

Revisiting the “Decentralization Theorem”: On the Role of Externalities

Marko Köthenbürger
CES, University of Munich and CESifo*

Abstract

The “Decentralization Theorem” (Oates, 1972) is central to the discussion of fiscal federalism. We revisit the role of the strength of consumption spill-overs in evaluating the merits of (de)centralization. Unlike the general prediction, a higher degree of spill-overs may weaken demand for centralization. We show that the result relates to the differential in expenditures on public consumption. Provided decentralized choices yield higher levels of public expenditure, a rise in spill-overs allows residents to enjoy higher utility gains under decentralization.

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*Schackstr. 4, 80539 Munich, Germany, email: mkoethen@ces.vwl.uni-muenchen.de, Phone: [49](89)2180-3021, fax [49](89)397303

1 Introduction

The question whether fiscal responsibilities should be assigned to a (de)central authority has long been debated in public economics. The discussion resorts to Oates' *Decentralization Theorem* (Oates, 1972) stating that, in the absence of cost savings from centralization and interjurisdictional externalities, fiscal responsibilities should be decentralized. This argument implicitly assumes that the center is unresponsive to preference heterogeneity, thereby only able to implement uniform policies. More specifically, "[...] individual local governments are presumably much closer to the people [...], they possess knowledge of both local preferences and cost conditions that a central agency is unlikely to have" (Oates, 1999, p. 1123).¹ In case the geographical scope of a jurisdiction falls short of the spatial pattern of spending benefits, the optimal assignment of policy tasks deduces from trading off the welfare costs of policy uniformity against the welfare gains from internalizing spill-overs in policy-making.²

Consider a country consisting of two regions which differ in their preferences for local public goods, which exhibit regional spill-overs. In the setting fiscal decentralization allows for better matching of public good provision to local tastes, whereas under centralization uniform provision ignores local taste heterogeneity but internalizes spill-overs. The paper analyses how the difference in the utility of centralization and decentralization changes with respect to the spill-over parameter.³ It is shown that the welfare consequences of a marginal rise in consumption spill-over relates to the amount of public expenditures chosen under (de)centralization. The rationale is that, provided a decentralized choice of public expenditures yields a larger amount of public service provision, a rise in spill-overs gives residents

¹The failure to adapt to taste differences is central to recent analyses of fiscal federalism - see e.g. Alesina and Spolaore (1997), Bolton and Roland (1997), Tabellini (2003), Brueckner (2004), Alesina et al. (2005), and Brueckner (2006).

²The posited trade-off is the essence of much of the discussion not only related to fiscal unions, but also to monetary unions and free trade areas; see e.g. Alesina and Barro (2002).

³In general, two types of welfare comparisons can be distinguished. The first one is to look at the welfare difference as a function of spill-overs irrespectively of the sign of the difference. The second one is to confine attention to spill-over values at which the sign of the welfare differential changes. The paper deals with the former.

higher utility gains when fiscal authority is decentralized. Hence, decentralization becomes more preferred in terms of welfare. The primitives of the preferences function and the extent to which public consumption is non-rival matter for the expenditure ranking across fiscal regimes. We characterize instances in which a perturbation of the spill-over renders centralization less preferred to decentralization both when the degree of rivalry in public consumption is small and high. The latter finding may be unexpected given the virtue of centralization to internalize spill-overs.

To the best of our knowledge, the result is unmentioned in previous analyses of fiscal federalism, resorting to a uniformity-externality trade-off. The paper complements earlier political-economy research on the merits of (de)centralization (Lockwood, 2002, and Besley and Coate, 2003). Therein, the equilibrium policy entails regionally differentiated public good bundles. The welfare trade-off differently follows from the political-economy deficiencies of centralized systems weighed up against the failure of internalization in decentralized systems.⁴ Relative welfare may not vary monotonically with the strength of consumption spill-overs. The finding reflects inefficiencies inherent either to the formation of minimum winning coalitions or to the strategic delegation of politicians to a central legislature. Both types of political deficiencies are absent in our model. Rather, we resort to a archetypical model of fiscal federalism hypothesizing benevolent governments; a setting which is most susceptible of predicting a monotone uniformity-externality trade-off.

The remainder of the paper is organized as follows. Section 2 introduces the model. The welfare analysis of (de)centralization is provided in Section 3. Section 4 concludes.

⁴Interestingly, the contributions point to a normative interpretation of Oates' uniformity assumption. With a centralized legislature an exogenously imposed policy uniformity requirement potentially enhances welfare (as policy uniformity reduces the incentives for pork-barrel spending).

2 The Model

Private Sector Consider 2 regions each being inhabited by a representative household whose preferences are defined over private and public consumption and are quasi-linear in private consumption, $u^i(c^i, G^i) = c^i + \theta^i v(G^i)$ where $\theta^i > 0$. $v(G^i)$ is continuously differentiable and satisfies $v'(G^i) > 0$, $v''(G^i) < 0$, and $\lim_{G^i \rightarrow 0} v'(G^i) = \infty$. Private consumption c^i equals the endowment I^i minus taxes levied by the government t^i , $c^i = I^i - t^i$. Public consumption in region i is

$$G^i = g^i + \alpha g^j, \quad i \neq j. \quad (1)$$

Region i benefits from resources spent on public consumption in the neighbor state at a rate $\alpha \in [0, 1)$.⁵ Regions differ with respect to preferences for public consumption. The preference type of a region is denoted by superscripts h and l with $\theta^h > \theta^l > 0$.⁶

Public Sector There are two types of policy regimes. With a central legislature we consider the type of policy rigidity conjectured by Oates (1972). Rather than imposing uniform policies, we could alternatively treat policy uniformity as an endogenous, equilibrium outcome along the lines suggested by Klibanoff and Poitevin (1999).⁷ We suppress such an equilibrium analysis as the paper's findings would not change.

⁵We refrain from a pure public good ($\alpha = 1$), not because it is less important, but because policy uniformity would be inherently related to the nature of the public good, rather than a deficiency of a central legislature.

⁶A perfect separation of preference types may follow from Tiebout-type sorting (Tiebout, 1956). The analysis extends to heterogeneous regional populations which imperfectly sort; most straightforwardly when the public good g^i is pure from region i 's perspective. In this case θ^i captures the average preference type in region i .

⁷To grasp the intuition, assume the central government has access to non-uniform taxes and transfers, but - following Oates (1972) - it lacks information on local preferences. In such a framework, local governments have an incentive not to self-select into tax-transfer programs whenever they expect the central government to adjust its policy subsequent to the truthful revelation of information. Local governments will misrepresent preference-related information; most notably the low preference region which would otherwise become a significant net-contributors to the federal tax-transfer scheme. The strategic behavior coerces the federal government to uniformly provide public services.

The central choice of public expenditures g follows from⁸

$$\max_g I^h + I^l - 2t + (\theta^h + \theta^l)v((1 + \alpha)g) \quad \text{s.t.} \quad t = g.$$

The first-order condition is

$$(1 + \alpha) \frac{\theta^h + \theta^l}{2} v'((1 + \alpha)g) = 1, \quad (2)$$

which implicitly defines the optimal level of public expenditure, denoted by \tilde{g} , as a continuous function of α, θ^h and θ^l . The policy choice is only optimal for a hypothetical region endowed with average preferences $(\theta^h + \theta^l)/2$. Countervailing the allocative cost of preference averaging, the choice reflects the expenditure spill-over α .

With decentralization each region independently determines its most preferred level of public expenditure. Taking the policy of the neighbor state g^j as given, the government in region i solves

$$\max_{g^i} I^i - t^i + \theta^i v(g^i + \alpha g^j) \quad \text{s.t.} \quad g^i = t^i, \quad i \neq j.$$

In public good contribution games agents may optimally decide not to contribute to the public good; even when $v'(G^i)$ goes to infinity as G^i becomes small (Bergstrom et al., 1986). Motivated by the paper's focus on second-order welfare effects, we consider $\{g^i > 0\}_{i=1,2}$. It allows for adjustments in both contribution margins in response to changes in spill-overs; thereby offering a comprehensive analysis of second-order welfare effects. At an interior solution the first-order condition

$$\theta^i v'(g^i + \alpha g^j) = 1, \quad i \neq j, \quad (3)$$

yields the optimal best-response as a continuous function of α, θ^i and g^j , i.e. $\bar{g}^i = r^i(g^j, \alpha, \theta^i)$. Mutually consistency of responses requires that $\bar{g}^i = r^i(\bar{g}^j, \alpha, \theta^i)$ and $\bar{g}^j = r^j(\bar{g}^i, \alpha, \theta^j)$ where $\bar{g}^i(\alpha, \theta^i, \theta^j), \bar{g}^j(\bar{\alpha}, \theta^i, \theta^j)$ is the Nash equilibrium. The policy choices adapt to regional

⁸Regionally-differentiated tax rates would not change the analysis as preferences are quasi-linear in private consumption.

preferences, but fail to account for the spill-over. Straightforwardly, the public good will be under-consumed in a Nash equilibrium when $\alpha \in (0, 1)$.

Differentiation of the mutually consistent best-responses gives

$$\frac{d\bar{g}^i}{d\alpha} = \frac{1}{1 - r_g^i r_g^j} (r_\alpha^i + r_g^i r_\alpha^j), \quad i \neq j, \quad (4)$$

with stability requiring $1 - r_g^i r_g^j > 0$.

3 Evaluating Relative Welfare

In this section we formally revisit the question of the relative merit of (de)centralization. The optimal policy choices (2) and (3) may confirm the predominant view that demand for centralization widens as the consumption spill-over becomes more pronounced. To assess the validity of the reasoning, we consider preferences to be

$$v(G) = \begin{cases} \frac{\gamma}{1+\gamma} G^{\frac{1+\gamma}{\gamma}} & \gamma \in \mathbb{R}_- \setminus \{-1\} \\ \ln G & \gamma = -1 \end{cases}, \quad (5)$$

where γ^{-1} is the elasticity of the marginal utility of public consumption, $v''(G) \frac{G}{v'(G)} < 0$. The simplification is adopted for expositional clarity as it allows for a transparent and tractable characterization of how the curvature of $v(G)$ influences relative welfare. Denoting W^c (W^d) as utilitarian welfare $u^h(\cdot) + u^l(\cdot)$ under centralization (decentralization) and \mathcal{W} as the welfare differential $W^c - W^d$, we have:

Proposition: *Assume preferences for public consumption to be iso-elastic.*

(i) *Let $\gamma < -1$. A marginal rise in spill-overs decreases the welfare differential \mathcal{W} if spill-overs are low.*

(ii) *Let $\gamma > -1$ and $|\gamma|$ to be small. A marginal rise in spill-overs decreases the welfare differential \mathcal{W} if spill-overs are high.*

(iii) *Let $\gamma = -1$. A marginal rise in spill-overs increases the welfare difference \mathcal{W} independently of the magnitude of spill-overs.*

A precise statement of the conditions related to part (i) and (ii) is given in the proof which is relegated to the Appendix. Applying the Envelope theorem, the marginal effect of a higher α on region i 's utility in a non-cooperative equilibrium is

$$\frac{d\bar{u}^i}{d\alpha} = \bar{g}^j + \alpha \frac{1}{1 - r_g^i r_g^j} (r_\alpha^j + r_g^j r_\alpha^i), \quad (6)$$

where by (3)

$$r_\alpha^j = -\bar{g}^i < 0 \quad \text{and} \quad r_g^j = -\alpha. \quad (7)$$

The first term in (6) gives the direct effect a change in α exerts on region i 's utility; just since region i benefits more from the neighbor's public good provision. Perhaps unexpected, but straightforwardly, the utility effect emanating from a downward adjustment in region i 's contribution level (i.e. the incentive to free-ride which is frequently considered to be the critical cost of decentralization) vanishes in equilibrium. The bracketed term captures how the retrenchment on the part of region j affects region i 's public consumption. Region j reduces its contribution (first term in brackets); a negative effect on utility which, since contribution levels are strategic substitutes, is attenuated by the equally diluted incentive of region i to contribute to the public good (second term in brackets).

As to welfare under centralization, the effect of a rise in spill-overs on W^c reads

$$\frac{dW^c}{d\alpha} = (\theta^h + \theta^l) v'(\tilde{G}) \tilde{g}, \quad (8)$$

which reflects the regions' improved joint consumption possibilities. Accounting for (2) and (4), the change in $\mathcal{W} = W^c - W^d$ is⁹

$$\frac{d\mathcal{W}}{d\alpha} = \frac{2}{1 + \alpha} \tilde{g} - (\bar{g}^i + \bar{g}^j) (1 - \alpha(1 - \alpha)). \quad (9)$$

To provide insight into the intuition for part (i) of the proposition, consider public consumption to be rival ($\alpha \rightarrow 0$). Evaluating the limit sign of (9) effectively involves a comparison

⁹Appendix A.2 contains a concise derivation of the expression.

of the amount of resources spent on public consumption under both modes of fiscal decision-making, $\bar{g}^h + \bar{g}^l$ and $2\tilde{g}$. Since optimal public expenditures deduce from $v'(G) = 1/\theta^i$ under decentralization and from $v'(G) = 2/(\theta^h + \theta^l)$ under centralization, the expenditure levels satisfy $\bar{g}^l < \tilde{g} < \bar{g}^h$ in the limit. The exact difference between the expenditure amounts is determined by how responsive $v'(G)$ is to changes in consumption. For instance, when $v'(G)$ is not too elastic (i.e. $\gamma^{-1} > -1$), we observe $\bar{g}^h \gg \tilde{g}$ with the consequence that aggregate expenditures in the uncoordinated equilibrium are more substantial, $\bar{g}^h + \bar{g}^l > 2\tilde{g}$. A higher externality now allows both regions to mutually benefit from the more generous uncoordinated public spending programs which rationalizes part (i) of the proposition.

A similar type of reasoning applies to part (ii). Provided public consumption tends to be non-rival ($\alpha \rightarrow 1$), regions will more amply benefit from a rise in spill-overs when fiscal authority is decentralized. The welfare impact of a higher spill-over is equal to the differential in public outlays $2\tilde{g} - (\bar{g}^h + \bar{g}^l)$. Unlike the previous case $\alpha \rightarrow 0$, it is now corrected by the free-riding behavior regions exhibit with decentralized choices (the welfare cost of which amounts to $\bar{g}^h + \bar{g}^l$)¹⁰. Netting out both effects, the welfare analysis reduces to a comparison of \tilde{g} and $\bar{g}^h + \bar{g}^l$ - see (9). To relate both terms, observe that $v'(G)$ converges to $1/\theta^i$ with decentralization and to $1/(\theta^h + \theta^l)$ with centralization. The uniform expenditure level exceeds the uncoordinated levels, $\tilde{g} > \bar{g}^h > \bar{g}^l$, which reflects the virtue of centralized policy making to account for spill-overs. $\bar{g}^h + \bar{g}^l$ will exceed \tilde{g} provided the advantage of internalization does not significantly translate into higher public expenditures; a property which holds when $v'(G)$ is sufficiently elastic (i.e. $\gamma^{-1} < -1$). The reasoning implicitly assumes that γ is close to 0. To see this firmly, note that the non-negativity constraint on region l 's public good contribution will be binding whenever it can sufficiently benefit from the neighbors contribution to the public good (high α). The incentive to spend on public consumption only preserves if the marginal utility of public consumption drops very slowly as α increases, i.e. $\gamma \rightarrow 0$. If

¹⁰See the Appendix for a derivation.

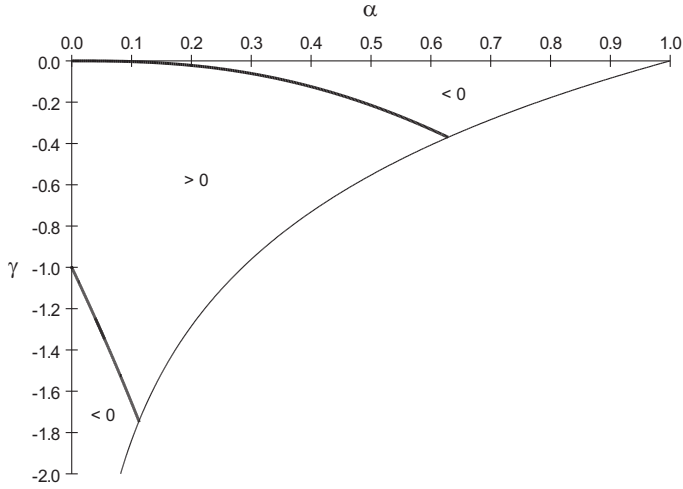


Figure 1: The sign of $\frac{d\mathcal{W}}{d\alpha}$ as a function of α and γ .

not, then there exist a critical level spill-over beyond which the non-negativity constraint on region l 's contribution becomes binding. This motivates the qualification on γ in part (ii) of the proposition.

Figure 1 provides an illustration of $\frac{d}{d\alpha}\mathcal{W}$ in the parameter space (α, γ) assuming $\theta^l = 2$ and $\theta^h = 7$. For all parameter combinations above the thin line both regions choose a positive contribution to the public good. The solid lines partition the space according to the sign of $\frac{d}{d\alpha}\mathcal{W}$. The limit reasoning presented above may suggest that the set of α -values supporting $\frac{d}{d\alpha}\mathcal{W} < 0$ is close to 0 and 1, respectively. The figure reveals that the range of α -values may well extend to degrees of rivalry sufficiently distinct from 0 and 1.

4 Concluding Comments

The paper provides a formal treatment of how relative welfare with (de)centralized policy relates to the strength of spill-overs in public consumption. Most of the discussion on the costs and benefits of fiscal federalism rests on a welfare trade-off which is taken to be monotone in the primitive of the economy. In contrast to the presumption, the analysis points to

a non-monotonic trade-off. A marginally higher degree of spill-overs may in fact undermine the well-being of constituents under centralization when compared with decentralization.

The paper investigates the welfare consequences of marginal changes in the primitives of the economy; thereby being of particular relevance in environments in which the complexity of the model excludes a direct comparison of welfare levels pertaining to both modes of fiscal governance.¹¹ Although simplified preference functions, to which analyses of (de)centralization predominantly resort, are in principle amenable to a perturbation analysis, they tend to suppress the identified rationales for the non-monotonicity of relative welfare - either because they lack concavity or are logarithmic in public consumption. For instance, Lockwood (2002) and Rubinchik-Pessach (2004) assume additively linear preferences. Differently, Besley and Coate (2003) resort to quasi-linear, logarithmic utility. Applied to uniform central policies, the non-monotonicity of \mathcal{W} in α evaporates for this class of preferences - see part (iii) of the proposition. The observation may explain why the paper's findings are unmentioned in previous literature.

A Proof

When preferences satisfy (5), the first-order conditions (2) and (3) yield as closed-form solutions of public expenditure levels

$$\tilde{g} = \left(\frac{2}{(\theta^h + \theta^l)(1 + \alpha)} \right)^\gamma \frac{1}{1 + \alpha} \quad \text{and} \quad \bar{g}^i = \frac{\left(\frac{1}{\theta^i}\right)^\gamma - \alpha \left(\frac{1}{\theta^j}\right)^\gamma}{1 - \alpha^2}, \quad i \neq j. \quad (10)$$

The contribution level \bar{g}^l may violate the non-negativity constraint. The condition guaranteeing $\bar{g}^l > 0$ reads

$$\alpha < \left(\frac{\theta^h}{\theta^l} \right)^\gamma. \quad (11)$$

¹¹At this point it might be informative to point out that the findings summarized in the Proposition do not presuppose a specific sign of \mathcal{W} . Simulations (available upon request) show that $\text{sign}\mathcal{W}$ and $\frac{d\mathcal{W}}{d\alpha} < 0$ arise in any combination.

We will next compute the derivative $\frac{d}{d\alpha}\mathcal{W}$. Inserting (7) into (6), we get

$$\frac{d\bar{u}^i}{d\alpha} = (1 + \alpha^2) \bar{g}^j - \alpha \bar{g}^i, \quad i \neq j. \quad (12)$$

Using the envelope theorem and (2) sequentially

$$\begin{aligned} \frac{dW^c}{d\alpha} &= (\theta^h + \theta^l) v'(\tilde{G}) \tilde{g} \\ &= \frac{2}{1 + \alpha} \tilde{g}. \end{aligned} \quad (13)$$

Differentiating $\mathcal{W} = W^c - W^d$ with respect to α and inserting (12) and (13)

$$\begin{aligned} \frac{d\mathcal{W}}{d\alpha} &= \frac{dW^c}{d\alpha} - \frac{dW^d}{d\alpha} \\ &= \frac{2}{1 + \alpha} \tilde{g} - (\bar{g}^h + \bar{g}^l) (1 - \alpha(1 - \alpha)). \end{aligned} \quad (14)$$

Note, the optimal policy choices (10) are continuous in α and so is (14).

We are now equipped to provide a proof of the three cases mentioned in the Proposition.

(i): Consider $\gamma < -1$. Following (10) we can state

$$\lim_{\alpha \rightarrow 0} \left\{ 2\tilde{g} - (\bar{g}^h + \bar{g}^l) \right\} = 2 \left(\frac{1}{2} (\theta^h + \theta^l) \right)^{-\gamma} - \left((\theta^h)^{-\gamma} + (\theta^l)^{-\gamma} \right).$$

The function $(\cdot)^{-\gamma}$ is convex since $\gamma < -1$. By the definition of the curvature property

$$\lim_{\alpha \rightarrow 0} \left\{ 2\tilde{g} - (\bar{g}^h + \bar{g}^l) \right\} < 0. \quad (15)$$

Combining (14) and (15) implies $\lim_{\alpha \rightarrow 0} \frac{d}{d\alpha}\mathcal{W} < 0$. Observe that the condition (11), guaranteeing $\bar{g}^l > 0$, holds for $\alpha \rightarrow 0$. Thus, invoking the continuity of (14) there exists a threshold $\bar{\alpha} \in (0, (\theta^h/\theta^l)^\gamma]$ with $\frac{d}{d\alpha}\mathcal{W} < 0, \forall \alpha \in (0, \bar{\alpha})$.

(ii): Consider $\gamma > -1$. Let α approach $(\theta^h/\theta^l)^\gamma$, i.e. the maximum value compatible with condition (11). Simultaneously, let γ approach 0 and -1 , respectively. Given by (10) and (14) the sign of the corresponding limit values is

$$\lim_{\alpha \rightarrow (\theta^h/\theta^l)^\gamma, \gamma \rightarrow 0} \frac{d\mathcal{W}}{d\alpha} < 0 \quad \text{and} \quad \lim_{\alpha \rightarrow (\theta^h/\theta^l)^\gamma, \gamma \rightarrow -1} \frac{d\mathcal{W}}{d\alpha} > 0.$$

Thus, by continuity of (14) there exists a $\gamma^* \in (-1, 0)$ and $\tilde{\alpha} \in (0, (\theta^h/\theta^l)^\gamma)$ with $\frac{d}{d\alpha}\mathcal{W} < 0$, $\forall(\alpha, \gamma) \in (\tilde{\alpha}, (\theta^h/\theta^l)^\gamma) \times (\gamma^*, 0)$.

(iii): Consider $\gamma = -1$. Evaluating (10) at $\gamma = -1$, inserting the respective expressions into (14) and rearranging yields

$$\frac{d\mathcal{W}}{d\alpha} = \frac{\theta^h + \theta^l}{1 + \alpha} \alpha(1 - \alpha). \quad (16)$$

The term is positive if and only if condition (11) holds. Thus, we can conclude $\frac{d}{d\alpha}\mathcal{W} > 0$, $\forall\alpha \in [0, \theta^l/\theta^h)$.

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