of the economic shock, ε_j , for which Scotland has incentives to move out.²⁹ Thus, the union has become less stable.

The US and the EU

One of the most significant political questions of the world today is the state and health of the two great unions, the European Union and the United States, especially in the wake of Brexit. The EU and the US are both highly decentralized unions consisting of many autonomous political entities — countries in the EU and states in the US. The model developed in this paper offers new insights into the resilience of these two federated systems.

The European Union evolved out of a series of international agreements following World War II, most importantly the Treaty of Rome, which called for an "ever closer union". Moravcsik (2005) criticizes the aspirations for a complete union or integration of Europe that was expressed by early advocates for a European Union, especially in Ernest Haas' 1958 classic *The Uniting of Europe*. The goal of complete integration, critics argued, ignores differing national preferences, the dynamics of interstate negotiations, and the delegation necessary to create credible commitments. Today, the EU's process of integration is a work in progress and there is an increasing number of policy areas transferred to the union, such as agriculture, monetary policy and trade.³⁰

The language of Haas and other early optimists about Europe, of course, echoes much of the language and idealism of the American founding. The preamble of the US Constitution begins "We the people of the United States, in order to form a more perfect union . . .", but, wary of the economic and cultural differences among the states, especially between the mercantilist northern states and agrarian southern states with slave economies, the American constitutional convention chose to create a system that allowed states to maintain their own powers of taxation and regulation. The US system further provided for majority rule within the legislature, but a mixed system of representation of people in the lower chamber and states in the upper chamber and the Electoral College, which chooses the president.

Each of these unions, which brought together disparate economies and cultures, opted for decentralized federalism, in which member states retained their authority over fiscal, regulatory, and cultural laws. Economies of scale of these two unions promise high

²⁹ This effect is analytically captured in Expression (17).

³⁰ In addition, there is increasing integration in fiscal policy. The European Monetary Union (that incorporates all EU members except for Denmark) imposes government deficits and debts to be less than 3 percent of GDP and less than 60 percent of GDP, respectively.

economic potential, but these nations have very heterogeneous cultures. Recent studies by [Alesina et al. \(2017\)](#) reveal that cultural diversity across EU member nations is similar in magnitude to that across the states of the US. Each of these unions represents around 16 percent of the world GDP.³¹ Many EU analysts consider it to be a consensus system ([Slapin, 2011](#)), while observers of US politics view the US as having a qualified majority rule. These features of the EU and US, under our model, carry clear implications about the economic prospects and resilience of these unions.

First, the consensus-based decision-rule used by key European institutions (such as the Council or the European Commission) may eventually lead to higher centralization.³² Consensus-based decision rules, our model suggests, result in legislative decisions that balance the division of the political costs among the member states of a union and translate into higher centralization. By contrast, according to our model, the heavy reliance on majority rule in the US Congress acts as a brake on higher centralization. Consequently, the EU may be in a better position to enjoy the benefits of the public good resulting from its union than the US has.

Second, the norm of unanimity in the European Council makes the EU more exposed to the risk of secession than the US.³³ Our results from [Proposition 5](#) speak to this contrast between the systems. Intuitively, high political heterogeneity limits the degree of centralization that is possible, especially under majority rule. Consequently, member states in a political system such as the US are more insulated from the central government's policies in the event of adverse economic shocks. The states in America get less of an upside benefit, but also have less downside risk. By contrast, increasing integration of the EU and the decision-making by unanimity makes central policy more rigid and less able to allow member states to adapt to economic shocks. As a result, member nations may, more likely, leave the EU in response to a shock than they would leave an even more decentralized union, such as the US. That, of course, is what happened with Brexit. Local economic shocks from trade, especially from China, hit the UK. This movement crystallized into a referendum to leave the EU ([Colantone and Stanig, 2018](#)). The United Kingdom, which joined the EU in 1973 after years of objections from France, voted to exit in 2016. That separation, at last, occurred on December 31, 2020.

Within the boundaries of our model, a practical policy implication derived from our analysis is that to make the EU better able to absorb economic shocks, the European Council should rely more on majority rule in making decisions rather than unanimity.

6. Conclusion

This paper studies a bargaining scenario with heterogeneous regions negotiating a common constitution. We use the Weighted Nash Bargaining Solution to provide an equilibrium prediction on the division of power in the union as a function of the distinctive economic benefits and cultural costs of joining a union. In our model, each region's bargaining power is inversely proportional to the expected benefits that the region receives from forming a union. We use this framework of nation-building to compare the consequences of opting for two distinct aspects of democratic government: the type of legislative decision rule (majority or consensus)³⁴ and the central government's power over the member states (centralized or decentralized). These two aspects of democratic governance of federal societies have clear implications for the overall economic growth and the durability of the system of government. And, as we show, the choice of legislative decision rule and degree of centralization are integrally linked.

We derive several implications that are open to empirical scrutiny:

First, more centralized regimes emerge when the political distinctiveness among regions is low and, generally, when the economic benefits derived from the union are high. Our result generalizes previous findings by [Bolton and Roland \(1997\)](#) and [Flamand \(2019\)](#). Intuitively, homogeneous societies reduce the political cost of the union and enable more centralized regimes. Similarly, union members obtaining more economic benefits demand more centralization.

Second, consensus-based democracies create more centralized regimes than majority-based democracies do. The intuition behind this result is that majority decision rules produce a high political cost to those member regions of the minority coalition. Anticipating this cost, constitutional bargainers opt for a more decentralized regime, which materializes on a lower transfer of powers to the central government.

Third, democracies that rely on consensus rather than simple majority rule are more efficient, i.e., every member region obtains higher utility. This argument links to the previous one; reaching decisions by consensus permits a balanced division of legislative power in conjunction with a highly centralized system that better exploits the economic benefits of the union.

Fourth, neither unanimity nor majority democracies outperform the other in terms of stability against the risk of dissolution. A region in a minority coalition has fewer incentives to exit a union when adverse economic shocks have little impact on the overall benefits of this region. Such a situation occurs when both fixed union benefits and political distinctiveness between member regions are high. Thus, high fixed union benefits and high cultural or political distinctiveness work as complements to guarantee that majority democracy is more stable. Otherwise, the regions in a minority bearing high political cost will propose exiting when exposed to unexpectedly low economic realizations of the benefits derived from the union. Unanimity is then more stable.

Our results reveal that unanimity and majority democracies present a trade-off; when a central planner seeks efficiency, consensus democracy is the best choice yet, majority democracy is superior when seeking stability if political heterogeneity and scale economies are high. Cultural diversity across EU members and the states of the US is similar ([Alesina et al., 2017](#)) along with their alike high

³¹ The data on GDP shares refer to 2017 and are published by the Global Office of the International Comparison Program (ICP) at the World Bank.

³² The European Council is in charge of dictating the directions and priorities of the EU, and the European Commission makes law proposals. Other EU institutions with lower competencies as the European Parliament and the Council, work under qualified majority.

³³ See, for example, [Baerg and Hallerberg \(2016\)](#).

³⁴ We treat consensus, which describes the process of deliberation, as unanimity, which is a formal voting rule. We interpret that no region member expresses objection or veto when reaching decisions by deliberation.

shares in the world GDP provide the conditions for a neat comparison of these unions in terms of our results. Our model suggests that the EU is called to produce a more centralized policy-making when compared to the US. The EU’s member nations will obtain higher benefits, but the EU is more exposed to the risk of secession.

Our analysis points to several directions for future research. Unanimity and majority rule are two extremes of a continuum of qualified majority rules. Bicameralism and other complex political processes provide a natural extension of the model. These procedures make it more difficult to pass laws and require something more than a simple majority to make a decision. The implication is that complexity in national law-making is akin to consensus decision rules and, thus, may actually enhance the efficiency of the political economy of federal systems. Another direction to explore is the cost of the exit option. For example, if a country’s option is to be isolated in the international arena if it leaves a union, then the costs are much higher than if it can readily move into another union or establish a set of alliances with other nations. Then, competition between supranational unions is a promising research area that we leave for future research.³⁵ Finally, there are distinct scenarios, such as firm mergers or marriages, where divisions of power may determine a union’s efficiency or stability and where our stylized model can provide further clarity.

Our contribution presents a new lens to disentangle the link between legislative procedures and degrees of integration in federal democratic regimes. Unexpectedly, we find that consensus-based democracies, in comparison to majority democracies, produce federal systems that are more centralized and more efficient. However, neither unanimity nor majority legislative systems outperform the other in providing more stability to the union.

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Appendix. Proofs

Lemma 1. Under unanimity rule, the Constitutional Contract Curve is defined by

$$\beta^*(a) = \begin{cases} \frac{a_k \bar{g}_k + a_l \bar{g}_l}{2(z_k - z_l)^2 a_k a_l} & \text{if } a_k \bar{g}_k + a_l \bar{g}_l < 2(z_k - z_l)^2 a_k a_l \\ 1 & \text{otherwise} \end{cases} \tag{9}$$

Proof of Lemma 1. Given some fixed utility level u , the set of Pareto efficient arrangements solves the following problem

$$\begin{aligned} \text{Max}_{\beta \in [0,1], a \in [0,1]} & E[u_l(\beta, a)] \\ \text{s.t.} & E[u_k(\beta, a)] \geq u, \end{aligned} \tag{10}$$

where $L = E[u_l(\beta, a)] - \mu [E[u_k(\beta, a)] - u]$ is the Lagrangian function. The first order condition defines the optimal interior values (a, β, μ) satisfying:

$$\begin{aligned} \frac{\partial L}{\partial a} &= -a - \mu(1 - a) = 0 \Leftrightarrow \mu = \frac{-a}{1-a} \\ \frac{\partial L}{\partial \beta} &= \bar{g}_l - 2\beta a^2(z_k - z_l)^2 - \mu[\bar{g}_k - 2\beta(1 - a)^2(z_k - z_l)^2] = 0. \end{aligned}$$

Substituting the first condition into the second, we deduce Expression (9).

The second order condition requires the determinant of the bordered Hessian being positive:

$$H = -(L_{aa}(h_\beta)^2 - 2L_{a\beta}g_a g_\beta + L_{\beta\beta}(h_a)^2),$$

where $h = E[u_k(\beta, a)] - u$ is the constraint function. The following derivatives prove that $H > 0$: $L_{aa} = 2\beta^2(z_k - z_l)^2(\mu - 1) < 0$, $L_{\beta\beta} = -2a^2(z_k - z_l)^2 + \mu 2(1 - a)^2(z_k - z_l)^2 < 0$, $L_{a\beta} = -4\beta a(z_k - z_l)^2 - \mu 4\beta(1 - a)(z_k - z_l)^2 = 0$. ■

Proof of Proposition 1. The Weighted Nash Bargaining solution provides the maximal argument (β, a) to the problem

$$\text{Max}_{\beta \in [0,1], a \in [0,1]} (E[u_k(\beta, a)] - (Y_k^0 + F_k))^a (E[u_l(\beta, a)] - (Y_l^0 + F_l))^{1-a}. \tag{11}$$

³⁵ For example, our model assumes that exiting a federal union implies closing the access to the common public goods and scale economies provided in conjunction. However, this is not the case for former Soviet Republics such as Estonia, Latvia, and Lithuania that joined the EU.

Simplifying the objective function and substituting the Contract Curve $\beta = \beta^*(a)$ yields

$$\text{Max}_{a \in [0,1]} \underbrace{(\beta^*(a)\bar{g}_k - \beta^*(a)^2(1-a)^2(z_k - z_l)^2)^\alpha}_{v_k} \underbrace{(\beta^*(a)\bar{g}_l - \beta^*(a)^2 a^2(z_k - z_l)^2)^{1-\alpha}}_{v_l}. \tag{12}$$

Solving for the first order condition,

$$\alpha \frac{\partial v_k}{\partial a} \frac{1}{v_k} + (1-\alpha) \frac{\partial v_l}{\partial a} \frac{1}{v_l} = 0 \iff \frac{\frac{\partial v_k}{\partial a}}{\frac{\partial v_l}{\partial a}} = -\frac{(1-\alpha)v_k}{\alpha v_l} \tag{13}$$

from where, substituting $\alpha = \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k} = \frac{1}{1 + \frac{\bar{g}_k}{\bar{g}_l}}$ (and therefore $1 - \alpha = \frac{\bar{g}_k}{\bar{g}_l + \bar{g}_k}$) yields³⁶ $a^U = \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k}$. The corresponding level of centralization is deduced from Expression (9), $\beta^U = \beta^*(\frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k}) = \frac{\frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k} \bar{g}_k + \frac{\bar{g}_k}{\bar{g}_l + \bar{g}_k} \bar{g}_l}{2(z_k - z_l)^2} = \frac{\bar{g}_l + \bar{g}_k}{2(z_k - z_l)^2}$ and $\beta^U = 1$ when $\bar{g}_l + \bar{g}_k > (z_k - z_l)^2$. Finally, calculating the expected utility

$$E[u_k(\beta^U, a^U)] = Y_k^0 + F_k + (\frac{\bar{g}_l + \bar{g}_k}{(z_k - z_l)^2}) \bar{g}_k - (\frac{\bar{g}_l + \bar{g}_k}{(z_k - z_l)^2})^2 (\frac{\bar{g}_k}{\bar{g}_l + \bar{g}_k})^2 (z_k - z_l)^2$$

$$E[u_l(\beta^U, a^U)] = Y_l^0 + F_l + (\frac{\bar{g}_l + \bar{g}_k}{(z_k - z_l)^2}) \bar{g}_l - (\frac{\bar{g}_l + \bar{g}_k}{(z_k - z_l)^2})^2 (\frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k})^2 (z_k - z_l)^2,$$

and simplifying, $E[u_j(\beta^U, a^U)] = Y_j^0 + F_j + \frac{\bar{g}_l \bar{g}_k}{(z_k - z_l)^2}$ for $j = l$ and $j = k$. This completes the proof. ■

Lemma 2. Under majority rule and provided that $\bar{g}_k \geq \bar{g}_l$, the set of efficient constitutions is defined by³⁷

$$a = 0 \text{ with } \begin{cases} \beta \in \left[\frac{\bar{g}_k}{2(z_k - z_l)^2}, 1 \right] & \text{if } \bar{g}_k < 2(z_k - z_l)^2 \\ \beta = 1 & \text{otherwise} \end{cases} \text{ and}$$

$$a = 1 \text{ with } \begin{cases} \beta \in \left[\frac{\bar{g}_l}{2(z_k - z_l)^2}, 1 \right] & \text{if } \bar{g}_k \leq 2\bar{g}_l \text{ and } \bar{g}_l < 2(z_k - z_l)^2 \\ \beta \in \left[\frac{\bar{g}_k}{4(z_k - z_l)^2}, 1 \right] & \text{if } \bar{g}_k > 2\bar{g}_l \text{ and } \bar{g}_k < 4(z_k - z_l)^2 \\ \beta = 1 & \text{otherwise} \end{cases} .$$

Proof of Lemma 2. When $a = 0$, the economic benefits of region l (over fixed benefits) are equal to $\beta \bar{g}_l$, which is strictly increasing in β . The benefits of region k are equal to $\beta \bar{g}_k - \beta^2(z_k - z_l)^2$ and thus, strictly increasing in β up to $\beta = \frac{\bar{g}_k}{2(z_k - z_l)^2}$ and decreasing afterwards. Hence, when $a = 0$, the two regions improve increasing β up to $\beta = \frac{\bar{g}_k}{2(z_k - z_l)^2}$. For $a = 0$ together with every $\beta \in \left[\frac{\bar{g}_k}{2(z_k - z_l)^2}, 1 \right]$ to be efficient, the two regions cannot improve by transferring the power to region k , i.e., shifting to $a = 1$ together with a level of centralization β' . The minimal benefits of region l when $a = 0$ are equal to $\frac{\bar{g}_l \bar{g}_k}{2(z_k - z_l)^2}$, and when shifting to $a = 1$, the benefits are $\beta' \bar{g}_l - \beta'^2(z_k - z_l)^2$, where $\beta' = \frac{\bar{g}_l}{2(z_k - z_l)^2}$ is the maximum and yields maximal benefits equal to $\frac{\bar{g}_l^2}{4(z_k - z_l)^2}$. Comparing the benefits we deduce that $\frac{\bar{g}_l \bar{g}_k}{2(z_k - z_l)^2} \geq \frac{\bar{g}_l^2}{4(z_k - z_l)^2}$ always satisfies when $\bar{g}_k \geq \bar{g}_l$. This proves that every combination $a = 0$ and $\beta \in \left[\frac{\bar{g}_k}{2(z_k - z_l)^2}, 1 \right]$ is efficient when $\bar{g}_k < 2(z_k - z_l)^2$, otherwise, $a = 0$ and $\beta = 1$ is efficient.

When $a = 1$, the economic benefits of region k are equal to $\beta \bar{g}_k$, which is strictly increasing in β and, regarding the benefits of region l , $\beta \bar{g}_l - \beta^2(z_k - z_l)^2$, these are strictly increasing in β up to $\beta = \frac{\bar{g}_l}{2(z_k - z_l)^2}$ and decreasing afterwards. Thus, when $a = 1$, the two regions improve increasing β up to $\beta = \frac{\bar{g}_l}{2(z_k - z_l)^2}$. For $a = 1$ together with every $\beta \in \left[\frac{\bar{g}_l}{2(z_k - z_l)^2}, 1 \right]$ to be efficient, the two regions cannot improve by transferring the power to region l , i.e., shifting to $a = 0$ together with a level of centralization β' . The minimal benefits of region k when $a = 1$ are equal to $\frac{\bar{g}_k \bar{g}_l}{2(z_k - z_l)^2}$ and when shifting to $a = 0$, the benefits are $\beta' \bar{g}_k - \beta'^2(z_k - z_l)^2$, where $\beta' = \frac{\bar{g}_k}{2(z_k - z_l)^2}$ is the maximum and yields maximal benefits equal to $\frac{\bar{g}_k^2}{4(z_k - z_l)^2}$. When $\frac{\bar{g}_k^2}{4(z_k - z_l)^2} \leq \frac{\bar{g}_k \bar{g}_l}{2(z_k - z_l)^2}$ ($\iff \bar{g}_k \leq 2\bar{g}_l$), every combination $a = 1$ with $\beta \in \left[\frac{\bar{g}_l}{2(z_k - z_l)^2}, 1 \right]$ is efficient. When $\frac{\bar{g}_k^2}{4(z_k - z_l)^2} > \frac{\bar{g}_k \bar{g}_l}{2(z_k - z_l)^2}$ ($\iff \bar{g}_k > 2\bar{g}_l$), we show that there are arrangements with $a = 1$ that are efficient provided that the benefits for the regions do not improve when shifting to $a = 0$; region l can always improve when $a = 0$, however, region k does not improve when $\beta' \bar{g}_k \geq \frac{\bar{g}_k^2}{4(z_k - z_l)^2}$ which implies $\beta' \geq \frac{\bar{g}_k}{4(z_k - z_l)^2}$. Thus, when $\bar{g}_k > 2\bar{g}_l$, those combinations $a = 1$ with $\beta \in \left[\frac{\bar{g}_k}{4(z_k - z_l)^2}, 1 \right]$ are efficient. Finally, when either $\frac{\bar{g}_l}{2(z_k - z_l)^2} \geq 1$ or $\frac{\bar{g}_k}{4(z_k - z_l)^2} \geq 1$, only the value of $\beta = 1$ together with $a = 1$ is efficient and this completes the proof. ■

³⁶ For every $\alpha \in [0, 1]$, the first order condition yields

$$\alpha = \frac{2a + a^2 \bar{g} + a \bar{g} - a^2 - 1}{-a + a \bar{g} + 1}$$

where $\alpha = 1$ implies $a = \frac{(\bar{g}+1)^{1/2}-3}{2(\bar{g}-1)}$ and $\alpha = 0$ implies $a = \frac{(\bar{g}(\bar{g}+8))^{1/2}-\bar{g}-2}{2(\bar{g}-1)}$. Since $\frac{\partial \alpha}{\partial a} = \frac{a^2-4a+8}{a^2-4a+4} > 1$ for all a , no other α provides another fixed point.

³⁷ The result for the case where $\bar{g}_k \leq \bar{g}_l$ is symmetric.

Proof of Proposition 2. We solve problem (11) for the case of majority rule. Simplifying the objective function

$$\text{Max}_{\beta \in [0,1], a \in \{0,1\}} \underbrace{(\beta \bar{g}_k - \beta^2(1-a)^2(z_k - z_l)^2)}_{v_k} \underbrace{(\beta \bar{g}_l - \beta^2 a^2(z_k - z_l)^2)}_{v_l}^{1-\alpha}.$$

First, we obtain the value $\beta \in [0, 1]$ maximizing the objective function in the two cases, when $a = 0$ and $a = 1$. Second, we substitute the optimal β in the objective function and compare which value, $a = 0$ or $a = 1$, provides a maximum. Substituting $a = 0$ and $a = 1$ respectively yields

$$\text{Max}_{\beta \in [0,1]} \underbrace{(\beta \bar{g}_k - \beta^2(z_k - z_l)^2)}_{v_k} \underbrace{(\beta \bar{g}_l)}_{v_l}^{1-\alpha} \quad \text{Max}_{\beta \in [0,1]} \underbrace{(\beta \bar{g}_k)}_{v_k} \underbrace{(\beta \bar{g}_l - \beta^2(z_k - z_l)^2)}_{v_l}^{1-\alpha}.$$

For the two cases, the first order condition yields

$$a \frac{\partial v_k}{\partial \beta} \frac{1}{v_k} + (1 - \alpha) \frac{\partial v_l}{\partial \beta} \frac{1}{v_l} = 0 \iff \frac{\frac{\partial v_k}{\partial \beta}}{\frac{\partial v_l}{\partial \beta}} = - \frac{(1 - \alpha)v_k}{\alpha v_l}. \tag{14}$$

Substituting $\frac{\partial v_k}{\partial \beta} = \bar{g}_k - 2\beta(z_k - z_l)^2$, $\frac{\partial v_l}{\partial \beta} = \bar{g}_l$ when $a = 0$ and $\frac{\partial v_k}{\partial \beta} = \bar{g}_k$, $\frac{\partial v_l}{\partial \beta} = \bar{g}_l - 2\beta(z_k - z_l)^2$ when $a = 1$ together with $\frac{1-\alpha}{\alpha} = \frac{\bar{g}_k}{\bar{g}_l}$, we deduce that

$$\frac{\bar{g}_k - 2\beta(z_k - z_l)^2}{\bar{g}_l} = - \frac{\bar{g}_k(\beta \bar{g}_k - \beta^2(z_k - z_l)^2)}{\beta \bar{g}_l^2} \text{ when } a = 0,$$

$$\frac{\bar{g}_k}{\bar{g}_l - 2\beta(z_k - z_l)^2} = - \frac{\bar{g}_k^2 \beta}{\bar{g}_l(\beta \bar{g}_l - \beta^2(z_k - z_l)^2)} \text{ when } a = 1.$$

Solving for β we obtain

$$\beta = \frac{\bar{g}_k(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(\bar{g}_k + 2\bar{g}_l)} \text{ when } a = 0 \text{ and } \beta = \frac{\bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(2\bar{g}_k + \bar{g}_l)} \text{ when } a = 1.$$

Only when the above value β is above 1, the solution is $\beta = 1$.

Substituting in v_k and v_l we deduce that

$$v_k|_{a=0} = \frac{\bar{g}_k^2 \bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(\bar{g}_k + 2\bar{g}_l)^2}, \quad v_l|_{a=0} = \frac{\bar{g}_k \bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(\bar{g}_k + 2\bar{g}_l)}$$

$$v_k|_{a=1} = \frac{\bar{g}_k \bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(2\bar{g}_k + \bar{g}_l)}, \quad v_l|_{a=1} = \frac{\bar{g}_l^2 \bar{g}_k(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(2\bar{g}_k + \bar{g}_l)^2}.$$

From where, the maximum value of the objective function calculated when $a = 0$ and $a = 1$ are

$$U_k \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k} \left. v_l \right|_{a=0} \frac{\bar{g}_k}{\bar{g}_l + \bar{g}_k} = \left[\frac{\bar{g}_k^2 \bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(\bar{g}_k + 2\bar{g}_l)^2} \right] \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k} \left[\frac{\bar{g}_k \bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(\bar{g}_k + 2\bar{g}_l)} \right] \frac{\bar{g}_k}{\bar{g}_l + \bar{g}_k} = A$$

$$U_k \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k} \left. v_l \right|_{a=1} \frac{\bar{g}_k}{\bar{g}_l + \bar{g}_k} = \left[\frac{\bar{g}_k \bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(2\bar{g}_k + \bar{g}_l)} \right] \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k} \left[\frac{\bar{g}_l^2 \bar{g}_k(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(2\bar{g}_k + \bar{g}_l)^2} \right] \frac{\bar{g}_k}{\bar{g}_l + \bar{g}_k} = B$$

where

$$A > B \iff \left[\frac{\bar{g}_k(2\bar{g}_k + \bar{g}_l)}{(\bar{g}_k + 2\bar{g}_l)^2} \right]^{\bar{g}_l} > \left[\frac{\bar{g}_l(2\bar{g}_l + \bar{g}_k)}{(2\bar{g}_k + \bar{g}_l)^2} \right]^{\bar{g}_k}$$

Consider w.l.g. that $\bar{g}_k > \bar{g}_l$ and, in particular, $\bar{g}_k = \lambda \bar{g}_l$ where $\lambda > 1$. Then,

$$A > B \iff \frac{\lambda(2\lambda+1)}{(\lambda+2)^2} > \left[\frac{\lambda+2}{(2\lambda+1)^2} \right]^\lambda \iff \lambda(2\lambda+1)^{2\lambda+1} > (\lambda+2)^{\lambda+2}.$$

Since $\lambda > 1$, then $2\lambda + 1 > \lambda + 2$ and we deduce that $A > B$. This implies that when $\bar{g}_k > \bar{g}_l$, the solution is $a^M = 0$ with $\beta^M = \frac{\bar{g}_k(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(\bar{g}_k + 2\bar{g}_l)}$ and when $\bar{g}_k < \bar{g}_l$, the solution is $a^M = 1$ with $\beta^M = \frac{\bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(2\bar{g}_k + \bar{g}_l)}$. In case that $\bar{g}_k = \bar{g}_l$, the solution is $\beta^M = \frac{2\bar{g}_k}{3(z_k - z_l)^2}$ and either $a^M = 0$ or $a^M = 1$. Finally, the expected utility for the regions over their respective reservation values ($Y_j^0 + F_j$) are

$$E[u_k] = \frac{\bar{g}_k^2 \bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(\bar{g}_k + 2\bar{g}_l)^2}, \quad E[u_l] = \frac{\bar{g}_k \bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(\bar{g}_k + 2\bar{g}_l)} \text{ when } a^M = 0$$

$$E[u_k] = \frac{\bar{g}_k \bar{g}_l(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(2\bar{g}_k + \bar{g}_l)}, \quad E[u_l] = \frac{\bar{g}_k \bar{g}_l^2(\bar{g}_k + \bar{g}_l)}{(z_k - z_l)^2(2\bar{g}_k + \bar{g}_l)^2} \text{ when } a^M = 1.$$

where $E[u_k] < E[u_l]$ if $a^M = 0$, and $E[u_k] > E[u_l]$ if $a^M = 1$. ■

Proof of Proposition 3. Regarding the expected union gains and for the case of unanimity, the results follow from the first derivatives, $\frac{\partial \beta^U}{\partial \bar{g}_l} > 0$ and $\frac{\partial \beta^U}{\partial \bar{g}_k} > 0$. Under majority, the results also follow from the first derivatives, when $\bar{g}_k > \bar{g}_l$, $\frac{\partial \beta^M}{\partial \bar{g}_k} > 0$ and $\frac{\partial \beta^M}{\partial \bar{g}_l} < 0$, and when $\bar{g}_k < \bar{g}_l$, $\frac{\partial \beta^M}{\partial \bar{g}_k} < 0$ and $\frac{\partial \beta^M}{\partial \bar{g}_l} > 0$. Regarding the legislative power, $\frac{\partial a^U}{\partial \bar{g}_k} < 0$, $\frac{\partial a^U}{\partial \bar{g}_l} > 0$, but note that $a^M = 0$ when $\bar{g}_k > \bar{g}_l$, while $a^M = 1$ when $\bar{g}_k < \bar{g}_l$. Finally, for both majority and unanimity, $\frac{\partial \beta}{\partial(z_k - z_l)} < 0$. ■

Proof of Proposition 4. Given $z_k, z_l, \bar{g}_k, \bar{g}_l$, let (β^U, a^U) and (β^M, a^M) be the equilibrium predictions under unanimity and majority respectively. Note that

$$\beta^M = \frac{\bar{g}_k}{\bar{g}_k + 2\bar{g}_l} \beta^U \text{ when } a_M = 0 \text{ and } \beta^M = \frac{\bar{g}_l}{2\bar{g}_k + \bar{g}_l} \beta^U \text{ when } a_M = 1.$$

Since $\frac{\bar{g}_k}{\bar{g}_k + 2\bar{g}_l} < 1$ and $\frac{\bar{g}_l}{2\bar{g}_k + \bar{g}_l} < 1$, we conclude that in every union, $\beta^M < \beta^U$. Regarding the utility for each region, let v_j^U and v_j^M be the additional utility (over the reservation value $Y_j^0 + F_j$) that each region $j \in \{k, l\}$ obtains in equilibrium under unanimity and majority respectively. Note that

$$v_k^M = v_k^U \frac{\bar{g}_k(\bar{g}_k + \bar{g}_l)}{(2\bar{g}_l + \bar{g}_k)^2}, v_l^M = v_l^U \frac{\bar{g}_k + \bar{g}_l}{2\bar{g}_l + \bar{g}_k} \text{ when } a^M = 0$$

$$\text{and } v_k^M = v_k^U \frac{\bar{g}_k + \bar{g}_l}{2\bar{g}_k + \bar{g}_l}, v_l^M = v_l^U \frac{\bar{g}_l(\bar{g}_k + \bar{g}_l)}{(2\bar{g}_k + \bar{g}_l)^2} \text{ when } a^M = 1.$$

Since $\frac{\bar{g}_k(\bar{g}_k + \bar{g}_l)}{(2\bar{g}_l + \bar{g}_k)^2} < 1$, $\frac{\bar{g}_k + \bar{g}_l}{\bar{g}_k + 2\bar{g}_l} < 1$, $\frac{\bar{g}_k + \bar{g}_l}{2\bar{g}_k + \bar{g}_l} < 1$ and $\frac{\bar{g}_l(\bar{g}_k + \bar{g}_l)}{(2\bar{g}_k + \bar{g}_l)^2} < 1$, we deduce that $v_j^M < v_j^U$ for $j \in \{k, l\}$ both when $a^M = 0$ and $a^M = 1$. ■

Proof of Proposition 5. We calculate the values $\bar{\epsilon}_j$ defined by Expression (8) that measure the magnitude of the negative economic shock for which the region opts-out, i.e.,

$$\bar{\epsilon}_j = \frac{F_j}{\beta} + \bar{g}_j - \beta(1 - a_j)^2 z^2,$$

where $z = z_k - z_l$ is the political distinctiveness between the regions. Notation $\bar{\epsilon}_j^U$ and $\bar{\epsilon}_j^M$ refers to unanimity and majority respectively. Consider unanimity and the obtained Weighted Nash Solution, solving for $\bar{\epsilon}_k^U$ yields,

$$\bar{\epsilon}_k^U = \frac{F_k z^2}{\bar{g}_l + \bar{g}_k} + \bar{g}_k - \frac{\bar{g}_l + \bar{g}_k}{z^2} (1 - \frac{\bar{g}_l}{\bar{g}_l + \bar{g}_k})^2 z^2 \iff \bar{\epsilon}_k^U = \frac{F_k z^2 + \bar{g}_l \bar{g}_k}{\bar{g}_l + \bar{g}_k}. \tag{15}$$

Similarly, for region l ,

$$\bar{\epsilon}_l^U = \frac{F_l z^2 + \bar{g}_l \bar{g}_k}{\bar{g}_l + \bar{g}_k}, \tag{16}$$

and where $F_l = F_k$ implies that $\bar{\epsilon}_k^U = \bar{\epsilon}_l^U$. For the case of majority, the equilibrium value (β, a) depends on whether $\bar{g}_k > \bar{g}_l$ or $\bar{g}_k < \bar{g}_l$. We consider, w.l.g., $\bar{g}_k > \bar{g}_l$ which implies that in the Weighted Nash Solution, $a = 0$. Solving for $\bar{\epsilon}_k^M$,

$$\bar{\epsilon}_k^M = \frac{F_k z^2 (\bar{g}_k + 2\bar{g}_l)}{\bar{g}_k(\bar{g}_l + \bar{g}_k)} + \bar{g}_k - \frac{\bar{g}_k(\bar{g}_l + \bar{g}_k)}{z^2(\bar{g}_k + 2\bar{g}_l)} z^2 \iff \bar{\epsilon}_k^M = \frac{F_k z^2 (\bar{g}_k + 2\bar{g}_l)}{\bar{g}_k(\bar{g}_l + \bar{g}_k)} + \frac{\bar{g}_l \bar{g}_k}{\bar{g}_k + 2\bar{g}_l}. \tag{17}$$

Solving for $\bar{\epsilon}_l^M$

$$\bar{\epsilon}_l^M = \frac{F_l z^2 (\bar{g}_k + 2\bar{g}_l)}{\bar{g}_k(\bar{g}_l + \bar{g}_k)} + \bar{g}_l. \tag{18}$$

For each region j , the higher $\bar{\epsilon}_j$, the less likely is to leave the union. First, we compare Expressions (16) and (18)

$$\bar{\epsilon}_l^M - \bar{\epsilon}_l^U = \frac{F_l z^2}{\bar{g}_l + \bar{g}_k} \frac{2\bar{g}_l}{\bar{g}_k} + \frac{\bar{g}_l \bar{g}_k}{\bar{g}_l + \bar{g}_k} \frac{\bar{g}_l}{\bar{g}_k} > 0,$$

thus, $\bar{\epsilon}_k^U = \bar{\epsilon}_l^U < \bar{\epsilon}_l^M$. Second, we compare expressions (15) and (17)

$$\bar{\epsilon}_k^M - \bar{\epsilon}_k^U = \frac{F_k z^2}{\bar{g}_l + \bar{g}_k} \frac{(4\bar{g}_l^2 + 2\bar{g}_l \bar{g}_k)}{\bar{g}_k(\bar{g}_k + 2\bar{g}_l)} - \frac{\bar{g}_l^2 \bar{g}_k^2}{(\bar{g}_l + \bar{g}_k)\bar{g}_k(\bar{g}_k + 2\bar{g}_l)} \tag{19}$$

from where

$$\bar{\epsilon}_k^M > \bar{\epsilon}_k^U \iff 2F_k z^2 (2\bar{g}_l + \bar{g}_k) - \bar{g}_l \bar{g}_k^2 > 0. \tag{20}$$

Thus, there is a threshold $\gamma = 2F_k z^2 (2\bar{g}_l + \bar{g}_k) - \bar{g}_l \bar{g}_k^2$, such that $\gamma > 0$ implies $\bar{\epsilon}_k^U = \bar{\epsilon}_l^U = \arg \min \{\bar{\epsilon}_k^U, \bar{\epsilon}_l^U, \bar{\epsilon}_k^M, \bar{\epsilon}_l^M\}$, and majority is more stable, while $\gamma < 0$ implies $\bar{\epsilon}_k^M = \arg \min \{\bar{\epsilon}_k^U, \bar{\epsilon}_l^U, \bar{\epsilon}_k^M, \bar{\epsilon}_l^M\}$, and unanimity is more stable. Note that $\gamma > 0$ implies that $F_k z^2 > \frac{\bar{g}_l \bar{g}_k^2}{2(2\bar{g}_l + \bar{g}_k)} = \delta$ as defined in Proposition 5. Finally, when $\gamma > 0$, both region k and region l are equally exposed to secession, and when $\gamma < 0$, it is region k that is more exposed to secession. ■

Extension to Proposition 5. Let $F_k > F_l$ and $\bar{g}_k \geq \bar{g}_l$, and let $\gamma' = (2\bar{g}_l + \bar{g}_k)z^2 [(F_k - F_l)\bar{g}_k + 2F_k \bar{g}_l] - \bar{g}_l^2 \bar{g}_k^2$. If $\gamma' > 0$, the negative economic shock above which a region prefers secession to integration is higher under majority with respect to unanimity (and thus, majority is more stable). However, if $\gamma' < 0$, the negative economic shock above which a region prefers secession to integration is higher under unanimity with respect to majority (and thus, unanimity is more stable). Let $F_k < F_l$ and $\bar{g}_k \geq \bar{g}_l$, then, the same statement of Proposition 5 applies.

Proof extension to Proposition 5. The proof in Proposition 5 calculates the values $\bar{\epsilon}_k^U, \bar{\epsilon}_l^U, \bar{\epsilon}_k^M, \bar{\epsilon}_l^M$. When $F_k > F_l$, $\bar{\epsilon}_l^U < \bar{\epsilon}_k^U$. Besides, for every F_k and F_l , $\bar{\epsilon}_l^U < \bar{\epsilon}_l^M$. Thus, the minimum of these values $\{\bar{\epsilon}_k^U, \bar{\epsilon}_l^U, \bar{\epsilon}_k^M, \bar{\epsilon}_l^M\}$ is either $\bar{\epsilon}_k^M$ or $\bar{\epsilon}_l^U$. We then compare the expressions of these two values, (16) and (17), which yields

$$\bar{\epsilon}_k^M - \bar{\epsilon}_l^U = \frac{z^2 [F_k(2\bar{g}_l + \bar{g}_k) - F_l \bar{g}_k]}{\bar{g}_k(\bar{g}_l + \bar{g}_k)} - \frac{\bar{g}_l^2 \bar{g}_k}{(\bar{g}_l + \bar{g}_k)(2\bar{g}_l + \bar{g}_k)},$$

from where

$$\bar{\varepsilon}_k^M > \bar{\varepsilon}_l^U \iff z^2(2\bar{g}_l + \bar{g}_k) [(F_k - F_l)\bar{g}_k + 2F_k\bar{g}_l] - \bar{g}_l^2\bar{g}_k^2 > 0.$$

Thus, there is a threshold $\gamma' = z^2(2\bar{g}_l + \bar{g}_k) [(F_k - F_l)\bar{g}_k + 2F_k\bar{g}_l] - \bar{g}_l^2\bar{g}_k^2$, such that $\gamma' > 0$ implies $\bar{\varepsilon}_l^U = \arg \min \{\bar{\varepsilon}_k^U, \bar{\varepsilon}_l^U, \bar{\varepsilon}_k^M, \bar{\varepsilon}_l^M\}$ and majority is more stable, while $\gamma' < 0$ implies $\bar{\varepsilon}_k^M = \arg \min \{\bar{\varepsilon}_k^U, \bar{\varepsilon}_l^U, \bar{\varepsilon}_k^M, \bar{\varepsilon}_l^M\}$ and unanimity is more stable. When $\gamma' > 0$, region l is more exposed to secession, and when $\gamma' < 0$, it is region k that is more exposed to secession.

When $F_k < F_l$, $\bar{\varepsilon}_k^U < \bar{\varepsilon}_l^U$. Besides, for every F_k and F_l , $\bar{\varepsilon}_l^U < \bar{\varepsilon}_l^M$. Thus, the minimum of these values $\{\bar{\varepsilon}_k^U, \bar{\varepsilon}_l^U, \bar{\varepsilon}_k^M, \bar{\varepsilon}_l^M\}$ is either $\bar{\varepsilon}_k^M$ or $\bar{\varepsilon}_k^U$, and the same comparison described in Expression (20) provides the result. ■

References

- Aghion, P., Alesina, A., Trebbi, F., 2004. Endogenous political institutions. *Q. J. Econ.* 119, 565–611.
- Alesina, A., Spolaore, E., 1997. On the number and size of nations. *Q. J. Econ.* 112, 1027–1056.
- Alesina, A., Spolaore, E., 2005. *The Size of Nations*. MIT Press.
- Alesina, A., Spolaore, E., Wacziarg, R., 2000. Economic integration and political disintegration. *Amer. Econ. Rev.* 90, 1276–1296.
- Alesina, A., Tabellini, G., Trebbi, F., 2017. Is Europe an Optimal Political Area? *Brookings Papers on Economic Activity* 169–213.
- Amoretti, U.M., Bermeo, N.G. (Eds.), 2004. *Federalism and Territorial Cleavages*. JHU Press.
- Anbarci, N., Sun, C.J., 2013. Asymmetric Nash bargaining solutions: a simple Nash program. *Econom. Lett.* 120, 211–214.
- Andeweg, R.B., 2000. Consociational democracy. *Annu. Rev. Political Sci.* 3, 509–536.
- Baerg, N.R., Hallerberg, M., 2016. Explaining instability in the stability and growth pact: The contribution of member state power and euroskepticism to the euro crisis. *Comp. Political Stud.* 49, 968–1009.
- Barberá, S., Jackson, M.O., 2006. On the weights of nations: Assigning voting weights in a heterogeneous union. *J. Polit. Econ.* 114, 317–339.
- Bardhan, P., 2002. Decentralization of governance and development. *J. Econ. Perspect.* 16, 185–205.
- Bednar, J., Eskridge, W.N., Ferejohn, J., 2001. A political theory of federalism. In: *Constitutional Culture and Democratic Rule*. Cambridge University Press, New York, pp. 223–270.
- Besley, T., Coate, S., 2003. Centralized versus decentralized provision of local public goods: a political economy approach. *J. Public Econ.* 87, 2611–2637.
- Binmore, K., Rubinstein, A., Wolinsky, A., 1986. The Nash bargaining solution in economic modelling. *Rand J. Econ.* 17, 176–188.
- Boffa, F., Piolatto, A., Ponzetto, G.A.M., 2016. Political centralization and government accountability. *Q. J. Econ.* 131, 381–422.
- Bolton, P., Roland, G., 1997. The breakup of nations: A political economy analysis. *Q. J. Econ.* 112, 1057–1090.
- Bolton, P., Roland, G., Spolaore, E., 1996. Economic theories of the break-up and integration of nations. *Eur. Econ. Rev.* 40, 697–705.
- Bouton, L., Llorente-Saguer, A., Malherbe, F., 2018. Get rid of unanimity rule: The superiority of majority rules with veto power. *J. Polit. Econ.* 126, 107–149.
- Campos, N.F., Coricelli, F., Moretti, L., 2014. Economic Growth and Political Integration: Estimating the Benefits from Membership in the European Union using the Synthetic Counterfactuals Method. IZA Discussion Paper No. 8162.
- Chu, A.C., 2010. Nation states vs. united empire: Effects of political competition on economic growth. *Public Choice* 145, 181–195.
- Colantone, I., Stanig, P., 2018. Global competition and Brexit. *Am. Political Sci. Rev.* 112, 201–218.
- Davoodi, H., Zou, H., 1998. Fiscal decentralization and economic growth: A cross-country study. *J. Urban Econ.* 43, 244–257.
- De Figueiredo, J.P., Weingast, B.R., 2005. Self-enforcing federalism. *J. Law Econ. Organ.* 21, 103–135.
- Desmet, K., Le Breton, M., Ortúño-Ortín, I., Weber, S., 2011. The stability and breakup of nations: A quantitative analysis. *J. Econ. Growth* 16, 183–213.
- Dewatripont, M., Maskin, E., 1995. Credit and efficiency in centralized and decentralized economies. *Rev. Econom. Stud.* 62, 541–555.
- Elazar, D.J., 1968. *Federalism*. International Encyclopedia of the Social Sciences. Macmillan, New York.
- Elazar, D.J., 1987. *Exploring Federalism*. University of Alabama Press.
- Filippov, M., Ordeshook, P.C., Shvetsova, O., 2004. *Designing Federalism: A Theory of Self-Sustainable Federal Institutions*. Cambridge University Press.
- Flamand, S., 2019. Partial decentralization as a way to prevent secessionist conflict. *Eur. J. Political Econ.* 59, 159–178.
- Haimanko, O., Le Breton, M., Weber, S., 2005. Transfers in a polarized country: bridging the gap between efficiency and stability. *J. Public Econ.* 89, 1277–1303.
- Hayek, F.A., 1945. The use of knowledge in society. *Amer. Econ. Rev.* 35, 519–530.
- Hindriks, J., Lockwood, B., 2009. Decentralization and electoral accountability: incentives, separation and voter welfare. *Eur. J. Political Econ.* 25, 385–397.
- Hirschman, A.O., 1970. Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States. Harvard University Press.
- Inman, R.P., Rubinfeld, D.L., 1997. Rethinking federalism. *J. Econ. Perspect.* 11, 43–64.
- Kalai, E., 1977. Proportional solutions to bargaining situations: Intertemporal utility comparisons. *Econometrica* 45, 1623–1630.
- Keating, M., 1998. Reforging the union: Devolution and constitutional change in the United Kingdom. *Publius* 28, 217–234.
- Le Breton, M., Weber, S., 2003. The art of making everybody happy: how to prevent a secession. *IMF Staff Pap.* 50, 403–435.
- Lijphart, A., 2012. *Patterns of Democracy*. Yale University Press.
- Lockwood, B., 2002. Distributive politics and the costs of centralization. *Rev. Econom. Stud.* 69, 313–337.
- Miller, C.E., 1985. Group decision making under majority and unanimity decision rules. *Soc. Psychol. Q.* 5, 1–61.
- Moravcsik, A., 2005. The European constitutional compromise and the neofunctionalist legacy. *J. Eur. Public Policy* 12, 349–386.
- Mortensen, D.T., Pissarides, C.A., 1994. Job creation and job destruction in the theory of unemployment. *Rev. Econom. Stud.* 61, 397–415.
- Musgrave, R.A., 1959. *The Theory of Public Finance: A Study in Public Economy*. McGraw-Hill, New York.
- Oates, W.E., 1972. *Fiscal Federalism*. Harcourt Brace Jovanovich, New York.
- Oates, W.E., 1999. An essay on fiscal federalism. *J. Econ. Lit.* 37, 1120–1149.
- Ostrom, E., 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press.
- Qian, Y., Weingast, B.R., 1997. Federalism as a commitment to preserving market incentives. *J. Econ. Perspect.* 11, 83–92.
- Riker, W.H., 1964. *Federalism: Origin, Operation, Significance*. Little, Brown, Boston.
- Rocheteau, G., Wright, R., 2005. Money in search equilibrium, in competitive equilibrium, and in competitive search equilibrium. *Econometrica* 73, 175–202.
- Rodden, J., 2004. Comparative federalism and decentralization: On meaning and measurement. *Comp. Politics* 36, 481–500.
- Roth, A.E., 1977. Individual rationality and Nash's solution to the bargaining problem. *Math. Oper. Res.* 2, 64–65.
- Slapin, J.B., 2009. Exit, voice, and cooperation: Bargaining power in international organizations and federal systems. *J. Theor. Politics* 21, 187–211.
- Slapin, J.B., 2011. *Veto Power: Institutional Design in the European Union*. University of Michigan Press.
- Törnudd, K., 1982. From unanimity to voting and consensus: Trends and phenomena in joint decision-making by governments. *Coop. Confl.* 17, 163–177.
- Voigt, S., 1997. Positive constitutional economics: A survey. *Public Choice* 90, 11–53.
- Weingast, B.R., 1995. The economic role of political institutions: Market-preserving federalism and economic development. *J. Law, Econ. Organ.* 11, 1–31.
- Whately, C., 2014. *The Scots and the Union: Then and now*. Oxford University Press.
- Wittman, D., 2000. The wealth and size of nations. *J. Confl. Resolut.* 44, 868–884.
- Young, J.R., 2007. The Scottish parliament and the politics of empire: Parliament and the Darien project, 1695–1700. In: *Parliaments, Estates and Representation*. Vol. 27. pp. 175–190.