How to assist separatists in breaking up a country... or, rather, not: The role of decentralization and development assistance

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Summary

The international community is usually set against secessionist movements that threaten to break up existing states. At the same time, many fragmented countries receive development aid, which influences the political process there. The model presented here seeks to answer two questions: "Is decentralization a suitable tool to appease separatist movements and prevent a secession?", and "Can development policies can be designed in a way that they don't unwillingly trigger secession as a side effect?". Using a framework frequently applied in the literature on secession, it turns out (a) that under certain conditions a secession threat can be used by a minority region to gain a higher level of decentralization than the larger part of the country would prefer, and (b) that a secession threat might undermine aid policies that focus directly on poverty reduction or on the improvement of governance, especially where they are not accompanied by (additional) decentralization. – It can be shown that the results are robust to a relaxation of initial simplifications.

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I Introduction

Among the specters that haunt Europe (and other places) from time to time, there is one called separatism. In Eastern Europe, the collapse of communism has led to a process of disintegration that even today, after more than two decades, has not yet come to a final halt. Elsewhere, too, claims of angry separatists are part of the political agenda. Think of Spain and Britain, to name just a couple, or the still unresolved question of Cyprus that continues to be a major strain on the EU's relations with Turkey.

And separatism is, of course, by no means just a European issue. The recent de facto break-up of Mali and the formal secession of South Sudan last year, but also the ongoing separatist challenges to the integrity of countries as diverse as Indonesia, Canada or Libya remind us that the number and size of independent states our small planet is divided into is permanently subject to change.

At the same time, these changes tend to affect the outside world, and they are not greeted with much joy by the international community. It is no surprise that separatists are seen as a danger for regional stability given that once conflicts related to separatist ambitions gain wider publicity, they are most likely to have already reached a certain level of escalation. Few outside the region knew about Abkhazia or could even pronounce the word "Chechnya" before their citizens took up arms and provoked military interventions. And there are further arguments supporting a reserved attitude towards separatism. Risks of "contagion" or ethnic cleansing as well as "soft security challenges"[1] are just a few examples of the manifold problems associated with secession threats. In the words of Canadian social philosopher Will Kymlicka, "there are more nations in the world than possible states, and since we cannot

[1] The term "soft security challenges" is used for dangers and annoyances that come along with instability, but do not imply armed conflict, e.g. smuggling and trafficking, money-laundering, etc.

simply wish national consciousness away, we need to find some way to keep multination states together."[2]

The discussion about secessions and how they can be avoided has raised an echo also in the economics profession[3]. The model I elaborate on the following pages is a contribution to this debate. Like many other papers published in this context, it draws on the framework provided by Alesina and Spolaore in their groundbreaking 1997 article (and elaborated further in their book of 2003). Like them, I assume the major trade-off involved in the formation of borders to be between economics and politics: While larger states allow for the realization of ever bigger economies of scale in the provision of public goods, in smaller states individual citizens (or groups of citizens) stand a much better chance to influence the political decision on the quality of the public goods provided. The size of the state, therefore, reflects citizens' preferences over the price and quality of public goods.

However, I suggest two important variations concerning the way secession takes place. Firstly, Alesina/Spolaore, who study the initial formation of countries, assume that *any* group of (geographically connected) citizens can secede and form a country of their own[4]. In the more "mature" world investigated here, however, internal as well as external boundaries are seen as historically fixed, shifting the question from "who might secede" to "will they (a *given* regional entity) secede". This leads to a second variation of Alesina/Spolaore's framework: Because in their world, borders are tailored to people's needs, only those willing to secede actually do so, and a new border is drawn – endogenously – between them and those who prefer to stay. In other words, secession is a matter of *consensus*. With exogenously fixed

[2] Kymlicka (1995), p. 186.
[3] A first simple economic model was proposed by Buchanan/Faith (1987), for an overview of the following two decades of discussion cf. Spolaore (2009). Several more recent papers have taken a quantitative approach (e.g. Bird et al. [2010], Osborne [2010], Desmet et al. [2011] and Tsuneyoshi et al. [2012]), other contributions focus on public good provision where secession is an option (e.g. Staal [2010] and Anesi/De Donder [2011]), or on secession costs (e.g. Anesi [2010]).
[4] Cf. Alesina/Spolaore (2003), p. 44f.

borders, as assumed here, however, it may well happen that some inhabitants of a region want to become independent while others do not, and the decision is made by *majority rule*[5]. If secession prevails in the vote, those citizens who have voted for unity have to go with the flow and become part of the new state[6]. Under these circumstances, it is also possible that "inefficient" secessions take place in the sense that breaking-up reduces over-all welfare (thus also supporting the argument that at least some secessions should be avoided).

On this basis, in the following I discuss policies that influence (and might either calm down or further ignite) secessionist aspirations. First, the option of decentralization as an alternative to a full-scale break-up of the country is examined. It turns out that decentralization might be a suitable tool to accommodate separatists, but only as long as certain conditions are met. Then, I investigate the role of development aid, seeking to answer the following questions: If aid to poor countries is administered with best intentions, is there still a danger that it might trigger secession (especially where decentralization is also part of the policy mix)? – Or, in a more general way: If secessions are to be avoided, which consequences follow for development policies of international donors?

The paper is organized as follows: Section II lays out the basic model and derives a first stability constraint. Section III broadens the scope of the model by introducing differences in income between regions, and it discusses majority votes on decentralization in the wake of a secession threat. Section IV draws lessons for donors who intend to provide development aid

[5] Many secessions of recent times have been subject to democratic decision making, not only the more recent ones of South Sudan, Kosovo, and Montenegro, but also, for example, those of Lithuania in 1991 and Ukraine in 1992 or the proposed one of Quebec, which in 1995 was dismissed only by a majority of 51 per cent. – Other models that have secession decided by majority rule include Haimanko et al. (2005) and Panizza (1998) within the Alesina/Spolaore framework, and, e.g., Bolton/Roland (1997) and Wei (1992) with substantially different models.

[6] Citizens are assumed to be immobile, an individual exit option by emigration, therefore, is not addressed here. – Also in reality, secessions have often produced fragmented new states. Ukraine (comprising "Russian" Kharkiv, Donetsk, and Crimea) and Croatia (including initially Serbian dominated East Slavonia and Krajina) are cases in point. – For an analysis of this minority issue cf. Olofsgård (2003).

in a welfare maximizing way but want to avoid triggering secessions at the same time. Section V discusses limitations and possible generalizations of the model.

II The basic model

As widely accepted in the literature, let us assume a correlation between regional and political assignment of citizens: within a country, citizens with similar political interests tend to live together, and more radical ones have the potential to propose secession (usually because they live along the borders). This may not always be true, but there definitely is evidence of such a correlation at least for some important political issues, at least in some countries[7].

As in Alesina/Spolaore (1997, 2003), the world is modeled as a Hotelling-style one-dimensional segment of length s. World population has mass s and is distributed evenly along the "world". For the sake of simplicity, all citizens have similar utility, which they derive from a private good x (that can be purchased at price 1 per unit) and a public good g (provided by the government at total price c). To pay for the public good (which can be identified with "government activity" or just "government" in a very general sense), a proportional tax $\tau = c/sy$ is levied on citizens' income y. Finally – and again as in Alesina/Spolaore (1997, 2003) –, (immobile) citizens incur a "disutility of distance" al proportional to their distance l from the location of the public good. If we assume substitutability of public and private goods and for utility at the margin to be either decreasing or constant, utility of citizen i living in a unitary state of size s is given as

$$U_i^U = \left[g - al_i + \left(1 - \frac{c}{sy}\right) y \right]^{\phi}, \quad \phi \leq 1 \tag{1}$$

As in Alesina and Spolaore, we start off with the assumption of constant marginal utility, or $\phi = 1$.

[7] Even the U.S., with its exceptionally mobile population, is clearly divided into "red" and "blue" States, isn't it?

Now let us imagine the world to be divided into two regions *A* and *B* of size *z* and *s*-*z* respectively. *A* is assumed to be the smaller region (*z*<*s*/2). For now, citizens receive the same income *y* no matter where they live. If a majority of region *A*'s citizens derives higher utility from breaking away and founding a new state, region *A* will secede at a per capita cost[8] of $\hat{\sigma}$. Afterwards, "policy" (here: the location of the public good) is decided upon by majority vote, either in the world as a whole or, in the case of secession, in each of the separated regions. It is assumed that each region will have to provide a full public good of its own[9].

It is straightforward that the public good will be located in the middle of any state, either at *s*/2, or at *z*/2 and (*s*+*z*)/2, respectively.

For the voters located between *z*/2 and *z*, secession is less favorable than for the potential new median voter (as they gain less in terms of "distance reduction"). Voters between 0 and *z*/2, however, go along with the voter at *z*/2 in their secession decision. It is important to note that their utility differs from hers only by the constant *az*/2-*i* in any case, whether the secession takes place or not.

In the following, let us assume *s*=1. The voter at *z*/2 (and at least half the region with her) decides against secession if (and only if)

$$U^U_{\frac{z}{2}} = g - a\left(\frac{1}{2} - \frac{z}{2}\right) + \left(1 - \frac{c}{y}\right)y \geq U^S_{\frac{z}{2}} = g + \left(1 - \frac{c}{zy}\right)y - \hat{\sigma} \qquad (2)$$

which leads to the unity constraint

$$\frac{a}{2} \leq \frac{c}{z} + \frac{\hat{\sigma}}{1-z} \qquad (3)$$

[8] Such a cost can be supported, among many others arguments, by the possible prospect of a violent conflict over secession (for an extensive analysis cf. Anesi/De Donder [2011]), or by the idea that for residents of smaller countries trade becomes more costly (cf. e.g. Alesina et al. [2000] or Casella/Feinstein [2002]). – More generally speaking, $\hat{\sigma}$ can also be interpreted as the net total of all individual costs and benefits of decentralization that do not enter via the public good argument made above.

[9] Again, this is in line with Alesina and Spolaore's model who argue that every country needs one government; cf. Alesina/Spolaore (2003), p. 33.

In words: for a given intensity of suffering[10] from "political distance" (from the public good), stability requires a sufficiently high combination of costs of the public good (i.e. size of government), secession costs, and "smallness" of the region in question. The smaller the size of government, and the bigger the region, the less likely becomes secession.

Given these major determinants governing votes on secession it is straightforward that, in contrast to the consensus model in Alesina and Spolaore (1997, 2003), secessions do not necessarily improve over-all welfare[11] (for a proof, cf. Appendix A). This, in turn, raises the question whether there are ways, for the sake of welfare and well-being, to avoid such secessions. Before we look into potential answers to that question, however, we'll first add some more complexity to our model.

III Income inequalities and the possibility of decentralization

Time for a little modification to our basic assumptions: let's bring production into the picture to allow for differences in income across (but not within) regions.

Let every citizen be endowed with one unit of labor and a certain fixed amount of (immobile) capital k_j, which is equal within each region but differs between the regions. The production function is assumed to be of Cobb-Douglas type:

$$y_j(k_j) = \eta_j k_j^{\alpha}; \quad j = A, B \tag{4}$$

(Productivity parameters η_A and η_B denote the level of development in region A and B respectively. In the following, η_B is normalized to 1.)

Utility changes to

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[10] This "intensity of suffering", denoted by a, which could be interpreted as, e.g., the intensity of people's interest in politics, is assumed here to be equal for all citizens. It is important to note, though, that under the more realistic assumption of individually different a_i distributed symmetrically around an average $\bar{a}$, the median voter of the secession decision changes position and moves closer to the center of the unified state. (In that case, the median voter of the secession decision is not identical any more with the median voter of the decision on the position of g in a newly formed state, who keeps her position at $z/2$.) Secession, therefore, becomes less likely with increasing variance of a. This argument still holds if on any arbitrarily small section the respective a_i are scattered around the same $\bar{a}$. – Again, all this is due to the fact that for constant a, the gain from secession decreases towards the centre of the unified country, while towards the fringes it remains constant (once one moves beyond the position of the median voter).

[11] Staal (2010, p. 537) gets an even stronger result (secession never being "socially optimal") with a model that allows for more than one public good.

$$U_i^U = g - al_i + \left(1 - \frac{c}{zy_A + (s-z)y_B}\right)y_j ; j = A, B \tag{5}$$

For s=1, the voter at $z/2$ will now opt against secession if and only if

$$U_{\frac{z}{2}}^U = g - a\left(\frac{1}{2} - \frac{z}{2}\right) + \left(1 - \frac{c}{zy_A + (1-z)y_B}\right)y_A \geq U_{\frac{z}{2}}^S = g + \left(1 - \frac{c}{zy_A}\right)y_A - \hat{\sigma} \tag{6}$$

and the unity constraint turns into

$$\frac{a}{2} \leq \frac{c}{z + z^2\left(\frac{y_A}{y_B} - 1\right)} + \frac{\hat{\sigma}}{1-z}, \tag{7}$$

or

$$a\frac{1-z}{2} + c\left(\frac{y_A}{zy_A + (1-z)y_B} - \frac{1}{z}\right) \leq \hat{\sigma} \tag{7'}$$

It is obvious that region A is more likely to secede as it becomes wealthier relative to region B. The reason for this effect is the inter-regional redistribution that takes place through the tax system.

Bearing all this in mind, let us move on another step and talk about the possibility of decentralization[12]. We now assume that the public good can be split into two parts, θg and $(1-\theta)g$. While the one part, θg, is still provided at the federal (or "world") level, the remaining part, $(1-\theta)g$, is taken care of by the regions[13]. We also assume that each region provides this remaining part of g as a local (pure) public good to its citizens in accordance with their preferences (and without any spill-over). As a consequence, while the amount of public good

[12] Decentralization has often been described as the standard tool to accommodate separatism, even as a "silver bullet for internal re-integration" (Petersen [2008], p. 16). Others have been more skeptical, also taking into account potential centrifugal effects (e.g. cf. Bird/Ebel [2006], p. 504). Overall, as Bird et al. (2010, p. 9) put it, "[t]o decentralize – and save the nation! … or to dissolve it? That is the question that theory and empirical work has not yet been able to answer".

[13] Staal (2010) follows a related path. In his model, however, the public good can only be provided either once (centrally) or twice (in a decentralized fashion).

consumed by every citizen remains fixed, there is less disutility being incurred from "distance" now. On the other hand, however, over-all production of the public good must increase, as its decentralized part has to be provided twice.

Moreover, decentralization is assumed not be *gratis*, but to come at a cost. As, by definition, "complete" decentralization (θ=0) amounts to outright secession, the cost of bringing θ down to zero must be $\hat{\sigma}$. For any other given level of θ, we assume a cost of $\sigma(\theta) = (1-\theta)^{\omega}\hat{\sigma}; \omega \geq 0$. (Bear in mind that θ itself is the share of the central public good and therefore a measure of *centralization*.) This formal description of decentralization cost reflects the fact that the sequencing of the different elements of decentralization does not necessarily follow a logical order but can be done in different ways. There is a multitude of paths that lead from a fully integrated, centralized state to a decentralized one (and, potentially, further towards disintegration). And, also, the costs of the different steps need not be distributed uniformly along the way. It is possible that the bulk of decentralization costs come at the beginning of the process, or, it is equally possible that the most costly steps come only at the end, when the region is already almost fully independent. It all depends on which government functions are handed over at which stage to the regional level. In the formal representation suggested here, exponent ω captures this feature[14].

Let us now examine the appeal of decentralization to voters. Is there an equilibrium level of decentralization that will be implemented by majority rule? – Depending on his or her location, each individual's utility is given either – for those living in region A – by

$$U_i^U = g - \theta a l_i - (1-\theta) a l_{Ai} + \left(1 - \theta \frac{c}{z y_A + (1-z) y_B} - (1-\theta)\frac{c}{z y_A}\right) y_A - (1-\theta)^{\omega}\hat{\sigma}\Big|_{i \leq z} \qquad (8.1)$$

or – for those in region B – by

[14] Obviously, this formal representation does not cover all possible functions for σ, but it allows for the analysis of increasing, constant, and decreasing marginal costs of decentralization.

$$U_i^U = g - \theta a l_i - (1-\theta) a l_{Bi} + \left(1 - \theta \frac{c}{z y_A + (1-z) y_B} - (1-\theta) \frac{c}{(1-z) y_B}\right) y_B - (1-\theta)^{\omega} \hat{\sigma} \Big|_{i>z} \qquad (8.2)$$

with l_{Ai} and l_{Bi} denoting citizen i's distance from "his" or "her" local public good.

Preferences over θ are single-peaked and allow for an internal solution only if $\omega>1$ (for a proof cf. Appendix B). Otherwise (and also in some cases of $\omega>1$), voters will prefer a corner solution: either complete centralization, or secession[15]. First of all, this implies that the sequencing of the decentralization process matters a lot[16]. If marginal costs of decentralization are decreasing, a secession-prone region will not be interested in settling for a compromise. On the contrary, the more decentralization it gets, the even more it will demand. Only if moves towards more decentralization become more costly along the way (in other words: if marginal costs are increasing), is there hope for an "inner solution", a compromise to accommodate secessionist aspirations through decentralization.

To determine the location of potential internal equilibria, let us, for a start, abstract from secession threats. Let us assume that decentralization is decided upon by majority vote and without a "hidden agenda" in the country as a whole. To discuss the outcome of such a vote, we have to consider the first order condition of every individual i. For region A, that is

$$-\frac{c}{z y_A + (1-z) y_B} y_A + \frac{c}{z} + \omega (1-\theta)^{\omega-1} \hat{\sigma} = a\left|\frac{1}{2} - i\right| - a\left|\frac{z}{2} - i\right| \quad \forall i \le z \qquad (9.1)$$

In region B, we are looking at

$$-\frac{c}{z y_A + (1-z) y_B} y_B + \frac{c}{1-z} + \omega (1-\theta)^{\omega-1} \hat{\sigma} = a\left|\frac{1}{2} - i\right| - a\left|\frac{1+z}{2} - i\right| \quad \forall i > z \qquad (9.2)$$

This leads us to

[15] We abstract from the theoretical possibility that voters might be indifferent between θ=0 and θ=1, while preferring both to any other level of θ (or that they even might be indifferent between any level of decentralization).

[16] From a different angle, this question is also being discussed in Bahl/Martinez-Vasquez (2006).

Proposition 1

In absence of a secession threat, there are two possible internal equilibrium values for θ, the one optimal for the voter at $z/2$ and the one optimal for the voter at $(1+z)/2$. If all conditions for an internal equilibrium are met, the higher one of these two potential equilibria will be the winner:

$$\theta^* = \max\left\{1-\left(\frac{\omega\hat{\sigma}}{a\frac{1-z}{2}+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)}\right)^{\frac{1}{1-\omega}},\ 1-\left(\frac{\omega\hat{\sigma}}{a\frac{z}{2}+c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)}\right)^{\frac{1}{1-\omega}}\right\}$$

$$\forall\ \omega>1\ \wedge\ -c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)<a\frac{1-z}{2}\ \wedge\ -c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)<a\frac{z}{2} \qquad (10)$$

$$\wedge\ \left[\omega\hat{\sigma}-c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)>a\frac{1-z}{2}\ \vee\ \omega\hat{\sigma}-c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)>a\frac{z}{2}\right]$$

Otherwise, majority rule will either lead to complete centralization (θ=1), or to the dissolution of the federation (θ=0).

Proof: cf. Appendix C.

Now, what happens if region A is allowed to consider secession? – If $\theta^{opt}(z/2)$ is the winning proposal, it is implemented, and secession is out of the question (as a majority in region A has already reached its optimal level of θ). In this case, however, the majority in region A is less keen on decentralization than the majority in region B, and this hypothetical case is not what we are interested in as we are analyzing potential secession of region A.

Therefore, the focus shifts to the situation where $\theta^{opt}((1+z)/2)>\theta^{opt}(z/2)$. If $\theta^{opt}(z/2)=0$, region A will secede anyway, as the person at $i=z/2$ is still the median voter on the secession issue (for a simple proof cf. Appendix D). Otherwise, we have to look at a three-stage game.

First, the level of decentralization θ^* is set at the federal level. Second, region A votes on secession, and, third, the positions of the public goods are determined.

Stage three has a straightforward solution: any public good is going to be located where the median voter is, which is at the center of the area concerned. Knowing this, voters will check whether $U(i,\theta=0)>U(i,\theta^*)$. As long as $U(z/2,\theta=0)\leq U(z/2,\theta^{opt}((1+z)/2))$, region B's central voter gets his way by putting through $\theta^*=\theta^{opt}((1+z)/2)$. If, however, $U(z/2,\theta=0)>U(z/2,\theta^{opt}((1+z)/2))$, a secession threat improves region A's bargaining position considerably[17]. As preferences for decentralization are single-peaked and $\theta^{opt}((1+z)/2)>\theta^{opt}(z/2)$, for region B's central inhabitant as well as for all other inhabitants of that region, any θ between $\theta^{opt}((1+z)/2)$ and zero is more attractive than secession of region A.

Therefore, we can expect the people from region B to offer a compromise just close enough to $\theta^{opt}(z/2)$ to keep region A in the union[18]. As this means leaving region A's central inhabitant (the median voter on secession, cf. Appendix D) indifferent on whether to break up the federation or not, we can pin down

Proposition 2

If a majority in region A favors a $\theta^{opt}(i)>0$, but would be better off under secession than under the degree of centralization preferred by the majority in region B, by threatening to secede they can successfully claim a level of θ^* such that the unity constraint is met exactly. Formally speaking,

$$\theta^* = \left\{ \theta \;\middle|\; \frac{1-(1-\theta)^{\omega}}{\theta}\hat{\sigma} = a\frac{1-z}{2} + c\left(\frac{y_A}{z y_A + (1-z) y_B} - \frac{1}{z} \right) \right\} \qquad (11)$$
$$\forall\ \omega > 1,\ \hat{\sigma} < a\frac{1-z}{2} + c\left(\frac{y_A}{z y_A + (1-z) y_B} - \frac{1}{z} \right) < \omega\hat{\sigma}$$

[17] This is a similarity to the model in Buchanan/Faith (1987).

[18] Note that the structure of the game suggested here leaves the bargaining power with region B. If region A could make a take-it-or-leave-it-offer, credibly committing somehow to secession as only alternative, they could push through any θ of their choice, including $\theta^{opt}(z/2)$.

(Although a general solution for θ^* cannot be specified, θ^* is well-defined in the relevant interval.)

Proof: cf. Appendix E.

In other words, if unity constraint (7) is violated and region A's central inhabitant's preferred level of centralization is not zero, a compromise at θ^* is to be expected. As the equilibrium at θ^* coincides with the secession constraint, this "compromise equilibrium" is unstable, and even a small shift in the parameter constellation may be enough to trigger secession. This issue is to be addressed in the subsequent section.

Before that, however, let us take a look at the case where $0 \leq \omega < 1$. As argued above, in such a situation the federation is either fully centralized or it disintegrates. Even if there is an overall majority for $\theta=1$[19], region A secedes anyway if that serves the interests of the voter at $i=z/2$. So, we are back at equation (6) generating the well-known unity constraint (7), whose violation again turns into the only prerequisite to trigger a secession. In other words, where a decentralization process goes along with decreasing marginal costs, it will not help to counter a looming secession, which remains as likely as in the case without the possibility of decentralization.

IV Considerations on the role of development aid

So, what can the international community learn whilst attempting (which it is here assumed to be doing) to make the world a better place? Let us consider two basic ways how aid can materialize[20]: it can either increase income y in one of the regions (or both), just as any subsidy to private capital does (from emergency food supply to sewerage construction or

[19] As voters close enough to $i=1/2$ always favour $\theta=1$, that requires either $\theta^{opt}((1+z)/2)=1$ or $\theta^{opt}(z/2)=1$.

[20] In this paper, I assume that there is a substantial positive impact of development aid. Although the existence of such an impact is being questioned by several broadly received studies (cf. for example Rajan/Subramanian [2008] or Doucouliagos/Paldam [2005], as opposed to other, more optimistic contributions like e.g. Burnside/Dollar [2004]), even these authors usually do not call for giving up aid, but to improve its effectiveness – which would bring the issues discussed here back on the table.

subsidizing of industrial machinery); or it can subsidize the price *c* of public goods, making "government" cheaper. In any case, however, aid might change the balance within the federation and tip region A towards demanding secession. As by assumption the international community is interested in preserving stability, it must take this danger into account in designing its aid package.

First let us assume that aid improves income directly. In line with Rajan/Subramanian (2008), I interpret this kind of aid as a positive inflow of capital. A benevolent donor provides transfers χ_A and χ_B to region A and region B respectively, maximizing aggregated utility under a budget constraint and with respect to the unity constraint known from equation (11).

The standard model of neoclassical growth theory[21] suggests that in equilibrium capital and labor grow at the same rate. In our model without population growth, therefore, equilibrium growth is zero. Furthermore, if capital were mobile, we should expect marginal returns to capital to have adjusted over time. However, if capital is immobile, as I have assumed here, different outcomes are possible: capital might be "inherited", with marginal returns differing between the regions, or it might have come in from outside to where it was expected to be more profitable until marginal returns were equalized. Both options shall be addressed in the following. In any case, the donor's problem can be formalized as

$$\sum_i U_i^U \rightarrow \max_{\chi_A, \chi_B}$$

$$\text{s. t. } \chi_A + \chi_B \leq \hat{\chi}, \tag{12}$$

$$a\frac{1-z}{2} + c\left(\frac{y_A(k_A,\chi_A)}{z y_A(k_A,\chi_A) + (1-z) y_B(k_B,\chi_B)} - \frac{1}{z}\right) \leq \frac{1-(1-\theta)^{\omega}}{\theta}\hat{\sigma}$$

The solution to this problem depends critically on whether secession is looming or not, and whether marginal returns to capital differ across regions or not. Let us first consider the case

[21] The classical reference is Solow (1956).

where secession cost $\hat{\sigma}$ is sufficiently high to make secession unattractive. With the unity constraint not binding, the donor's problem boils down to maximizing average utility[22]. Solving equation (12) renders χ_A* and χ_B* as follows:

$$\chi_A^*, \chi_B^* = \begin{cases} 0\ , \hat{\chi}\ \forall\ \dfrac{\partial y_A}{\partial k_A} << \dfrac{\partial y_B}{\partial k_B} \\ \left\{ \chi_A, \chi_B \middle|\ \dfrac{\chi_A}{\chi_B} = \dfrac{k_A}{k_B}\left(= \dfrac{y_A}{y_B}\right) \right\}\ \forall\ \dfrac{\partial y_A}{\partial k_A} = \dfrac{\partial y_B}{\partial k_B} \\ \hat{\chi},\ 0\ \forall\ \dfrac{\partial y_A}{\partial k_A} >> \dfrac{\partial y_B}{\partial k_B} \end{cases} \Bigg|_{\frac{1-(1-\theta)^{\omega}}{\theta}\hat{\sigma} >> a\frac{1-z}{2} + c\left(\frac{y_A}{zy_A + (1-z)y_B} - \frac{1}{z}\right)} \tag{13}$$

(Note that transitory cases where development aid leads either to the alignment of marginal returns to capital or to the unity constraint binding (or both) are omitted here for the sake of clarity.)

In words, equation (13) demands that in the absence of an immediate secession threat, aid should be administered either unilaterally to the region where additional capital is most productive or, if marginal productivity is equalized already, to both regions in proportion of their initial capital endowment.

How does a credible secession threat (i.e. the unity constraint binding) change this picture? – At first sight (and if for the moment we assume θ to be fixed), the rule from equation (13) is confirmed, with the exception of the last case, where region A's secession threat *worsens* its position – instead of being awarded all aid available, it loses a substantial share to region B:

$$\chi_A^*, \chi_B^* = \begin{cases} 0\ , \hat{\chi}\ \forall\ \dfrac{\partial y_A}{\partial k_A} << \dfrac{\partial y_B}{\partial k_B} \\ \left\{ \chi_A, \chi_B \middle|\ \dfrac{\chi_A}{\chi_B} = \dfrac{k_A}{k_B}\left(= \dfrac{y_A}{y_B}\right) \right\}\ \forall\ \dfrac{\partial y_A}{\partial k_A} \geq \dfrac{\partial y_B}{\partial k_B} \end{cases} \Bigg|_{\frac{1-(1-\theta)^{\omega}}{\theta}\hat{\sigma} = a\frac{1-z}{2} + c\left(\frac{y_A}{zy_A + (1-z)y_B} - \frac{1}{z}\right)} \tag{14}$$

[22] As here utility is assumed to be linear, this is equivalent to maximizing average income.

In the steady state (where marginal productivity of capital is equal in both regions), stability raises the same requirement on development aid as welfare maximization does. This result, however, holds only subject to two important simplifications.

First, the assumption of ϕ=1 (or linear utility) leads to an aid policy that is just maximizing overall income, without paying attention to its distribution. Relaxing this assumption changes the pattern of optimal aid – the requirements for stability, however, remain intact. Therefore, if utility of income decreases at the margin (ϕ<1), and welfare maximizing aid thus does not just aim at maximizing income, but instead, for example, at narrowing an income gap between regions or reducing extreme poverty, a secession threat may well interfere with that, especially if region A is poorer than region B[23].

Second, we have assumed the degree of centralization θ to be fixed and unaffected by an aid policy. If we take into account that under certain conditions such an aid package may still work without triggering secession when accompanied by a decentralization policy.

To sum up, we can formulate

Proposition 3a

If region A is on the brink of secession, (capital increasing) development aid must

- either be spent such that $\frac{\chi_A}{\chi_B} \leq \frac{k_A}{k_B}$,
- or, if ω>1, go along with a decrease in θ sufficient to compensate region A for the net loss in implicit transfers from (or increase in implicit transfers to) region B.

Proof: cf. Appendix F.

[23] Although it may sound odd, even if region A is poorer, secession can still be triggered by an *improvement* in its income position relative to region B, as this improvement reduces the implicit transfer it receives through the tax system. That increasing prosperity goes along with an increased readiness to secede is supported empirically by, for example, the frequency of separatist motions in regions where natural resources have been discovered (cf. Collier/Hoeffler [2006])

Once more it is to be stressed that the specific design of the decentralization process and the shape of the related cost function is of utmost importance here. Moreover, the requirement of $\omega>1$ (or, more generally, of steadily increasing marginal costs of decentralization) implies that in this context institutional congruence (between voters, taxpayers, and beneficiaries of a public good) is not necessarily the best of all possible worlds: If decentralization is carried out in a way that is "too efficient", it may implicitly prepare further decentralizing moves and thus lead to falling marginal costs, which could put a separatist region on a "slide" towards outright secession[24]. Instead, it might be a good idea not to delegate certain functions completely, but just partly; entanglement of institutions could avoid an "unnecessary" facilitation of further disintegration. In this case, there is a clear trade-off between efficiency (of decentralization) and stability.

Now let us take a look at the alternative case of development aid being spent on, e. g., improved public services, thus reducing the cost of "government". This case is less ambiguous than the one discussed before. As follows from equation (11) (as well as from equation [7]), reduction of c will immediately increase the likelihood of secession, as it becomes more demanding to satisfy the unity constraint. Accordingly, as government becomes cheaper, the equilibrium level of θ decreases. An aid package reducing the cost of government must therefore go along with decentralization if the country's stability is to be preserved. This leads to

[24] The break-up of the Soviet Union as well as that of Yugoslavia might be examples in point. – The effect described here is not necessarily relevant where marginal costs begin to fall only after the optimal degree of decentralization has been reached, i.e. for $\theta < \theta^{opt}$.

Proposition 3b

If region A is on the brink of secession, development aid subsidizing "government" is a threat to the country's unity. If this aid comes along with (support for) decentralization, the problem might be solved.

Proof cf. Appendix G.

This argument, however, holds only as long as the reduction of "government costs" refers to public goods (or to goods employing substantial economies of scale) and as long as this cost reduction can be maintained by the newly emerging state after secession. That is the case where either the aid program, once under way, can be expected to continue in each of the new entities, or where the aid program makes certain goods cheaper for the whole region, regardless of the number of states it is divided into.

Where, on the other hand, secession implies being cut off from this kind of subsidies because, for example, the remaining state maintains all international agreements while the new secessionist entity is left to its own devices (and might not even be recognized as an independent state), the argument is turned on its head. Losing access to aid resources then becomes another opportunity cost for separatists. Therefore, where there is a credible commitment that only citizens of the existing state will in the future be able to take advantage from donor assistance, a donor-driven reduction in c acts to support unity and stability.

This ambivalence leaves room for a compromise: aid to support the public sector is not necessarily destabilizing, as long as separatists know that secession will imply a certain reduction in their expected benefits.

V Limitations and Generalizations

For the sake of clarity and tractability, the model presented here uses all kinds of simplifications. But, as shall be shown in the following, its results carry over to cases where these simplifying assumptions are released. More specifically, this refers to the utility function U, the interpretation of government g, the one-dimensional shape of the model's "world", and the proportional relationship between distance l and utility loss[25].

First, let us have a look at the utility function. Releasing the assumption of ϕ=1 allows for a higher degree of complexity and realism, and specifically for decreasing marginal utility. It is important to note, though, that in the case of ϕ<1 the positions of the median voters in the question of secession as well as in that of decentralization remain unchanged. The same holds for the stability constraint and for θ*, the equilibrium level of centralization[26]. Moreover, more complex interactions between the utility contributions of income y and public good g also leave the basic results intact (as long as at least part of the public good enters as a summand).

In a similar way, the description of "government" also allows for generalization. As noted in similar contexts by Alesina/Spolaore (1997) and Haimanko et al. (2005)[27], the cost c of government can easily be generalized as $c_F + c_V(\mathrm{s})$, where c_F is a fixed cost, while c_V captures a cost dependent on population size. (This might be, for example, an additional per capita cost: $c_V = c_K \cdot \mathrm{s}$. In that case it would just be necessary to raise an additional tax, for example a per capita tax of c_K, independent of country size.) For our argument here it is essential, though, that $c_F > 0$, implying that at least some part of g is a pure public good, or that its

[25] All these simplifications are in line with Alesina/Spolaore (2003).
[26] The only additional assumption necessary is that individuals' utility is always positive, i.e. it must hold for all i in region A, that $\theta al_i+(1-\theta)al_{Ai}<g+(1-\tau)y_A$, and for all i in region B, that $\theta al_i+(1-\theta)al_{Bi}<g+(1-\tau)y_B$.
[27] Cf. Alesina/Spolaore (1997), p. 1031, fn. 7, and Haimanko et al. (2005), p. 1281, fn. 7.

provision employs certain economies of scale. Otherwise, the motivation for state formation breaks down entirely[28].

Implicitly, this is acknowledged also by Robert Barro, although he advises not to overestimate the public good argument (and, thus, also, not to overestimate the minimum size recommendable for a country):

> "The reason that small countries perform reasonably well in practice is that the public-goods argument may not be so important. For instance, a larger country has more property to protect from foreign aggressors and therefore requires larger outlays for national defense than a small country. Empirically, the ratio of defense expenditures to gross national product is uncorrelated with the size of the country: If the public-goods argument were compelling, then larger countries would tend to spend less on defense as a share of GNP. No doubt, it is inefficient for sovereign states to be too small, but the minimum size for a viable state seems not to be very great."[29]

(It is worth bearing in mind that also in our theoretical context secessions *can* be efficient under certain conditions, but – as shown in Appendix A – do not necessarily *have to* be, even where supported by a majority of voters.)

Another bold simplification is the assumption of a proportional relationship between an individual's location and his or her political preferences (captured by the "disutility of distance" al_i). It could be argued, however, that Tiebout-style migration has already occurred[30] (that argument would be in violation of our assumption of immobile citizens – which could be considered a short-to-medium-term restriction, though). Moreover, political preferences might be influenced directly or indirectly by geography (for example, where revenues from tourism or from natural resources are at stake[31]). Third (and probably most relevant here), many political opinions have their roots in people's religious or ethnic affiliation, which, in turn, is often connected with a certain territory[32]. Additionally, the

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[28] This would imply, however, that there weren't any tasks that could be carried out more efficiently (i.e. at a lower individual cost) if done together than on one's own – quite a radical assumption, to say the least. – For empirical arguments supporting a negative correlation (as assumed here) between population and size of government (in relation to GDP) cf. Alesina/Wacziarg (1998).

[29] Barro (1996), p. 30 – Barro takes this argument to recommend to the US government to treat separatist movements less reluctantly and even to support them "on a selective basis" (p. 31).

[30] Stegarescu (2004), p. 3 has a similar argument.

[31] Collier/Hoeffler (2006) assume the appropriation of resource rents to be the driving force behind most secessionist claims.

[32] Election results in Ukraine, for example, usually give a clear indication of the strongholds of ethnic Ukrainians and ethnic Russians respectively. – For further arguments in point cf. Alesina/Spolaore (2003), p. 19f.

results derived in this paper do not depend on political preferences to be strung geographically like beads on a cord. It is sufficient that citizens with similar preferences tend to live closer together than others (i.e. that "average preferences" differ substantially between regions)[33] and that these citizens can mobilize a majority of voters for their goals (i.e. that median voters in the regions have preferences different from the "centralized" median voter's). Usually we would also expect a secession-prone region to be located at the margin (bordering at least one other state, or the sea), though this requirement is not indispensable[34].

The assumption of one-dimensional policy spaces is more straightforward, as "secession" and "decentralization" are not complex, but, rather, relatively clear-cut issues[35].

The assumption of proportionally declining utility with increasing distance from the capital, on the other hand, is probably the most far-fetched and questionable simplification in the utility function (especially where the "position of the capital" is treated as a metaphor for all kinds of government policies). As there is no proper argument to support the idea that doubling the "distance" (by whatever definition) should also mean doubling the disutility, a more general disutility function $A(l)$, decreasing in l (and entering utility as a summand in place of al_i) would allow for a much better picture of reality. Therefore, in the following we will examine to what extent the simplification of proportional disutility affects the validity of our results.

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[33] Goyal/Staal (2004), p. 574, take this as given: "In general, populations are not uniformly distributed over regions and the preferences of individuals are typically clustered." Among many other examples, the already mentioned existence of traditionally "red" or "blue" US States (like Texas or California) is a case in point, and especially fragmented states with secession-prone regions tend to be politically polarized along geographic lines.

[34] Buchanan (1991) discusses possible „donut hole secessions", an example being the aspirations of Tatarstan in the 1990s to break away from Russia, which were eventually calmed by a compromise. Empirically, not a single one of today's sovereign states has come into existence this way. The case coming closest is probably that of The Gambia, which in 1989 terminated the confederation with surrounding Senegal. The Gambia, though, in addition to its border with Senegal has a short coastline, giving it direct access to the sea.

[35] In the latter case, this holds especially where the potential course of the decentralization process, and thus the form of $\sigma(\theta)$, is well defined. Generally speaking, this is the case as long as the vote is not about different "decentralization packages", but (just like in real life) the decision is between a centralistic and a less centralistic alternative (which clearly differ in the degree of decentralization they imply). Moreover, the sequencing of many elements of decentralization is prescribed by logic (or by customs and traditions), which further limits political manoeuvring space.

For these considerations it is important to take a look at possible functional forms of the marginal disutility of distance, given by $\partial^2 A/\partial l^2$, or $A''(l)$[36] (cf. figure 1).

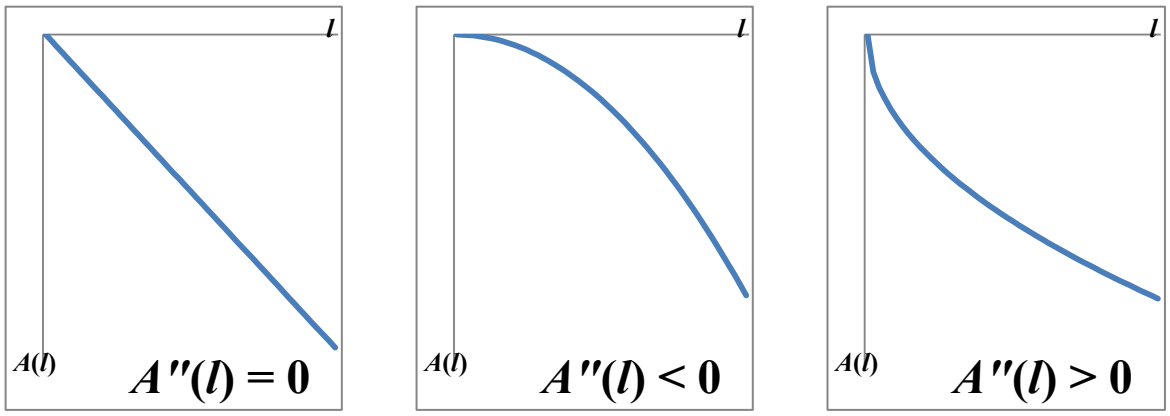

Fig. 1: Possible functional forms of the "disutility of distance"

If $A''(l) < 0$, or, in other words, marginal disutility of distance is *increasing* in l, the simplifying assumption of $A(l) = -al$ does not create any problems. The central voter in the region, who has, geographically, an equal number of fellow voters on either side of her position (and who will become the median voter to decide over the position of the new government in case of secession), also remains the median voter in the secession question, as long as $A''(l) \leq 0$ (which includes $A(l) = -al$). With $A''(l) < 0$, voters closer to the outer border might be ready to vote for secession "earlier" than the median voter (as opposed to the model's special case, where they change their mind just at the same time as the voter in the center). Yet this does not matter for the vote's outcome: still, *all those closer to the government in the unified state than the central voter* get a benefit from secession only "after" her. Whenever she opts for secession, though, *all her fellow citizens further towards the fringe* choose secession, too. Therefore, precisely when the central voter switches from favoring unity to supporting separation, the majority for secession is there.

[36] As long as we use the purely additive utility function, then $\partial^2 U_i/\partial(l_i)^2 = A''(l)$. If we consider the more general function from equation (1), for all $A''(l) \leq 0$ it is $\partial^2 U_i/\partial(l_i)^2 < 0$; therefore our argument remains valid in the general case, as long as $A''(l) \leq 0$.

Note that this argument holds independent of the individuals' distribution: with $A''(l) \leq 0$, utility from secession (given by $U_i^U - U_i^S$ for the citizen at position i) is increasing monotonously with increasing distance from the government in the unified state.

For $A''(l) > 0$, implying *decreasing* disutility of distance, on the other hand, the business becomes much trickier. In that case, the central voter in the region becomes the *first one* to opt for secession, and only with secession cost decreasing further, to her right and left people begin to join her until a majority (clustered around the center of the potential new state) finds secession more attractive than unity. In such a case, conceivable at least in theory, voters in the center would prefer secession, while the "extremists" on the fringes would oppose it. (For illustration: with A'' approaching infinity, citizens outside the capital would not care anymore from where they would be remote-controlled, whether from the union's or the new state's center. In that case, only the central voter would benefit from secession, while even at infinitesimally small costs all the others would oppose it.) The position of the new median voter would heavily depend on the model's parameters, and she would certainly not be found in the middle of the region any more. As a consequence, the model would lose much of its explanatory power.

So, which one of the two cases is more realistic? – In real life, "disutility of distance" seems to increase rather more than just proportionally with increasing distance. The assumption of $A''(l) \leq 0$, therefore, seems to fit better with reality[37], which would leave the results of the model intact.

In the following, this impression shall be supported with a thought experiment, using the well-known construction kit of microeconomics: If the political space were to be seen as a large set of political questions, each of which could be decided (for example, by an elected

[37] This assumption is, for example, made by Wittman (2000), although without being discussed any further (Wittman looks at a "quadratic political loss", in our terminology that would translate into $A(l) = -l^2$).

government) either in line with individual *i*'s preference or against it, then l_i – measuring the "distance" from the government – could be interpreted as the over-all share of government decisions that are not in line with individual *i*'s preferences. $(1–l_i)$, on the other hand, would denote the share of decisions individual *i* agrees with. If in such a scenario the individual were in a position to influence decisions directly with a certain effort (or even to "buy" them) and thus to increase the value of $(1–l_i)$, it could plausibly be expected that this increase in the quantity of the good "political proximity" (or "political satisfaction") would exhibit the same properties as increases in the availability of other goods, especially decreasing marginal utility (cf. figure 2). Therefore, for all *i* we should expect $A''(1–l) \leq 0$, which implies $A''(l) \leq 0$, giving plausibility to the assumption made in the model[38].

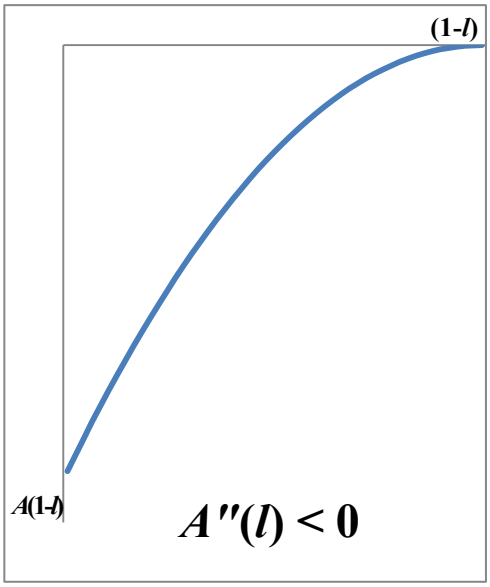

Fig. 2: Decreasing marginal utility of "proximity to the centre"

If we also allow for decreasing marginal utility of decentralization, which could be supported by a similar argument, the necessity (for an inner equilibrium) of increasing marginal cost of decentralization is being qualified[39]. Nevertheless, too fast a decrease of marginal cost of secession can still trigger secession, and the core of the argument remains intact.

[38] The faster the increase of the marginal cost of distance (i.e., the smaller $A''[l]$), the less significant becomes the effect (described above) that the median voter moves closer to the centre if the "intensity of suffering" (as given by the specification of $A[l]$) is not fixed, but scattered around an average value.

[39] Increasing marginal cost and decreasing marginal utility of decentralization are "substitutes". Their effects go in the same direction, as they both reduce the additional utility being created by the next step in the decentralization process. We don't even have to model decreasing marginal utility explicitly; it can also be interpreted as being part of decentralization cost, while explicit marginal utility remains constant. In that case, that part of decentralization cost would have to increase at the margin, making it easier in turn to fulfil the requirement of increasing total marginal cost of decentralization.

As mentioned already, further simplification is given by the assumed monotony of decentralization costs, as implied by $\sigma(\theta) = (1-\theta)^{\omega}\hat{\sigma}$. In reality, of course, the cost function may also have inflexion points, with the implication of "slide effects" as discussed above. If another inflexion point follows suit, an interior solution is still possible. If, however, there is no additional inflexion point on the way down to $\theta = 0$, secession takes place. (Whether secession takes place even in spite of another inflexion point depends on the specific form of the cost function.)

Even with these considerations in mind, the model's results remain intact, as long as voters' utility functions have each just one maximum in θ. Only where this condition is violated, is there no guarantee for a unique solution. A discussion of potential local optima, multiple equilibria and majority votes with ambiguous outcomes, though, would not only go far beyond this model's framework, but would also imply multi-peaked preferences over θ. As we have seen, this is a theoretical possibility (if sections of $\sigma(\theta)$ exhibit falling marginal cost), but it is not likely to play any major role in real life. Think of it this way: Voters with preferences like that would prefer a high degree *and* a low degree of decentralization over an intermediate solution. Such preferences are possible, and they are neither stupid nor self-contradictory, but they are a bit strange, and probably not on the minds of a sufficient number of voters to really influence political outcomes.

Furthermore, in reality, the exact shape of the decentralization cost function is not completely exogenous, but it is to some extent influenced by political decisions of the central government (that takes the decision or makes an offer to decentralize specified functions). Therefore, the center is in a position to either promote or hamper the possibility of an inner solution ($0 < \theta^* < 1$), through the order and design of the decentralization process it proposes. (This also holds for $\hat{\sigma}$ – the cost of an outright secession. For example, the center can try to threaten credibly that it will not tolerate secession even at the expense of triggering civil war

and thus to drive up the value of $\hat{\sigma}$.) Clearly, what we are dealing with here is another political variable that would be worth a closer examination; it is, however, beyond the limitations of the model.

Two additional choices that have been made in setting up the model need some clarification: the timing of the different votes, and the decision not to look at interregional transfers.

The sequence of the votes (first on secession, then on the position of the public good) follows from a time consistency problem. A vote on secession is usually a long-term decision. (Take, for example, Quebec: although in 1995 its people rejected independence by a razor-thin margin, there has not been another vote on the issue for almost two decades now.) Decisions regarding *g*, on the other hand, tend to be much less binding in the long run (especially where it is not the geographical position of the capital that is at stake, but, rather, the political position of the government). Therefore, political concessions made in response to a separatist challenge are not likely to have much impact on the secession calculus, as they could be revoked as soon as the immediate threat has faded away. For the model, this implies that the vote on secession must be held *before* the decision over *g*.

Devolution, on the other hand, is suitable as a compromise, as it is also long-term in nature. It implies the setting-up of institutions and the transfer of political responsibility. The decentralization policy suggested by the model, however, cannot avoid completely a trade-off between caution and credibility: As it recommends focusing on the less costly elements of decentralization first, it prescribes starting with measures that might also be relatively easy to roll back.

This makes it even more important not just to promise decentralization, but also to deliver on the promise and to do so in a credible and sustainable way, if a real impact on separatists' decisions is to be achieved. (This is also why, in the model, the vote on secession is held *after*

the decision on decentralization, and only after these long-term issues are settled, the vote on *g*, or on actual policies, takes place).

As already mentioned, a similar time consistency problem comes hand in hand with policy choices like transfer payments designed in order to calm down separatists[40]: as soon as the immediate secession threat is over, transfer schemes can easily be cut, or they can be thwarted by other redistributive policies. (The infrequency of secession decisions also does not allow for a build-up of trust over several iterations of the game, as would be the standard approach in game theory.) What is left is the establishment of trustworthy institutions to safeguard the rights of citizens in the regions over the long term[41]. However, in developing countries, where financial transfers are often just viewed as an instrument of executive power and rarely follow the principles of good governance, this strategy is not very convincing[42]. (In this respect, devolution seems somewhat more promising, as it implies the transfer of power and, therefore, the strengthening of local elites as a counterweight to those running the central government). For these reasons, the model presented here refrains from discussing interregional transfers as an instrument to prevent secession[43].

VI Conclusion

The decision to break up a country and set up an independent state has a fundamental impact on the people affected by it, and it is influenced by a complex set of factors of all kinds, political, economic, cultural, and many others. I have chosen the model structure first

[40] Transfers as a cure for separatism are dealt with by, e.g., Le Breton/Weber (2003); further problems of this approach (in cases where states are politically "polarized") are addressed by Haimanko et al. (2005).
[41] Alesina/Spolaore (2003), p. 56, suggest this as a solution to the commitment problem. Along the same lines, Anesi/De Donder (2011) argue in favor of "binding constitutional rules protecting the secessionist minority" (p. 12).
[42] Given these problems (and other political impediments in the way of purely "stability oriented" redistribution), and also the centrifugal forces potentially unleashed by income-oriented interregional transfers, Spolaore (2009, p. 14) in sum even expects a rather *destabilizing* impact of interregional redistribution.
[43] It should be mentioned here that there's a difference between development aid and interregional transfers. Aid money is not only administered by international actors with long-term objectives in mind, it is also, unlike transfers from a central government, not automatically cut off in case of secession.

developed by Alesina and Spolaore with its broad interpretation of the trade-off involved to take account of this complexity (and not to reduce it to just one dimension, like trade or redistribution, as others have done). This kind of a very stylized model that takes a general approach is not likely to produce a straightforward policy recommendation. It can illustrate, however, in which direction the modification of certain policy parameters is likely to influence the secession calculus. The policy instruments of decentralization and development aid proved worthy of a closer examination, as it could be shown that they can influence the decisions of potential separatists – interdependent, however, with several other factors.

So, the question of whether decentralization and development aid can "save the nation" has to remain open. However, the model discussed here has provided certain insights into the ways other parameters influence the impact of these instruments, and how they interact. As these results proved quite robust to a generalization of the basic assumptions, the insights are also of certain practical value. They are a contribution to a debate that tends to rest silent for long periods of time, only to erupt into emotional discussions on principles as soon as yet another previously unknown small people takes up arms to fight for national independence. It is to render a little more objectivity and steadiness to this debate what the argument laid out above aims to achieve.

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Appendix A

Given the assumptions of the basic model, is it possible that a secession subtracts from overall welfare? – For even more simplicity, let's assume that $\hat{\sigma}$=0. In this special case, equation (3) can easily be rearranged to

$$2\frac{c}{a} \geq z$$

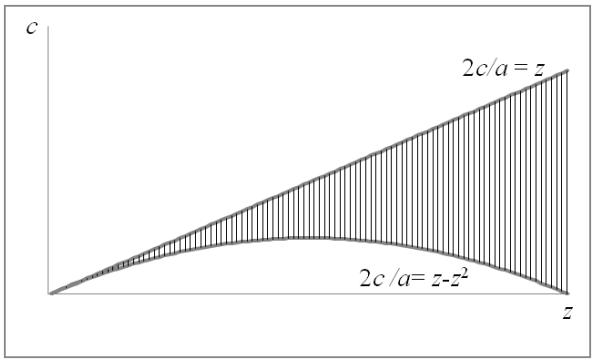
If this condition is violated, region A opts for secession. Is that good news or bad news? – From a welfare maximizing point of view, there is no general answer. If utility after secession (U^S) is higher on average than before, a secession is favorable – in formal language if

$$\overline{U}^U = g - \frac{a}{4} + y - c < \overline{U}^S = g - \frac{a}{4}\left(1 - 2z + 2z^2\right) + y - 2c$$

So here's the constraint for preserving unity to be *efficient*:

$$2\frac{c}{a} \geq z - z^2$$

As z>0, any efficient secession will take place, but *not any secession that is approved by majority vote is necessarily efficient*.



Therefore, although there may be many reasons why international policy makers try to stabilize states and to keep countries together, in some cases one reason at least may be that over-all welfare would decrease in the event of secession.

Appendix B

- *Preferences over θ are single-peaked and allow for the possibility of an internal optimum if and only if ω>0:*

Marginal utility of decentralization,

$$\frac{\partial U^U}{\partial \theta} = -al_i + al_{Ai} - \frac{c}{zy_A + (1-z)y_B} y_A + \frac{c}{z} + \omega(1-\theta)^{\omega-1}\hat{\sigma} \quad \forall i \le z \text{ (region A)}$$

and

$$\frac{\partial U^U}{\partial \theta} = -al_i + al_{Bi} - \frac{c}{zy_A + (1-z)y_B} y_B + \frac{c}{1-z} + \omega(1-\theta)^{\omega-1}\hat{\sigma} \quad \forall i > z \text{ (region B)}$$

respectively, is monotonous in θ for any possible value of θ. As

$$\frac{\partial^2 U^U}{\partial \theta^2} = -\omega(\omega-1)(1-\theta)^{\omega-2}\hat{\sigma},$$

an extremum (if it exists) must be a maximum for any ω>1. For $\omega \le 1$, no internal optimum is possible.

Appendix C

- *If ω>1, there are two potential internal equilibria for θ under majority rule:*

First order conditions

$$-c\left(\frac{y_A}{zy_A + (1-z)y_B} - \frac{1}{z}\right) + \omega(1-\theta)^{\omega-1}\hat{\sigma} = a\left|\frac{1}{2} - i\right| - a\left|\frac{z}{2} - i\right| \quad \forall \quad i \le z \text{ (region A)}$$

and

$$-c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)+\omega(1-\theta)^{\omega-1}\hat{\sigma}=a\left|\frac{1}{2}-i\right|-a\left|\frac{1+z}{2}-i\right| \quad \forall \quad i>z \text{ (region B)}$$

technically allow for eight cases, three of which drop out immediately, as $0<z<1/2$. The remaining five generate optimal $\theta^{opt}(i)$ for different sections of the country as follows:

$$\theta^{opt}(i)=\begin{cases} 1 \ \forall \ a\frac{1-z}{2}+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)\le 0 \\ 1-\left(\frac{\omega\hat{\sigma}}{a\frac{1-z}{2}+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)}\right)^{\frac{1}{1-\omega}} \ \forall \ 0<a\frac{1-z}{2}+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)<\omega\hat{\sigma} \\ 0 \ \forall \ a\frac{1-z}{2}+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)\ge\omega\hat{\sigma} \end{cases}\Bigg|_{i\le\frac{z}{2}},$$

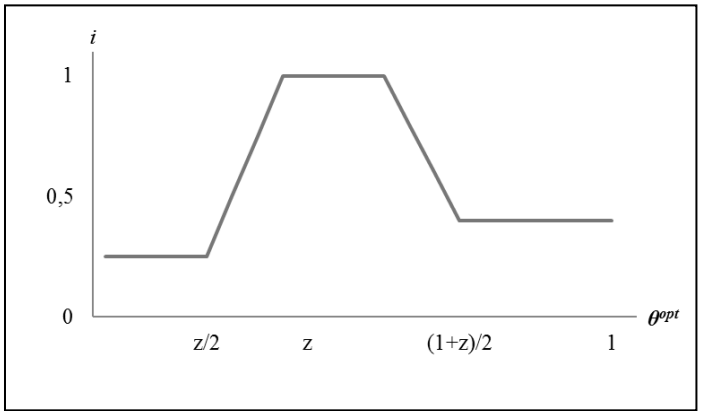
$$\theta^{opt}(i)=\begin{cases} 1 \ \forall \ a\frac{1+z}{2}-2ai+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)\le 0 \\ 1-\left(\frac{\omega\hat{\sigma}}{a\frac{1+z}{2}-2ai+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)}\right)^{\frac{1}{1-\omega}} \ \forall \ 0<a\frac{1+z}{2}-2ai+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)<\omega\hat{\sigma} \\ 0 \ \forall \ a\frac{1+z}{2}-2ai+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)\ge\omega\hat{\sigma} \end{cases}\Bigg|_{\frac{z}{2}<i\le z},$$

$$\theta^{opt}(i)=1 \ \forall \ z<i\le\frac{1}{2},$$

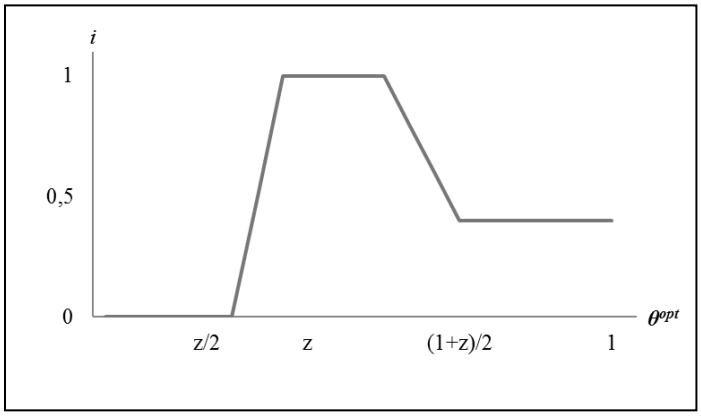
$$\theta^{opt}(i)=\begin{cases} 1 \ \forall \ a\left(2i-1-\frac{z}{2}\right)+c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)\le 0 \\ 1-\left(\frac{\omega\hat{\sigma}}{a\left(2i-1-\frac{z}{2}\right)+c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)}\right)^{\frac{1}{1-\omega}} \ \forall \ 0<a\left(2i-1-\frac{z}{2}\right)+c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)<\omega\hat{\sigma} \\ 0 \ \forall \ a\left(2i-1-\frac{z}{2}\right)+c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)\ge\omega\hat{\sigma} \end{cases}\Bigg|_{\frac{1}{2}<i<\frac{1+z}{2}}$$

$$\theta^{opt}(i)=\begin{cases} 1 \;\forall\; a\frac{z}{2}+c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)\le 0 \\ 1-\left(\frac{\omega\hat{\sigma}}{a\frac{z}{2}+c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)}\right)^{\frac{1}{1-\omega}} \;\forall\; 0<a\frac{z}{2}+c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)<\omega\hat{\sigma} \\ 0 \;\forall\; a\frac{z}{2}+c\left(\frac{y_B}{zy_A+(1-z)y_B}-\frac{1}{1-z}\right)\ge\omega\hat{\sigma} \end{cases}\Bigg|_{i\ge\frac{1+z}{2}}.$$

To find out about potential outcomes of a majority vote on secession, let's take a look at the shape of the function $\theta^{opt}(i)$. In general, it looks like this for $\theta^{opt}(z/2)>0$ and $\theta^{opt}((1+z)/2)>0$ (note that three of the five sections are constant in i):



If $\theta^{opt}(z/2)=0$, the picture changes to look like this:



(The first kink is to the right of $z/2$! – If $\theta^{opt}((1+z)/2)=0$, the picture is reversed accordingly.) Note that (for any z) $z/2+(1-(1+z)/2)=1/2$ and that there is always a group gathered around $i=1/2$ that prefers $\theta=1$. Therefore,

- in the case of either $\theta^{opt}(z/2)=1$ or $\theta^{opt}((1+z)/2)=1$ it is obvious that there is a majority for $\theta=1$,
- in the case of $\theta^{opt}(z/2) = \theta^{opt}((1+z)/2)$ (this includes the possibility of these both being zero) the sections to the very left and to the very right will join to implement this common optimum,
- in any other case, suggesting the greater among $\theta^{opt}(z/2)$ and $\theta^{opt}((1+z)/2)$ – the optima of the region's central inhabitants – will win over any smaller suggestion, as the "outer" part of the region goes along with the regional center, while all voters between this regional center and 1/2 prefer either the same or even a greater θ. And it will beat any greater suggestion as well, as the other regional center, and with it the outer part of that region, prefer a θ even smaller, therefore again joining a winning "coalition of the fringes".

Q. e. d.

Appendix D

- *When region A votes on secession, the individual at i=z/2 is always median voter:*

Every citizen of region A checks whether he or she will be better off under secession ($\theta=0$) than in a federation with a given degree of centralization $\bar{\theta}>0$ (in which case, the citizen will vote in favor of seceding). Formally, the question is whether

$$g - al_{Ai} + \left(1 - \frac{c}{zy_A}\right)y_A - \hat{\sigma} > g - \bar{\theta}al_i - (1-\bar{\theta})al_{Ai} + \left(1 - \bar{\theta}\frac{c}{zy_A + (1-z)y_B} - (1-\bar{\theta})\frac{c}{zy_A}\right)y_A - (1-\bar{\theta})^{\omega}\hat{\sigma}$$

which can be rearranged to

$$\bar{\theta}al_i - \bar{\theta}al_{Ai} + \left(\bar{\theta}\frac{c}{zy_A + (1-z)y_B} - \bar{\theta}\frac{c}{zy_A}\right)y_A + \left((1-\bar{\theta})^{\omega} - 1\right)\hat{\sigma} > 0$$

or

$$\bar{\theta}a\left(\frac{1}{2}-i-\left|\frac{z}{2}-i\right|\right)+\bar{\theta}c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)+\left(\left(1-\bar{\theta}\right)^{\omega}-1\right)\hat{\sigma}>0$$

Obviously, for $i\leq z/2$ – and therefore a majority in region A – this constraint is independent of i.

Appendix E

The constraint for the union to be preserved is

$$U^U_{\frac{z}{2}}=g-\theta^* a l_{\frac{z}{2}}+\left(1-\theta^*\frac{c}{zy_A+(1-z)y_B}-(1-\theta^*)\frac{c}{zy_A}\right)y_A-(1-\theta^*)^{\omega}\hat{\sigma}\geq U^S_{\frac{z}{2}}=g+\left(1-\frac{c}{zy_A}\right)y_A-\hat{\sigma}$$

This yields as critical value for the degree of centralization

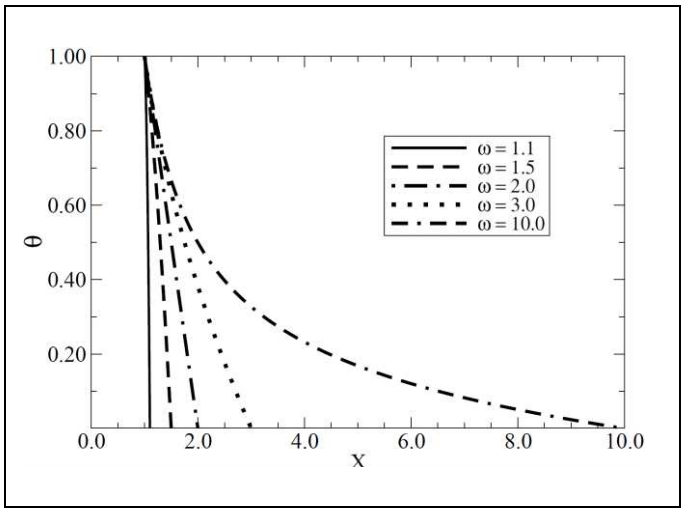
$$\theta^*=\left\{\begin{array}{c}\left(1\ \forall\ a\frac{1-z}{2}+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)\leq\hat{\sigma}\right)\\ \left\{\theta\ \middle|\ \frac{1-(1-\theta)^{\omega}}{\theta}\hat{\sigma}=a\frac{1-z}{2}+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)\right\}\ \forall\ \hat{\sigma}<a\frac{1-z}{2}+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)<\omega\hat{\sigma}\\ 0\ \forall\ a\frac{1-z}{2}+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)\geq\omega\hat{\sigma}\end{array}\right|_{\omega>1}$$

(Note that the corner solution of $\theta^*=1$ occurs if constraint (6) is satisfied: The union is preserved without any decentralization. – $\theta^*=0$, on the other hand, means that no degree of decentralization is sufficient to prevent region A from breaking away.)

Appendix F

- *If secession is looming, for fixed θ, region A should not get a higher share in aid than its share in the country's aggregate capital:*

Although there is no explicit function rendering values between 0 and 1 for θ^*, it can be shown that the inverse function of any $X = \frac{1-(1-\theta)^{\omega}}{\theta}$ is strictly monotonic decreasing for any $\omega>1$ and $0<\theta<1$:



In other words, θ^* is decreasing in $\left[a\frac{1-z}{2}+c\left(\frac{y_A}{zy_A+(1-z)y_B}-\frac{1}{z}\right)\right]$. If θ is fixed at θ^*, this term must not increase if a secession is to be prevented. For increasing y_A, therefore, y_B must increase by the same factor. From homogeneity of the production function follows that such a proportional increase in income requires a proportional increase of both capital endowments. Therefore, the ratio of the transfers χ_A and χ_B must be the ratio of capital endowment k_A/k_B.

- *If aid is to improve region A's income relatively more than region B's, it must go along with decentralization:*

From the argument above it is straightforward that $\frac{\partial \theta^*}{\partial y_A} < 0$. In consequence, when its income increases, region A will call for less centralization. In case of $\omega \leq 1$, this means secession; otherwise, fostering decentralization is helpful.

Appendix G

- *If region A is on the brink of secession, development aid subsidizing "government" is a threat to the country's unity.*

As shown in Appendix B, an increase of the expression $\left[a\frac{1-z}{2} + c\left(\frac{y_A}{z y_A + (1-z) y_B} - \frac{1}{z} \right) \right]$ triggers secession, if θ is fixed at θ^*. As $\left(\frac{y_A}{z y_A + (1-z) y_B} - \frac{1}{z} \right) < 0 \ \forall \ y_A, y_B > 0$, a reduction of c leads to the break-up of the existing state.

- *A reduction of c must come along with sufficient decentralization, if unity shall be preserved.*

Proof is straightforward, given the argumentation in Appendix B on the behavior of θ^*.