More Groups, Cheaper Reforms?

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Abstract:

The topic of reforms is hotly debated among politicians and researchers. There are many approaches to explore the origins of reform deadlocks and budget deficits. Central to all these approaches are the costs generated either by the Status Quo or by eliminating the Status Quo via a reform. Costs generated by the reform can be offset by the government using compensation payments. Crucial for a successful reform is to minimize these compensation costs. The task is rather complicated, as certain groups of individuals, such as countries, federal states or political parties are hard to separate. Against this background this paper shows that under a majority rule the compensation costs can be minimized via enacting fragmentation among the population.

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1 Introduction

The topic of reforms is one of the most important and most discussed issues among politicians as well as researchers. Despite great efforts and different approaches no clear picture has yet emerged why reforms in some countries tend to be delayed and in others not. Theoretical contributions on the subject come from various origins, the “war of attrition” (1991), the theory on “common pools” (Mondino et al., 1996) the credibility literature (Tabellini/Alesina, 1990; Fernandez/Rodrik, 1991) the sequencing of reforms (Dewatripont/Roland, 1992; Roland/Dewatripont, 1992; Martinelli/Tommasi, 1997) or the literature on behavioural economics (Caplan, 2001; Heinemann, 2004). These theories provide certain insights but do not really cover the origin of the problem. The literature of ethnic diversity (Alesina et al., 2003) paid the greatest attention to the problem. Unfortunately it is mostly empirical and lacks a theoretical background. Most of the other approaches especially the literature on “common pools” (a modification of the public good problem) found that fragmentation has negative effects on reform activities. Most empirical work seems to support this finding.

This paper will add another aspect to the discussion. We notice that costs of reforms are an important factor in every model. On the one side the Status Quo itself (like inflation) generates costs, while on the other side changing the Status Quo (like stabilization) induces costs as well. There will always be groups that oppose the reform as individuals have different economic interests and reforms rarely benefit every group in the same way. Economic losses for some groups are usually the result. The state or more generally the authority can offset these losses through compensation payments in the form of lower taxes or the offering of public goods. Also subsidies can be an instrument of compensation. It is hard to imagine any major reform pushed through without any transfers to groups which are losing out as a result of the political action. Undoubtedly compensation payments are an important fraction of all reform costs. So to reduce these costs seems to be crucial for the enforcement for every reform.

This task is intricate. Reform generates losing groups and groups themselves are hard to split up, such as countries, federal states, cities or parties. It is not possible to pay transfers to a part of a group, as this approach has no justification. Groups are compensated or not compensated as a whole. At this point fragmentation among the population comes into play. The model evaluates the connection between group numbers or fragmentation and transfers. The conclusion is straightforward: The higher the number of groups and the lower the number of individuals that form a group the easier it is for the government to compensate the necessary number of groups to push through reform. It is much easier for the government to avoid overcompensation. Against the background of the importance of compensation payments and the problem that groups cannot be separated, fragmentation can generate positive effects. This paper tries to offer a solution to a widespread problem, while most other research tries to explain the sources of reform deadlocks.

The paper is organized as follows: Section 2 reviews relevant theories on reform-deadlocks. Section 3 presents models incorporating compensation payments and various expansions. Section 4 draws conclusions and raises further questions for research.

2 Research Update

Despite the importance of the topic, neither empirical nor theoretical research could pinpoint the reasons why reforms rarely work out. Different models are based on different assumptions and different definitions. Theory provides a wide range of possible explanations for delayed reforms, ranging from incomplete information, the incompetence of policymakers, or the intervention of interest groups to irrational behaviour of the parties involved. The most obvious explanation is that sometimes there is no clear and unambiguous answer to economic problems. Even if there is general agreement on the necessity of reform, the design can still be a matter of dispute (Drazen, 2000). Reform deadlocks may also occur if politicians behave according to their own ideological instead of social preferences. In the literature on political economy (Alesina/Tabellini, 1988; Drazen, 2000) there has been excessive modelling of the possibility of selfish politicians. Another reason for reform delay is often incomplete information among both the public and politicians (Cukiermann/Tommasi, 1998) or a general uncertainty about the effects of a reform (Fernandez/Rodrik, 1991). Most models find heterogeneity in either form as an origin of reform procrastination and thus of reform costs. Heterogeneity can be defined – either in qualitative differences, like costs or abilities (Alesina/Drazen, 1991; Fernandez/Rodrik, 1991), or quantitative differences, like group numbers and size. In the “war of attrition” models two or more groups struggle about the distribution of stabilization costs. Reform is delayed because none of the groups wants to bear these costs. Here, qualitative heterogeneity is emphasized. Groups face different (or heterogeneous) costs. Most of the mentioned approaches use this dimension of heterogeneity. Martinelli and Escorza (2007) show that in this case an extreme heterogeneous distribution of stabilization costs can help to push a reform through. Models of “common pools” are based on quantitative heterogeneity. To explain reform deadlocks the number of groups or the degree of fragmentation of the population are used. This approach was mainly employed to explain growing budget deficits among OECD members and Latin American countries (Mondino et al. 1996). In these models, the government budget is often seen as a common resource exploited by different groups, for example sub-national governments. The problem can be described as follows: While a group receives the complete transfer benefits it only pays a fraction of the related costs. The group in this case demands more transfers than it would demand if it would have to settle all the costs involved on its own. This leads to an excessive consumption of transfers followed by a significant budget deficit. Hence, a higher number of groups leads to a non-internalization of external effects and thereby an inefficient solution (Aizenman, 1992; Velasco, 1997; Velaso, 1997). The more agents are involved in the process, the higher the deficit and the lower the motivation to change the situation. The basic model can be broadened by differing assumptions (Zarazaga, 1995; Aizenman/Velasco, 1998; Woo, 2005). There is actually a great difference between models that merely refer to qualitative differences in preferences for public goods and models that refer to the exclusive consumption of transfers. While for example federal governments benefit exclusively from transfers certain public goods will be beneficial for every federal state to a different degree. This was taken into account by Woo (2005). It does not, however, change the results of the model: A higher group number brings higher deficits and makes a cutback of spending more difficult.

In connection with this type of model the so-called “interest group” approaches are frequently mentioned. These use interest groups such as the military or certain lobby groups to explain slowly proceeding reforms (Olson, 1981). The core hypothesis is that policies are not chosen by the majority of the population but by certain powerful vested interest groups. Initially, the problem is also caused by a non-internalization of costs (Tornell, 1998; McBride, 2005), as in the case of “common pools” theories. In comparison with these theories “interest group” models do not emphasize the differences in group size but differences in political voice. The implications of group size in these models depend on the underlying situation and assumptions.[1]

Finally, theories emphasize different reasons for reform delays. A central topic is the effects of fragmentation on reform losses and the origins of these costs. The theory of “common pools” shows, that a greater group number has a negative effect on reform activity, as groups do not have any motivation to change the situation. Other theories say nothing about the problem of quantitative fragmentation. Both theoretical and empirical research, which will be discussed below, is consistent about what in fact delays reforms.

The majority of empirical studies concentrates on quantitative heterogeneity as an explanation of reform deadlocks, as this type of heterogeneity is easier to measure. Most studies focus on size of groups or the number of existing groups. These can be defined in various ways and can for example be measured by cabinet size or the number of parties[2]. The results are not convincing. However, it should be noted that it is not the pure number of players that matters but that the political power of the respective players is equally important. The decision power of governments or officeholders can be measured in different ways, namely the vigorousness of the government’s majority either in parliament or in other decision making bodies, or the power of the opposition which is closely connected with its degree of fragmentation. A fragmented opposition is most likely less strictly organized and therefore less able

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[1] The literature on ethnic diversity (Collier, 2001; Garcia-Montalvo/Reynal-Querol, 2005) offers some insights into the problem of group size in “interest group” approaches.

[2] Possible measures are for example the number of parties in a coalition in different specifications (De Haan et al., 1999; Volkerink/De Haan, 2001; Perotti/Kontopoulos, 2002; Woo, 2003; Lora/Olivera, 2004; Ricciuti, 2004; Ashworth/Heyndels, 2005) a dummy for coalition governments (Woo, 2003) or the number of ministers in cabinet size (Volkerink/De Haan, 2001; Perotti/Kontopoulos, 2002; Woo, 2003; Ricciuti, 2004; Ashworth/Heyndels, 2005). While the number of ministers in the cabinet has the expected sign and is significant for most specifications, the number of coalition parties is mostly insignificant. Ashworth and Heyndels (2005) find different effects for “good” and “bad” times. While cabinet size hinders budget cuts in bad times, the number of parties in the coalition has negative effects in good times. The coalition dummy shows that coalition governments tend to have more problems in carrying out reforms.

to act than a homogeneous group (Ricciuti, 2004)[3].The decision power of a government is also greatly influenced by constitutional rules, such as the number of veto players which seems to play a significant role in pushing through policy decisions (Tsebelis/Chang, 2004). Researchers found weak evidence for the hypothesis that a greater power of a small group of decision makers such as finance ministers or a smaller number of decision makers leads to a more favourable outcome of the decision making process (Woo, 2003; Ricciuti, 2004). Leachman et al. (2007) actually find no evidence for a negative effect of fragmentation. Instead, they claim that their findings contradict "common pool" predictions and that fragmentation in form of federalism helps to hinder budget deficits. The effects may also depend on the form of government system (Spolaore, 2004).

These studies are of only limited value because of the data used. Most of this work is based on budget data which have significant shortcomings as an indicator: A reduction of the budget deficit shows only outcomes but not policy decisions. The original decisions may be influenced by external conditions having an impact on the budget deficits (Lora, 1997). Other possibilities would be to take into account indices of economic freedom (Pitlik/Wirth, 2003; Heinemann, 2004; Lora/Olivera, 2004) or to collect data on reform attempts such as combating inflation (Veiga, 2000, 2005). In summary the empirical evidence slightly supports the theoretical assumption that fragmentation hinders reform but the evidence is poor (Leachman et al., 2007).

Regarding these results further evaluation of the effect of fragmentation on reform deadlocks seem necessary. This paper does not concentrate on the origins of reform deadlocks but on the removal of the problem. It sheds light on the connection between fragmentation and transfers, as reform costs are an important barrier to successfully adopt a reform.

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[3] Various specifications of the strength of the government's majority have been tested by different authors (Volkerink/De Haan, 2001; Woo, 2003; Lora/Olivera, 2004; Ricciuti, 2004; Tsebelis/Chang, 2004). It turns out that most of them, except for the control variable for the majority in different houses or chambers (Ricciuti, 2004), are insignificant.

3 Model

3.1 Motivation

It seems that none of the models discussed has incorporated compensation payments. Central to these payments is the fact that groups cannot be split up. It is shown that reforms are more efficient and less intricate if the group number rises. This can intuitively be explained in simple terms: If it is assumed that a government needs the approval of half of the population to adopt a policy action and every individual votes, it needs to reach $0.5+\varepsilon$ to push through a reform. This percentage rate can be met by coincidence or by compensation payments. Imagine a society with two and a society with four groups. Half of the groups profit from a proposed reform, the other half of the groups suffers costs as a result of the reform. To win a majority the government needs to compensate some individuals. If groups are not separable, more individuals or a higher fraction of losing groups need to be compensated in the first than in the second case. The model presented in this paper will show the same results as the intuitive assumptions. Note that reforms are only beneficial when the Kaldor Hicks criterion is met. This means that a project that suffices this criterion can be pushed through by compensating the losing groups by using goods or money from the winning groups. As long as total losses are lower than total profits nobody will be adversely affected by the reform.

Compensation payments are central to the approach and surely they need to be financed e.g. using taxes, which generate transaction costs. Transaction costs resulting from charging and collecting taxes as well as the execution of the tax law. Administrative costs for private households account for about 2.3 percent and administrative costs for the fiscal authority amount to 5.6 percent of total tax revenue. Costs depend on the relevant type of tax and can be quite high as in the case of a property tax. Administrative costs of fiscal authority in this case absorb about 32.3 percent of the tax revenue[4]. Beside administrative costs taxes induce a behaviour change causing the excess burden. There exists a vast literature on the excess burden of taxes and the dead weight loss. For example, according to Feldstein and Feenberg (1995) the dead weight loss of the increase of the marginal labour tax in

[4] Data are taken from Homburg (2007), page 54. Percentages are measured in Germany in 1984.

the US (1993) was twice as high as the resultant budget revenue. These revenue losses are induced by a change in labour behaviour according to a change of tax rates. [5] The stronger the reaction of attitude towards labour in connection with taxes the greater is the difference between planned and realized tax revenue. The paper neglects these costs, as they will not have any influence on the structure of the population. Taxes are in the last instance paid by individuals and thus fragmentation does not influence these transaction costs, unless the elasticity does not change with the amount of taxes that are paid. Ignoring these transaction costs in providing a revenue, the expected results are: Reforms should be less costly if the population is more fragmented.

3.2 Basic Version

To construct a proper model to measure the effects of fragmentation on compensation costs some restrictions have to be made:

- N represents the number of groups. Groups are indivisible. It is not possible to compensate just a fraction of a group. The population is standardized to one.
- The groups are defined as n_i with $i = 1;...;N$. The population and all groups are equal in size. Thus the number of persons in every group is $\frac{1}{N} = h_i$ for every h_i, so that $h_1 = h_2 = ... = h_N$.
- The performance of groups is independent and random. Benefits and Losses have the same probability (*p=0.5*). Losses and profits are either monetary or non-monetary and are assumed to be measurable in an equal way.
- Profits and losses are defined as $z_i \in \mathbb{R}^N$; $i = 1;...;N$. z_i is drawn from $z_i \left\{ x_i, y_j \right\}$ where $x_i = z_i > 0$ demarks a profit and $y_i = z_i < 0$ demarks a loss.
- N comprises N_L losing groups and N_W winning groups where $N = N_L(y_i) + N_W(x_i)$.

[5] For more details see Feldstein (2008) , Feldstein and Feenberg (1995) or Gruber and Saez (2002).

- Total losses are assumed to be constant irrelevant of the degree of the fragmentation of the population. Total losses are demarked by $Y = \sum_{j=1}^{L} y_j$.
- The basic version assumes the losses to be uniformly distributed, thus $y_1 = y_2 = ... = y_L$ and $y_j = \frac{Y}{N_L}$
- Profits and losses as well as compensation payments are shown for the whole group and not for single individuals.
- Reforms are only accepted if more than 50% of the groups are in favour of the reform. Otherwise reforms are voted down.
- The model assumes rational individuals. Thus, all groups that benefit from the proposed reform are in favour of the reform. Hence, the majority constraint is $N_W > \frac{1}{2}N$.
- The model only incorporates such cases where aggregate benefits exceed aggregate losses, thus the realization of the random vector $(x_i)_{i \in N}$ must exceed the realization of the random vector $(y_j)_{j \in N}$. Reforms must be beneficial in the sense of the Kaldor Hicks criterion. [6]

(3.2-1) $\sum_{n=1}^{N} (Benefits - Losses) > 0$ or to be more concrete

(3.2-2) $\sum_{i=1}^{N_W} x_i - \sum_{j=1}^{N_L} y_j > 0$.

Note that the Kaldor Hicks criterion can only be met when $N > N_L$, when $N = N_L$ then all groups lose and no individual will gain. In this case a reform is not enhancing social welfare. This situation cannot be efficient. In every other composition of W and L a certain distribution of profits and losses meets the Kaldor Hicks criterion.

Individuals in this model know exactly ex ante what their pay-offs are as the losses from reform and the compensation payments offered are known before the vote. If these conditions are not met, trust and uncertainty will come into play. In reality

[6] Note that costs represent a positive number.

groups will not know the exact value of reforms. Especially in periods of high reform activity individuals may lose orientation. Also, the paper only deals with trustworthy politicians. An offered transfer is definitely paid so the prospect of receiving an amount of money is not uncertain.

- The reform is a yes-or-no decision. There are no alternative reforms and only one scheme exists within the reform.
- Decision makers are single representatives which vote representing the whole group.

As already mentioned it is possible that benefits only accrue to a part of the population so that generally beneficial reforms do not win the consent of the majority of the population. In this case the government needs to compensate the losing groups via transfers that offset the losses of the reform for this particular group. In reality these transfers will probably be higher than the losses of the reform itself due to political reasons. It can therefore be assumed that the model only presents the minimal choice of transfers.

For each *N* there is a marginal *L* that still ensures a majority. For example a number of ten groups allows four losing groups before the government needs to compensate to win the ballot. When this margin is crossed government action is needed. All groups that exceed this benchmark need to be compensated. The notation demands to draw a line between even and odd group numbers. For even group numbers a majority is reached when $N_{W;even} \geq \frac{N+2}{2}$, for odd numbers a majority is reached when $N_{W;odd} \geq \frac{N+1}{2}$. Compensation is only needed, when these majority rules are not met at the outset. The following formula shows how to calculate the losing groups that must be compensated to ensure a majority.

(3.2-3) $N_C = N_{L;j} - \frac{N+2}{2}$ for even groups

(3.2-4) $N_C = N_{L;j} - \frac{N+1}{2}$ for odd groups

The probabilities for a compensation case are:

(3.2-5) $\Pi_{even} = \frac{1}{2^N - 1}\sum_{j=N/2}^{N-1} \frac{N!}{N_{L;j}!\left(N - N_{L;j}\right)!}$ for even group numbers and

(3.2-6) $\Pi_{odd} = \frac{1}{2^N - 1}\sum_{j=\frac{N+1}{2}}^{N-1} \frac{N!}{N_{l;j}!\left(N - N_{L;j}\right)!}$ for odd group numbers,

Simply the formula adds up the probabilities $\left(\frac{1}{2^N - 1}\right)\left(\frac{N!}{N_{L;j}!\left(N - N_{L;j}\right)!}\right)$ for every number of *L* that need to be compensated to reach a majority. Indexes of the sum operator show all cases where compensation is necessary[7]. The situation is best explained using an example.

Example 1: Probability of a compensation case for 3 (N = 3) groups

In total there exist 8 ($2^N = 2^3$) possibilities to arrange winning groups (N_W) and losing groups (N_L). One possibility is eliminated as the Kaldor Hicks criterion is not met. So, there remain 7 possibilities to arrange the two types ($2^N - 1$ or $2^3 - 1$ respectively). It is obvious that a transfer is only needed when more than half of the groups lose from the reform. Thus, whenever N_L is smaller than two a compensation is not necessary (this constraint is shown by the sum operator). Compensation cases are only those cases that exactly involve two losing groups. It can be seen that three ways exist to arrange two losing groups and one winning group $\left(\frac{N!}{N_{L;j}!\left(N - N_{L;j}\right)!} = \frac{3!}{2!\left(3-2\right)!} = 3\right)$.

As there is a total of seven cases and only three are compensation cases, the probability of a compensation case is 3/7.

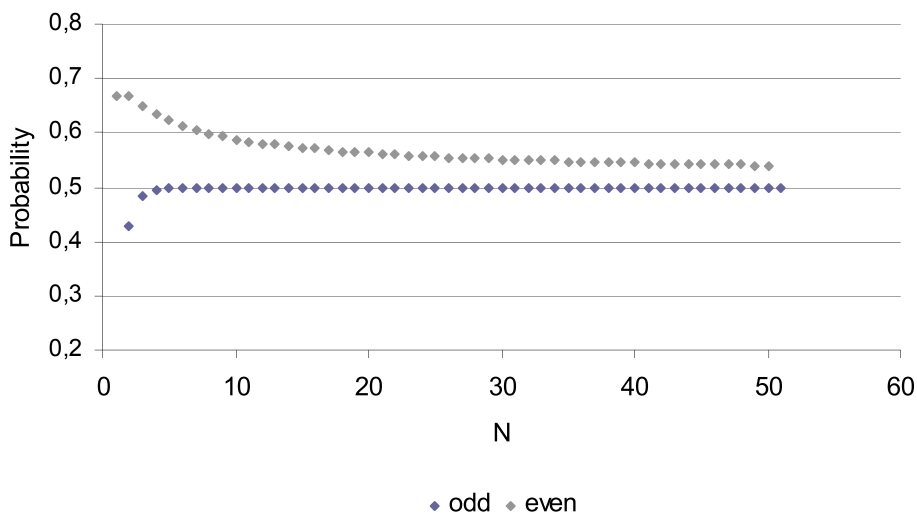
[7] Note if all groups lose that is if *L*=*N* the Kaldor- Hicks Criterion is no longer met. Thus this situation is not considered as a Compensation case.

Table 1: Probability of a Compensation Case

case	*possible arrangements of three groups*	*number of losing groups*	*cumulated probability for number of losing groups*	*compensation/no compensation*	*probability for a compensation case*
1	*W W W*	*L = 0*	*1/7*	*no compensation*	
2	*W W L*	*L = 1*	*3/7*	*no Compensation*	
3	*W L W*				
4	*L W W*				
5	*W L L*	*L = 2*	*3/7*	*compensation*	*3/7*
6	*L W L*				
7	*L L W*				
8	*L L L*	*L = 3*	*0*	*impossible (Kaldor Hicks)*	

The formulas (3.2-5 and (3.2-6 above yield the following results for the probability of a compensation case. For odd group numbers Π_{odd} turns out to be constant at 0.5 from 29 groups onwards. For even group numbers Figure 1 shows that Π_{even} converges to 0.5 with an increasing group number. Thus the probability that groups are to be compensated to reach a majority decreases with a higher group number in this case. Note that different results only accrue to the definition of the majority.

Figure 1: Probability for Compensation



The question becomes more obvious when expected compensation payments are added to the framework.

It is assumed that losses are constant, no matter to what degree the population is fragmented. Thus costs for groups are $\frac{Y}{N_L}$. The fraction of losses then resembles the fraction of losing groups. For example 100% of losing groups bear 100% of all losses. If a government needs to compensate 50% of the losing groups, it needs to pay 50% of the total losses. Crucial for the expected costs of a reform is then the probability of a compensation case and the question of how many groups or respectively what fraction of losing groups need to be compensated in that special case.

Expected compensation costs then are computed with the following formula:

(3.2-7) $E(C(N_{even})) = Y \frac{1}{2^N - 1} \sum_{N_{L;j} = \frac{N}{2}}^{N-1} \frac{N!}{N_{L;j}!\left(N - N_{L;j}\right)!} \frac{N_{L;j} - (\frac{N}{2} - 1)}{N_{L;j}}$ for even group numbers

(3.2-8) $E(C(N_{odd})) = Y \frac{1}{2^N - 1} \sum_{N_{L;j} = \frac{N+1}{2}}^{N-1} \frac{N!}{N_{L;j}!\left(N - N_{L;j}\right)!} \frac{N_{L;j} - (\frac{N}{2} - \frac{1}{2})}{N_{L;j}}$ for odd group numbers.

As the formula contains faculties it is not differentiable and therefore it is not possible to examine the effect of N any closer. To exemplify the formula, an example is presented.

Example 2: Expected Costs for the case of three groups

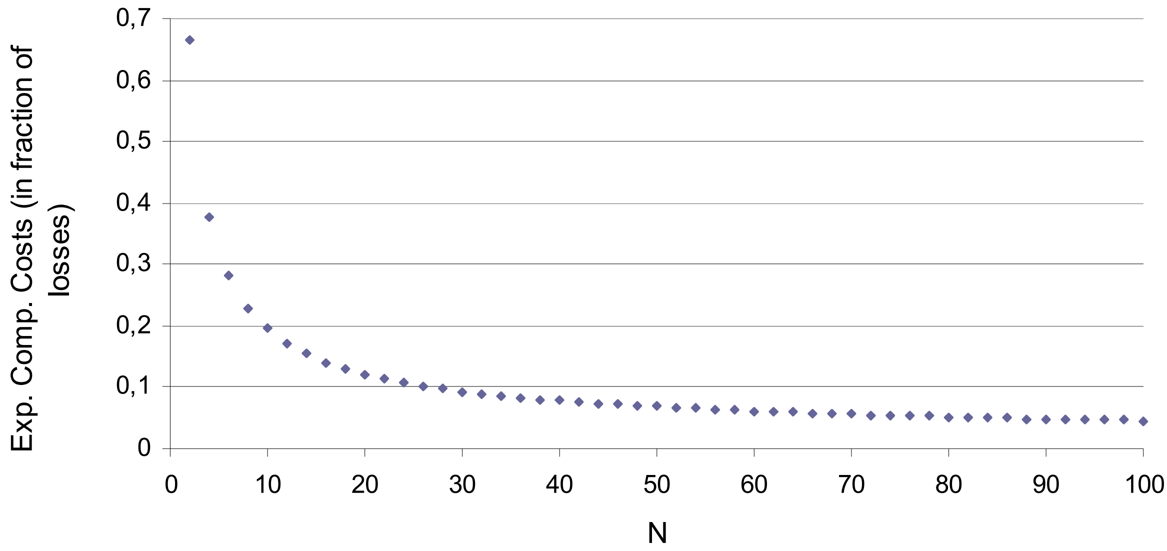
Again we analyse the case of three groups. Suppose that total losses are Y=70. The only compensation case is the case with two losing groups (L=2), with the probability of $\frac{3}{7}$ *as was shown above. In this case, only one losing group needs to be compensated (*$N_{L;2} - (\frac{N}{2} - \frac{1}{2}) = 2 - (\frac{3}{2} - \frac{1}{2}) = 1$*) to achieve the majority. Therefore half of the losing groups have to be compensated* $\left(\frac{N_{L;2} - (\frac{N}{2} - \frac{1}{2})}{N_{L;2}} = \frac{2 - (\frac{3}{2} - \frac{1}{2})}{2} = \frac{1}{2} \right)$ *and costs amount to the half of the total losses times the probability that this case with L=2 occurs.*

Table 2: Expected Costs

degree of fragmentation	3 groups			
losses	*total=70*			
compensation case	$3/7$	*with two losing groups*	*cost per group =* $70/2=35$	*compensate one group*
expected compensation costs				$35 \cdot 3/7 = 15$

Figure 2 shows expected compensation payments measured in the fraction of losses for even group numbers. [8]

Figure 2: Expected Costs



Expected compensation payments decline with a rising group number. The model thus clearly shows that an increasing group number fosters rather than hinders reform. Thus a decision maker is on average better off with a high group number, independent of the projects and reforms planned. Of course there may be projects

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[8] *Here only even group numbers will be considered. The case for odd group numbers resembles the case for even numbers. Therefore there is no need to consider both. Results for odd group numbers are presented in the Appendix.*

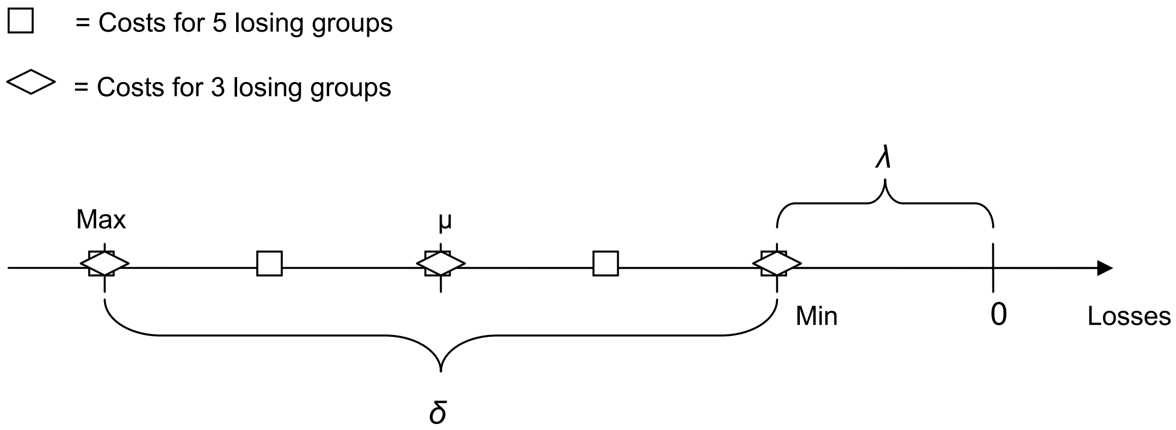
that would be less costly with a lower group number but on average, especially when the decision maker is unsure about his actions, higher group numbers are more advantageous.

3.3 Differing Losses

The model presented so far shows only the basic idea. To broaden the hypothesis the paper introduces differing losses for the groups, as it seems unlikely that all losing groups incur the same losses. Moreover different groups will have different losses. In this case it is no longer irrelevant, which group is compensated. The government will always try to compensate the group with the lowest costs to obtain a majority for the reform. Thus, compensation costs may decline by compensating such groups that bear lower losses than other groups. To calculate the exact compensation costs some assumptions about the loss function have to be made. This can be intricate, as it may be hard to construct a realistic cost function and these cost functions may be different from case to case.

Notwithstanding these problems, the paper makes some assumptions about the reform losses $C(N;N_{L;j;};k)$. These losses or costs depend on the total number of groups N, the loss of the group in question demarked by k, and the total number of losing groups $N_{L;j}$. In this case N is only relevant for the possible number of losing groups. The amount of total losses is constant and individual losses depend on the number of losing groups ($N_{L;j}$). Note that assumptions that have already been made in the basic version still hold, except for the assumption of a uniform distribution of losses. Total losses are still constant but the distribution is variable. The loss function is exemplified in Chart 1.

Chart 1: Differing Losses



- Reform costs or losses are symmetrically distributed around the mean μ .
- μ has distance λ from the point of origin and the amplitude of the whole distribution is δ , so that the expected loss is $E(y_j) = \lambda + \frac{\delta}{2}$.
- Maxima and Minima of the distribution are assumed to be constant. This means the variance of the distribution declines with more losing groups and intervals between losing groups decline as is the case with rising group numbers.
- No group considered has negative costs, that means $\lambda > \frac{\delta}{2}$, $\lambda > 0$ and $\frac{\delta}{2} > 0$.

To exemplify the cost function an example is presented.

Example 3: Losses for losing groups

Suppose we have three losing groups, which are symmetrically distributed around μ *and the maxima and minima of the distribution are fixed. Each group has individual costs* y_1, y_2 *and* y_3. *Y is constant and consists of* y_1, y_2 *and* y_3 *weighed by the fraction of losing groups they present.*

Table 3: Individual Losses wit Variable Losses

losing groups	*losses*		*fraction of losing groups*
$N_{L;1}$	$y_1: C(N_{L;j=3;k=1};r) = \lambda = \lambda + \frac{1-1}{3-1}\delta$	*minimal loss*	*1/3*
$N_{L;2}$	$y_2: C(N_{L;3;2};r) = \lambda + \frac{1}{2}\delta = \lambda + \frac{2-1}{3-1}\delta$	*mean of loss*	*1/3*
$N_{L;3}$	$y_3: C(N_{L;3;3};r) = \lambda + \delta = \lambda + \frac{3-1}{3-1}\delta$	*maximal loss*	*1/3*
$N_{L;1}+N_{L;2}+N_{L;3}$	$Y = \frac{y_1+y_2+y_3}{3} = \frac{1}{3}\lambda + \frac{1}{3}(\lambda + \frac{1}{2}\delta) + \frac{1}{3}(\lambda + \delta) = \lambda + \frac{1}{2}\delta$		

Of course one needs to pay attention to the size of δ and λ but the results do not depend on the choice of these parameters. Individual losses (y_i) naturally depend on the number of losing groups (N_{Lj}) and thus on the total number of groups (N). Compensation costs are then based on these individual losses and the amount of losing groups that needs to be compensated by the government. As in the basic version the compensation costs are multiplied with their own probabilities and the probability of a compensation case in general.

To calculate compensation costs individual costs are to be added according to how many losing groups are to be compensated. Compensation starts with the group that has the lowest losses and proceeds to the next group with the second lowest losses and so forth as the majority is reached. The following formula is used to add these costs.

(3.3-1) $C = \sum_{k=0}^{k=N_{L;j}-\frac{N}{2}-1} \frac{1}{N_{L;j}} \left(\frac{k\delta}{N_{L;j}-1} + \lambda\right)$ for even and

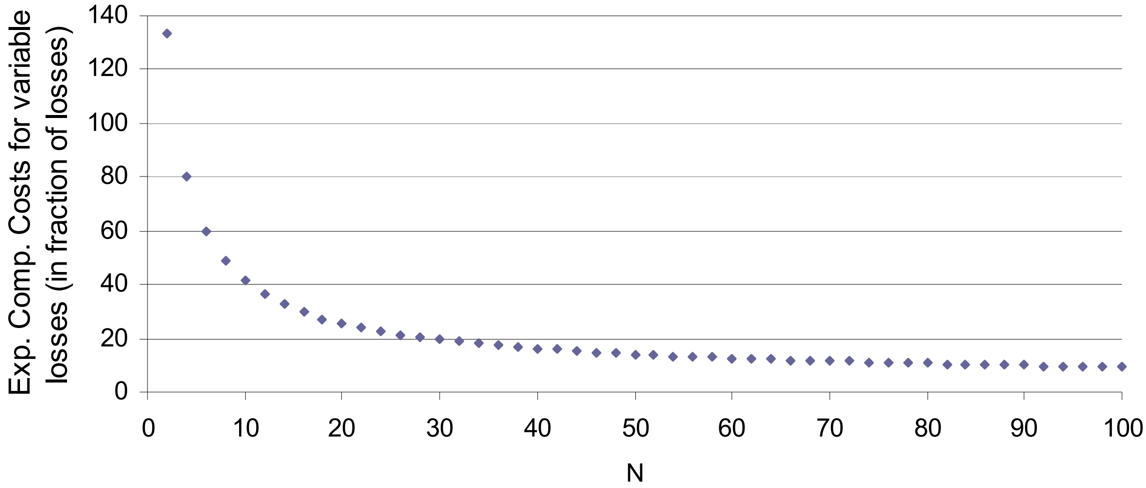
(3.3-2) $C = \sum_{k=0}^{k=L_j-\frac{N-1}{2}-1} \frac{1}{N_{L;j}} \left(\frac{k\delta}{N_{L;j}-1} + \lambda\right)$ for odd numbers respectively.

Expected Costs then are:

(3.3-3) $E(C(N_{even})) = \sum_{N_{L;j}=\frac{N}{2}}^{N-1} \left(\frac{1}{2^{N-1}} \frac{N!}{N_{L;j}!\left(N-N_{L;j}\right)!} \frac{1}{N_{L;j}} \sum_{k=0}^{k=N_{L;j}-\frac{N}{2}-1} \left(\lambda + \frac{k\delta}{N_{L;j}-1}\right) \right)$ for even group numbers, where j represents the distinct number of losing groups.

Figure 3 shows that costs tend to fall with increasing group numbers, as in the basic version. On average, differences in costs tend to decrease with increasing group numbers. For the figure the values of δ =100 and λ = 200 are chosen.

Figure 3: Expected Costs (Differing Losses)



Expected payments with differing losses tend to fall with an increasing group number.[9] The result however depends on the loss distribution and therefore this result does not hold for every distribution of losses. However, when total losses are given differing losses will always outperform situations with equal losses, as differing losses allow the authority to compensate the groups that have lower costs first.

As a second expansion transaction costs are included into the framework to make the model more realistic.

3.4 Including transaction costs

As already mentioned, central to compensation payments are transaction costs. Compensation payments will induce transaction costs as every economic transaction does. Here it is assumed that transfers are paid from a general budget. How this budget is accumulated and what transaction costs are involved in this process are neglected, as was explained in section 3. We are only interested in the transaction costs that occur in spending this budget, such as wages of bureaucrats, problems in identifying the groups that are be to compensated, time consumed during the decision or simply bureaucratic costs. Transaction costs in spending a budget are probably as high as in the case of providing a budget (see section 3.1.). Here as well transaction costs may depend on the type of compensation paid.

[9] Using odd group numbers, the results are nearly the same. Results can be found in the Appendix.

Of course reform can only be beneficial if total costs composed of transaction costs *(TC)* and losses are lower than the benefits. Thus:

$\sum_{N=1}^{N}$ *Benefits-Losses-Transaction Costs* > *0* or to be more concrete

(3.4-1) $\sum_{i=1}^{N_W} x_i - \sum_{j=1}^{N_L} y_j - TC$

The formula is only an expansion of the Kaldor Hicks criterion referred to above. The paper discusses two possibilities to integrate transaction costs into the model that are entailed to the process of paying transfers. The first possibility is to consider individuals being compensated. The more individuals are compensated the higher the bureaucratic costs. The transaction cost function would then take the form of:

(3.4-2) $TC(N_{even}) = \alpha E(C(N_{even}))$

where α represents the distinct value of transaction costs. It is obvious, that α must exceed zero but has no upper limit. Note that when α exceeds one the transaction costs would be higher than the original costs. As transaction costs are proportional to expected costs, the shape of the transaction costs curve is analogous to the compensation payment. The lower the number of groups the higher the number of compensated individuals and the higher the transaction costs. It seems quite clear that α only shifts the cost curve. The higher α, the more intense is the shift[10]. Including transaction costs formerly beneficial reforms might then become inefficient.

The second possibility is that transaction costs are dependent on the number of compensated groups. Suppose that each group has its own distribution system that squanders a part of the transfers independent of the group's size. The European Union can be seen as an example. Here not individuals but countries are compensated. The number of groups compensated can be easily computed

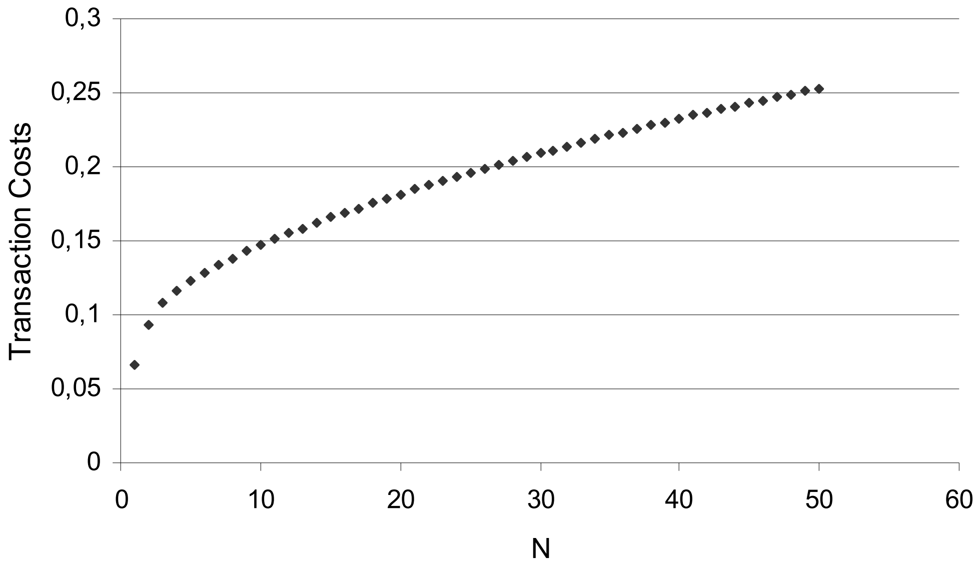
(3.4-3) $TC(N_{even}) = \beta(N_{L;j} - \frac{N-2}{2})$

for even group numbers, where β represents the value of transaction costs with $0 < \beta$. Even in the absence of transaction costs it can easily be seen that the number

[10] The reaction is analogous to odd group numbers. The Results for odd numbers are shown in the Appendix.

of groups that have to be compensated increases with the total group number. This strongly contradicts the hypothesis presented above that a higher group number decreases reform costs. Instead reforms become more costly the higher the group number as β -transaction costs rise. This can clearly be seen in figure 4.

Figure 4: Transaction Costs ($\beta = 0.1$)



The total effect however will be ambiguous. As β transaction costs rise with a rising group number, normal compensation costs will fall as has been shown.

Total expected costs equal[11]:

(3.4-4)

$$E(C(N_{even})) = \beta \frac{1}{2^N - 1} \sum_{N_{L;j}=\frac{N}{2}}^{N-1} \frac{N!}{N_{L;j}!\left(N - N_{L;j}\right)!}\left(N_{L;j} - \frac{N-2}{2}\right) + \frac{1}{2^N - 1} Y \sum_{N_{L;j}=\frac{N}{2}}^{N-1} \frac{N!}{N_{L;j}!\left(N - N_{L;j}\right)!} \frac{N_{L;j} - (\frac{N}{2} - 1)}{N_{L;j}}$$

After some transformation we obtain the following:

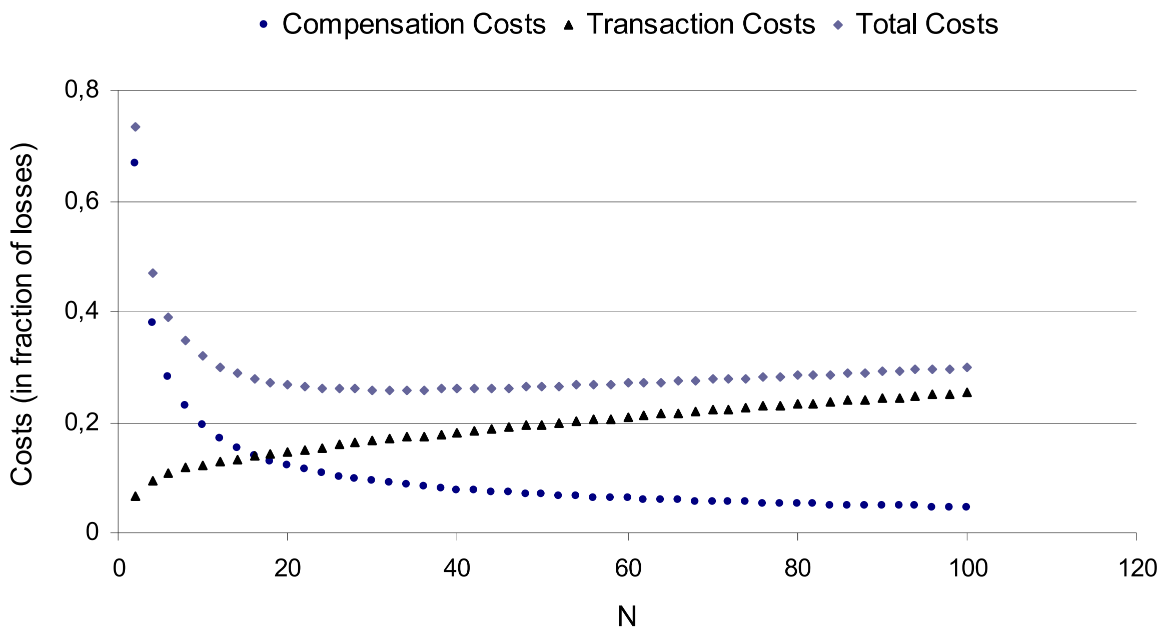
(3.4-5) $$E(C(N_{even})) = \frac{1}{2^N - 1} \sum_{N_{L;j}=\frac{N}{2}}^{N-1} \frac{N!}{N_{L;j}!\left(N - N_{L;j}\right)!}\left(N_{L;j} - \frac{N-2}{2}\right)\left(\beta + \frac{Y}{N_{L;j}}\right)$$

It can easily be seen that the reaction of total expected costs depends on two variables: β and N. The higher β the higher is the influence of transaction costs and the lower the optimal group size. It is clear that total costs have a minimum. Reform costs induced by transfers tend to decrease steadily with the number of groups and

[11] The results for odd numbers are analogous and can be found in the Appendix.

transaction costs will rise with a higher number of groups. In Figure 5 a value of β = 0.1 is chosen as reference point.

Figure 5: Compensation Costs and Transaction Costs



The minimum of total costs approximates 24 groups and total costs of 0.219. For odd numbers the minimum is reached with 17 groups and total costs of 0.172. With varying β (the value for transaction costs) the minimum will clearly show different optimal group numbers and total costs. Each case has to be computed separately. Nevertheless the chosen value of β is not unrealistic, regarding the results in section 3. The connected optimal group size of a population is actually quite high (24 or 17 respectively). In general politicians stick to the line of their party and the number of parties will in most cases not exceed 17. It is unlikely that more than 17 groups exist in a regular party system. In most countries there are either two parties (as in the case of the United States) or there is a barring clause restricting the number of parties in parliament (as in the case of Germany). Even groups in most international organisations are not greatly in excess of of 24. The EU has 27 members, the OECD 30, NATO 26, Nafta 3 and Mercosur 8 (of which some are only associates). It should be noted however that with a lower β the results would differ in so far, as group numbers for the total cost minimum are even higher and vice versa. It can be concluded that the hypothesis that a higher group number is favourable for reform holds to a certain extent even taking into account transaction costs.

4 Conclusion

Models constructed to explain reform delays or budget deficits normally focus on their origins, their costs and their impact. To overcome the Status Quo it may help to offer compensation payments but this part of the problem has not yet been analysed yet. This is a serious shortcoming as these transfers are an important part of reform costs. One can hardly imagine a situation where reform was pushed through without any compensation for the losing groups. Transfers are central to reform costs and thus a reduction of these costs may help to foster reforms. To lower the transfers it is necessary to decrease the number of groups that are compensated. This is actually nearly impossible, as groups such as countries, federal states or parties are hard to treat differently. Creating subgroups for compensation payments is not feasible. Against this background, a fragmented population can be an advantage to the policy maker.

This intuitive result is demonstrated by the presented model. While “common pool” models show negative effects for higher group numbers in the emergence of the problem of deadlocks, this paper shows positive effects for the case of a higher group number. These findings are still valid in the case of differing losses and certain transaction costs as shown. A higher number of groups avoids overcompensation and makes reform cheaper. Therefore, fragmentation is very attractive for governments. On average, a greater level of fragmentation within the population makes reform cheaper. This is clearly an argument for more and smaller sub-national states, a greater number of parties in parliament or more member states in an international organization. The result can only be applied to fundamental decisions that cannot be reversed easily such as the number of federal states or a decision on a barring clause for the number of parties in parliament. In other situations, that are not fundamental, groups can be defined case to case. An example would be the fragmentation of the postal service as happened in Germany in 2007. During the discussion about minimum wages in the post sector companies were divided into companies that either deliver letters or companies that deliver packages. This is clearly a fragmentation of the sector in two groups. This fragmentation was only defined in connection with the reform and was not a fundamental decision. However, the groups have to be involved in the same poll. Otherwise the majority rule has no consequence and the predictions of the model do not hold. So the model does not demand to multiply labour organisations as these do not vote in the same poll.

In general however, depending on the decision, more fragmentation will rather foster than delay the elimination of reform deadlocks, as it helps to overcome the problem of inseparable groups. However, the model presented here is highly stylized. The sowed results cannot be regarded in isolation. They will also depend on other factors such as transaction costs and voting rules. In reality, group sizes will not be constant, as assumed in the model. Neither in institutions like the European Union nor in national parliaments groups will be of the same size and have the same political power. So, the model offers many opportunities for future research.

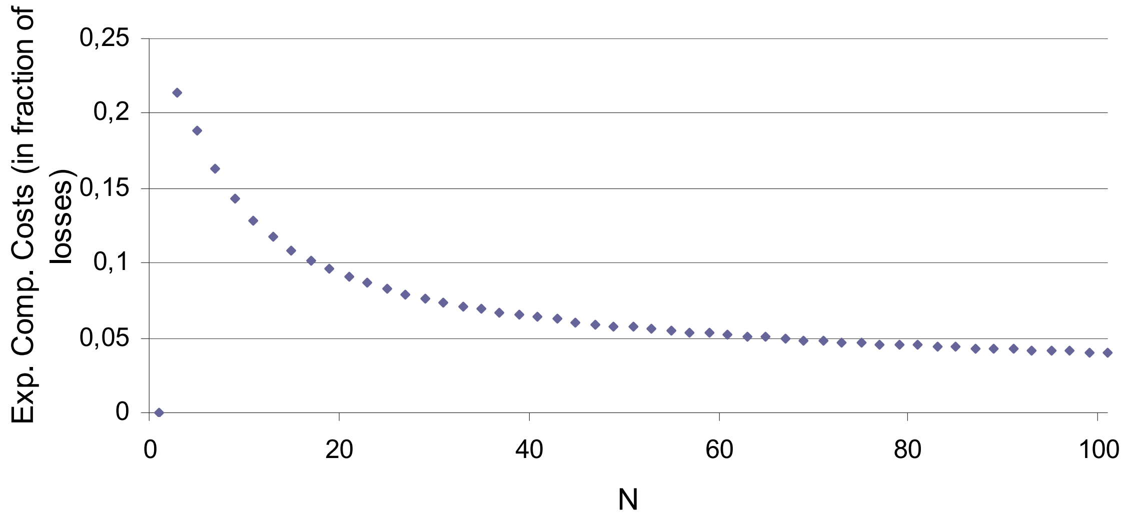
The result is quite important. The model shows a possibility for the government how to decrease reform costs even when groups are indivisible. Thereby it makes a crucial contribution to fragmentation and federalism. It lays the groundwork for interesting political discussions and further research.

5 Appendix

The Appendix shows the results for odd numbers. Parameters are chosen as in the foregoing discussion (λ=200, δ= 100, β=0.1). The results for constant costs per group, variable costs per group and one sort of transaction costs are shown (i, ii, iii). Formulas and Figures are presented.

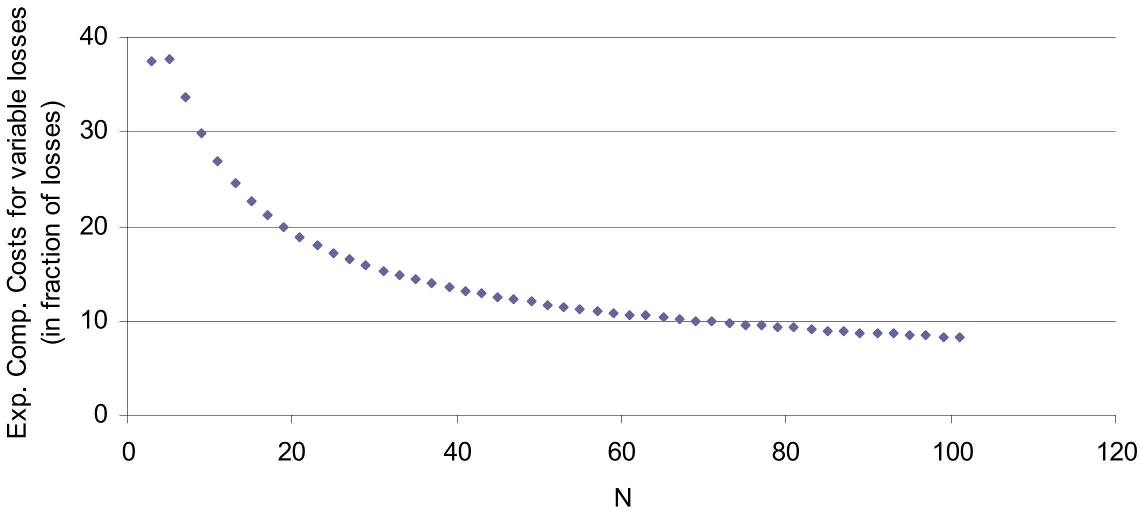
Expected Costs with Constant Costs (Odd No. of Groups)

I. $$E(C(N_{odd})) = \frac{1}{2^N - 1} Y \sum_{N_{L;j}=\frac{N+1}{2}}^{N-1} \frac{N!}{N_{L;j}!\left(N - N_{L;j}\right)!} \frac{N_{L;j} - (\frac{N}{2} - \frac{1}{2})}{N_{L;j}}$$



II. Expected Costs with Variable Costs (Odd No. of Groups)

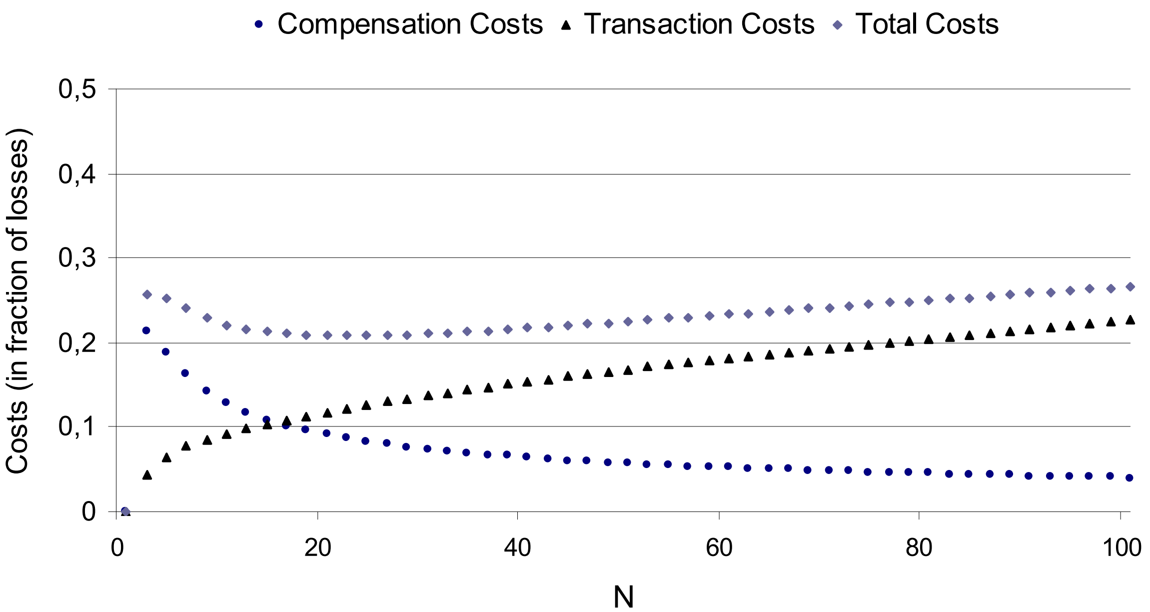
$$E(C(N)_{even})) = \sum_{N_{L;j}=\frac{N+1}{2}}^{N-1} \left(\frac{1}{2^{N-1}} \frac{N!}{N_{L;j}!\left(N - N_{L;j}\right)!} \frac{1}{N_{L;j}} \sum_{k=0}^{k=N_{L;j}-\frac{N+1}{2}-1} (\lambda + \frac{k\delta}{N_{L;j} - 1}) \right)$$



III. Transaction Costs and Total Costs

$$TC(N)_{odd} = \beta(N_{L;j} - \frac{N-1}{2})$$

$$E(C(N)_{odd})) = \beta \frac{1}{2^N - 1} \sum_{N_{L;j}=\frac{N+1}{2}}^{N-1} \frac{N!}{N_{L;j}!\left(N-N_{L;j}\right)!}\left(N_{L;j} - \frac{N-1}{2}\right) + \frac{1}{2^N - 1} Y \sum_{N_{L;j}=\frac{N+1}{2}}^{N-1} \frac{N!}{N_{L;j}!\left(N-N_{L;j}\right)!} \frac{2N_{L;j} - (N-1)}{2N_{L;j}}$$



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