UPPSALA
UNIVERSITET

Uppsala Center for Fiscal Studies
Department of Economics

Working Paper 2012:12

Public Goods in a Voluntary Federal Union: Implications of a Participation Constraint

Thomas Aronsson, Luca Micheletto and Tomas Sjögren

Uppsala Center for Fiscal Studies
Department of Economics
Uppsala University
P.O. Box 513
SE-751 20 Uppsala
Sweden
Fax: +46 18 471 14 78

Working paper 2012:12
November 2012

Public Goods in a Voluntary Federal Union: Implications of a Participation Constraint

Thomas Aronsson, Luca Micheletto and Tomas Sjögren

Papers in the Working Paper Series are published on internet in PDF formats.
Download from http://ucfs.nek.uu.se/

Public Goods in a Voluntary Federal Union: Implications of a Participation Constraint*

Thomas Aronsson†, Luca Micheletto‡, Tomas Sjögren§

October 2012

Abstract

This paper re-examines the question of whether federal ex-post redistribution in terms of public funds leads to under-provision of public goods by adding the assumption that the member states are free to leave the economic federation. We show that federal ex-post redistribution leads to efficient provision of local and federal public goods under certain conditions.

JEL Classification: D61, H41, H77

Keywords: Public goods, fiscal federalism, ex-post redistribution.

*Research grants from the Bank of Sweden Tercentenary Foundation, the Swedish Council for Working Life and Social Research, and the Swedish Tax Agency are gratefully acknowledged.

†Corresponding author. Department of Economics, Umeå School of Business and Economics, Umeå University, SE - 901 87 Umeå, Sweden. E-mail: Thomas Aronsson@econ.umu.se.

‡Department of Law "Cesare Beccaria", University of Milan, 20122 Milan, Italy; Uppsala Center for Fiscal Studies (UCFS), Uppsala University, Box 513, 751 20 Uppsala, Sweden; CESifo, Germany. E-mail: luca.micheletto@unimi.it.

§Department of Economics, Umeå School of Business and Economics, Umeå University, SE - 901 87 Umeå, Sweden. E-mail: Tomas.Sjogren@econ.umu.se.

1 Introduction

The question of how federal ex-post redistribution affects the incentives for public good provision at lower levels of government has been addressed in several previous studies. These studies focus on economic federations with decentralized leadership, where ex-post redistribution at the federal level means that the federal government redistributes across lower level jurisdictions *after* it observes the policies decided upon by the lower level governments. One important reason for analyzing the policy incentives implicit in such decision-structures is that the European Union (EU) plays an important fiscal role in Europe by redistribution between the member states and provision of certain public goods like services. Since the EU is still in its infancy as a fiscal union, and (at least some of) the member countries may already have pre-committed to their tax policies or expenditure programs, the EU most likely shares the characteristics of an economic federation with decentralized leadership discussed above. Earlier research shows that federal ex-post redistribution in terms of private consumption across citizens in different regions may under certain conditions lead to efficient provision of public goods (Caplan, Cornes and Silva, 2000; Caplan and Silva, 2011), whereas federal ex-post redistribution in terms of public funds typically leads to under-provision of public goods at the lower level of government as it undermines the local incentive to collect tax revenue (Köthenbürger, 2004, 2007).[1]

Yet, these previous studies assume that the number of member states/regions in the economic federation is fixed and does not depend on the redistribution policy chosen by the federal government. The present paper re-examines the effects of federal ex-post redistribution in terms of public funds under the assumption that membership is voluntary by adding a participation constraint to the decision-problem faced by the federal government. This change of assumption is clearly relevant from the perspective of the EU, where each member state is free to leave the union.[2] It is also important from a theoretical point of view, i.e. for our understanding of policy incentives: we show that federal ex-post redistribution in terms of public funds no longer necessarily leads to under-provision of public goods at the lower level of government. Instead, if the participation constraint is binding for a certain group of member states, and if another group of member states is acting first mover vis-a-vis the federal level, the disincentive to collect tax revenue due to federal ex-post redistribution might be fully offset by an effect through the participation constraint. We also derive a similar result with respect to a federal public good: although federal ex-post redistribution would lead to under-provision in the absence of any participation constraint (i.e., in a framework such as that used in earlier comparable literature), a binding participation constraint may lead to efficient provision also of the federal public good. Section 2 presents the model, while the main results are discussed in Section 3.

[1] See also the related literature on environmental policy; e.g., Silva and Caplan (1997), Caplan and Silva (1999) and Aronsson, Jonsson and Sjögren (2006).

[2] This is further emphasized by the recent financial crisis in the Euro-area, where the option of leaving the European Monetary Union (which is part of the EU) has been discussed in some of the member states.

2 The Model

To simplify the analysis as much as possible, we consider an economic federation comprising two groups of member states; denoted by 1 and 2, respectively, and referred to as "countries" in what follows. Since the number of countries in each such group is of no importance for the qualitative results derived below, it will be normalized to one. Also, each country is populated by identical residents, whose number is normalized to one. In country i ($i = 1, 2$), a national government collects tax revenue to finance a national public good (the benefits of which are only enjoyed by the residents of country i), while the federal government redistributes between the countries in terms of public funds as well as provides a federal public good (whose benefits are enjoyed by all residents of the economic federation).

2.1 Consumers and Firms

The utility function faced by the residents in country i is given by

$$U_i = U_i(c_i, g_i, G) = u_i(c_i) + \phi_i(g_i) + \Phi_i(G) \tag{1}$$

for $i = 1, 2$, where c_i denotes private consumption, g_i a national public good provided by the government in country i and G a federal public good provided by the federal government. Since none of the results to be derived below refer to work hours, we assume that each consumer supplies one unit of labor inelastically. As such, the consumers are passive agents; they consume their income net of national income taxation, $c_i = y_i - t_i$, where y_i denotes the before-tax income and t_i the tax payment, while treating the two public goods, g_i and G, as exogenous.

Output is produced by a linear technology such that the before-tax wage rate (which, in this case, coincides with the before-tax income due to that the labor supply is inelastic) is fixed.

2.2 National and Federal Objectives and Constraints

We assume that the objective function faced by each level of government is a social welfare function. Since the residents in each country are identical, the objective of the national government in country i is given by U_i in equation (1), while the objective of the federal government is a utilitarian utility sum, i.e. $U = \sum_i U_i$.[3] The budget constraints faced by the national government is country i and the federal government can be written as

$$g_i = t_i - s_i, \tag{2}$$

$$G = \sum_i s_i, \tag{3}$$

respectively, where s_i denotes a fee (positive or negative) paid by the national government in country i to

[3] None of the qualitative results derived below would change if we generalize the federal welfare function such that $U = \sum_i \alpha_i U_i$, where $\sum_i \alpha_i = 1$. We will, therefore, use the simpler utilitarian formulation in the text.

the federal government.

A novelty here is that we allow the member countries to leave the economic federation (or, equivalently, that a potential entrant may decide not to enter), which means that the federal redistribution and provision must be carried out subject to participation constraints. This participation constraint is assumed to be binding for one of the countries, while it is not necessarily binding for the other. Therefore, if we assume that the participation constraint is binding for country 2 (an arbitrary choice of no significance for the qualitative results), this constraint may be written as

$$U_2(c_2, g_2, G) = \hat{U}_2 \tag{4}$$

where $\hat{U}_2$ denotes the reservation utility, which depends on the private consumption and consumption of the national public good if the country leaves the economic federation. The reservation utility is treated as exogenous by the federal government.

3 Redistribution and Provision of Public Goods

The policy problem analyzed here is characterized by decentralized leadership. The order of decision-making is as follows: (i) either one or both countries move first by deciding upon their tax revenue while recognizing how this choice will affect the fee that both countries pay to the federal government; (ii) the remaining (non-leader) country decides upon its tax revenue, and the federal government decides upon its redistribution policy, while treating the policy instruments faced by all other policy-makers as exogenous. Following earlier comparable literature (see the introduction), we also assume that the national governments treat one another as Nash-competitors (irrespective of whether they are first movers vis-a-vis the federal level).

3.1 Federal Government

The federal government redistributes lump-sum in terms of public funds through the fees levied on the national governments and provides the federal public good, G, while treating the tax revenue collected by the national governments, t_1 and t_2, as exogenous. As such, the federal government chooses s_1, s_2 and G to maximize $U = \sum_i U_i$ subject to the national and federal public budget constraints given in equations (2) and (3), respectively, and the participation constraint given in equation (4). By substituting equations (2) and (3) into the objective function to obtain a decision-problem only in s_1 and s_2, the additional first order conditions can be written as

$$s_1 \quad : \quad -U_{1,g} + U_{1,G} + (1+\lambda)U_{2,G} = 0 \tag{5a}$$

$$s_2 \quad : \quad (U_{2,G} - U_{2,g})(1+\lambda) + U_{1,G} = 0 \tag{5b}$$

where λ denotes the Lagrange multiplier attached to the participation constraint, while $U_{i,g} = \partial U_i/\partial g_i$ and $U_{i,G} = \partial U_i/\partial G$ are the marginal utilities of national and federal public goods, respectively, in country i.

By using equations (4), (5a) and (5b), we can solve for s_1 and s_2 and functions of t_1 and t_2 as follows (the dependence on constant terms has been suppressed):

$$s_1 = s_1(\overset{+}{t_1}, \overset{-}{t_2}) \tag{6a}$$

$$s_2 = s_2(\overset{+}{t_1}, \overset{+}{t_2}). \tag{6b}$$

The sign above each argument indicates comparative statics. Notice in particular that an increase in t_1 leads to an increase in s_2; a consequence of the participation constraint. Without the participation constraint, we would have found that $\partial s_2/\partial t_1 < 0$ (while the other qualitative comparative statics would remain as above). The intuition is that an increase in t_1 leads to an increase in the federal public good, ceteris paribus; in turn, this means that the federal government can increase s_2 without violating the participation constraint. This mechanism is crucial for the results to be derived in the next section.

3.2 National Governments

Clearly, since national governments may differ with respect to commitment power vis-a-vis the federal level, we distinguish between a country whose government acts as Stackelberg leader vis-a-vis the federal level, and a country whose government treats the federal government as a Nash-competitor (i.e. moves simultaneously with the federal government). If the national government in country i acts as a Nash-competitor towards the federal level, it chooses t^i and g^i to maximize its own welfare function, U_i, subject to the national public budget constraint given in equation (2a), while treating s_1 and s_2 (and, therefore, G) as exogenous. On the other hand, if the national government in country i acts as first mover vis-a-vis the federal level, it will also recognize that s_1 and s_2 (and, therefore, G) are affected by its own policy choice through equations (6a) and (6b).

Let $MRS_i^{g,c} = U_{i,g}/U_{i,c}$ denote the marginal rate of substitution between the national public good and private consumption faced by the resident in country i, while $MRS_i^{G,c} = U_{i,G}/U_{i,c}$ denotes the corresponding marginal rate of substitution between the federal public good and private consumption. By substituting equations (2) and (3) into the objective function, such that t_i becomes the effective decision-variable for the national government, the first order condition can be written as follows if the national government behaves as a *Nash-competitor* vis-a-vis the federal government:

$$MRS_i^{g,c} = 1, \tag{7}$$

which is the well-knows Samuelson condition. Instead, if the national government behaves as *Stackelberg leader* vis-a-vis the federal level, the corresponding first order condition becomes

$$MRS_i^{g,c} = 1 + \left[MRS_i^{g,c} - MRS_i^{G,c}\right] \frac{\partial s_i}{\partial t_i} - MRS_i^{G,c} \frac{\partial s_j}{\partial t_i} \tag{8}$$

for $j \neq i$. Therefore, based on equation (8), efficient provision of the national public good requires that the second and third terms on the right hand side sum to zero.

We are now ready to derive the main result:

Proposition 1 *Suppose that the participation constraint binds for country* 2. *(a) If the national government in country* 1 *acts as Stackelberg leader vis-a-vis the federal level, while the national government in country* 2 *behaves as a Nash-competitor towards the federal level, a subgame perfect equilibrium satisfies*

$$MRS_i^{g,c} = 1 \quad for \quad i = 1, 2 \quad and \quad \sum_i MRS_i^{G,c} = 1.$$

(b) If the national government in country 2 *is Stackelberg leader vis-a-vis the federal level, while the national government in country* 1 *behaves as a Nash-competitor towards the federal level, the subgame perfect equilibrium instead satisfies*

$$MRS_1^{g,c} = 1, \quad MRS_2^{g,c} > 1 \quad and \quad \sum_i MRS_i^{G,c} > 1.$$

An obvious corollary to Proposition 1 is that if the national governments in both countries are first movers vis-a-vis the federal level, then the national public good of country 2 and the federal public good will be under-provided.

However, the most interesting aspect of the proposition is that the outcome in terms of efficiency depends on in which country (or country-group) the national government is first mover vis-a-vis the federal level. More specifically, if the government in the country for which the participation constraint does not bind is first mover, while the government in the country for which the participation constraint is binding engages in Nash-competition with the federal level, the outcome is efficient: g_1, g_2 and G are all provided in accordance with the Samuelson condition. This is clearly different from the outcome that would follow in the absence of the participation constraint, which always implies under-provision of the national public good by the strategic leader country and under-provision of the federal public good, respectively.

Proposition 1 follows from the comparative statics properties of equations (6a) and (6b). We start with part (a). Notice first that the policy rule for public provision in country 2 is given by equation (7), since the national government in country 2 treats s_1 and s_2 as exogenous. For country 1, on the other hand (which is first mover vis-a-vis the federal level), the policy rule is given by equation (8): yet, due to the comparative statics properties of the federal redistribution problem, the second and third terms on the right hand side of equation (8) sum to zero in this case. To give some intuition, suppose that country 1 raises its tax revenue by one dollar. This raises the fee that the the government in country 1 pays to the federal government and also the fee that country 2 pays. The increase in s_2 is due to that a higher s_1 relaxes the participation constraint through an increase in G, ceteris paribus, which, in turn, gives room for an increase in the fee paid by country 2. The latter effect stands in sharp contrast to the case where the participation constraint is absent (in which the fee paid by country 2, instead, would decrease) and works to reduce the welfare cost of raising revenue to the point where the marginal cost of public funds perceived by the national government in country 1 is unity. As such, when the national public good is efficiently provided in both countries, efficient provision of the federal public good follows from the federal first order conditions in equations (5a) and (5b).

In part (b) of the proposition, where country 2 is first mover while country 1 treats the federal government as a Nash-competitor, this reasoning no longer holds, since the comparative statics properties of equations

(6a) and (6b) imply that the second and third terms on the right hand side of equation (8) sum to a positive number for country 2. The reason is that an additional dollar of revenue raised by the government in country 2 leads to an increase in the fee paid by country 2 to the federal government and a decrease in the fee paid by country 1, implying that the marginal cost of public funds exceeds unity from the point of view of country 2. In this case, the outcome is similar to that derived in earlier research in that federal ex-post redistribution in terms of public funds undermines the motive to collect tax revenue at the lower level of government.

In terms of the EU, one can think of arguments for either scenario in the proposition, and it is not a priori clear to us which one is the more realistic. The basic lesson from our study is that federal ex-post redistribution in terms of public funds does not necessarily cause under-provision of public goods (neither at the lower level nor at the federal level), if the member states are free to leave the economic federation. Instead, addressing the efficiency aspects of federal redistribution policy requires in this case more information, and our study shows what additional information to look for. Therefore, whether or not federal ex-post redistribution in terms of public funds distorts the incentives underlying public good provision in a voluntary fiscal union is ultimately an empirical question.

References

[1] Aronsson, T., Jonsson, T. and Sjögren, T. (2006b) Environmental Policy and Optimal Taxation in a Decentralized Economic Federation. *FinanzArchiv* **62**, 437-454, 2006.

[2] Caplan, A., Cornes, R. and Silva, E. (2000) Pure Public Goods and Income Redistribution in a Federation with Decentralized Leadership and Imperfect Labor Mobility. *Journal of Public Economics* **77**, 265-284.

[3] Caplan, A. and Silva, E. (1999) Federal Acid Rain Games. *Journal of Urban Economics* **46**, 25-52.

[4] Caplan, A. and Silva, E. (2011) Impure Public Goods, Matching grant Rates and Income Redistribution in a Federation with Decentralized Leadership and Imperfect Labor Mobility. *International Tax and Public Finance* **18,** 322-336.

[5] Köthenbürger, M. (2004) Tax Competition in a Fiscal Union with Decentralized Leadership. *Journal of Urban Economics* **55**, 498-513.

[6] Köthenbürger, M. (2007) Ex-Post Redistribution in a Federation: Implications for Corrective Policy. *Journal of Public Economics* **91**, 481-496.

[7] Silva, E. and Caplan, A. (1997) Transboundary Pollution Control in Federal Systems. *Journal of Environmental Economics and Management* **34**, 173-186.

WORKING PAPERS
Uppsala Center for Fiscal Studies
Editor: Håkan Selin

2009:1 Sören Blomquist and Håkan Selin, Hourly Wage Rate and Taxable Labor Income Responsiveness to Changes in Marginal Tax Rates. 31 pp.

2009:2 Luca Micheletto, Optimal nonlinear redistributive taxation and public good provision in an economy with Veblen effects. 26 pp.

2009:3 Håkan Selin, The Rise in Female Employment and the Role of Tax Incentives. An Empirical Analysis of the Swedish Individual Tax Reform of 1971. 38 pp.

2009:4 Håkan Selin, Marginal tax rates and tax-favoured pension savings of the self-employed Evidence from Sweden. 32 pp.

2009:5 Tobias Lindhe and Jan Södersten, Dividend taxation, share repurchases and the equity trap. 27 pp.

2009:6 Che-Yan Liang, Nonparametric Structural Estimation of Labor Supply in the Presence of Censoring. 48 pp.

2009:7 Sören Blomquist, Vidar Christiansen and Luca Micheletto, Public Provision of Private Goods and Nondistortionary Marginal Tax Rates: Some further Results. 42 pp.

2009:8 Laurent Simula and Alain Trannoy, Optimal Income Tax under the Threat of Migration by Top-Income Earners. 26 pp.

2009:9 Laurent Simula and Alain Trannoy, Shall We Keep Highly Skilled at Home? The Optimal Income Tax Perspective. 26 pp.

2009:10 Michael Neugart and Henry Ohlsson, Economic incentives and the timing of births: Evidence from the German parental benefit reform 2007, 21 pp.

2009:11 Laurent Simula, Optimal Nonlinear Income Tax and Nonlinear Pricing: Optimality Conditions and Comparative Static Properties, 25 pp.

2009:12 Ali Sina Onder and Herwig Schlunk, Elderly Migration, State Taxes, and What They Reveal, 26 pp.

2009:13 Ohlsson, Henry, The legacy of the Swedish gift and inheritance tax, 1884-2004, 26 pp.

2009:14 Onder, Ali Sina, Capital Tax Competition When Monetary Competition is Present, 29 pp.

2010:1 Sören Blomquist and Laurent Simula, Marginal Deadweight Loss when the Income Tax is Nonlinear. 21 pp.

2010:2 Marcus Eliason and Henry Ohlsson, Timing of death and the repeal of the Swedish inheritance tax. 29 pp.

2010:3 Mikael Elinder, Oscar Erixson and Henry Ohlsson, The Effect of Inheritance Receipt on Labor and Capital Income: Evidence from Swedish Panel Data. 28 pp.

2010:4 Jan Södersten and Tobias Lindhe, The Norwegian Shareholder Tax Reconsidered. 21 pp.

2010:5 Anna Persson and Ulrika Vikman, Dynamic effects of mandatory activation of welfare participants. 37 pp.

2010:6 Ulrika Vikman, Does Providing Childcare to Unemployed Affect Unemployment Duration? 43 pp.

2010:7 Per Engström, Bling Bling Taxation and the Fiscal Virtues of Hip Hop. 12 pp.

2010:8 Niclas Berggren and Mikael Elinder, Is tolerance good or bad for growth? 34 pp.

2010:9 Heléne Lundqvist, Matz Dahlberg and Eva Mörk, Stimulating Local Public Employment: Do General Grants Work? 35pp.

2010:10 Marcus Jacob and Martin Jacob, Taxation, Dividends, and Share Repurchases: Taking Evidence Global. 42 pp.

2010:11 Thomas Aronsson and Sören Blomquist, The Standard Deviation of Life-Length, Retirement Incentives, and Optimal Pension Design. 24 pp.

2010:12 Spencer Bastani, Sören Blomquist and Luca Micheletto, The Welfare Gains of Age Related Optimal Income Taxation. 48 pp.

2010:13 Adrian Adermon and Che-Yuan Liang, Piracy, Music, and Movies: A Natural Experiment. 23 pp.

2010:14 Spencer Bastani, Sören Blomquist and Luca Micheletto, Public Provision of Private Goods, Tagging and Optimal Income Taxation with Heterogeneity in Needs. 47 pp.

2010:15 Mattias Nordin, Do voters vote in line with their policy preferences? The role of information. 33 pp.

2011:1 Matz Dahlberg, Karin Edmark and Heléne Lundqvist, Ethnic Diversity and Preferences for Redistribution. 43 pp.

2011:2 Tax Policy and Employment: How Does the Swedish System Fare? Jukka Pirttilä and Håkan Selin. 73 pp.

2011:3 Alessandra Casarico, Luca Micheletto and Alessandro Sommacal, Intergenerational transmission of skills during childhood and optimal public policy. 48 pp.

2011:4 Jesper Roine and Daniel Waldenström, On the Role of Capital Gains in Swedish Income Inequality. 32 pp.

2011:5 Matz Dahlberg, Eva Mörk and Pilar Sorribas-Navarro, Do Politicians' Preferences Matter for Voters' Voting Decisions?

2011:6 Sören Blomquist, Vidar Christiansen and Luca Micheletto, Public provision of private goods, self-selection and income tax avoidance. 27 pp.

2011:7 Bas Jacobs, The Marginal Cost of Public Funds is One. 36 pp.

2011:8 Håkan Selin, What happens to the husband's retirement decision when the wife's retirement incentives change? 37 pp.

2011:9 Martin Jacob, Tax Regimes and Capital Gains Realizations. 42 pp.

2011:10 Katarina Nordblom and Jovan Zamac, Endogenous Norm Formation Over the Life Cycle – The Case of Tax Evasion. 30 pp.

2011:11 Per Engström, Katarina Nordblom, Henry Ohlsson and Annika Persson, Loss evasion and tax aversion. 43 pp.

2011:12 Spencer Bastani and Håkan Selin, Bunching and Non-Bunching at Kink Points of the Swedish Tax Schedule. 39 pp.

2011:13 Svetlana Pashchenko and Ponpoje Porapakkarm, Welfare costs of reclassification risk in the health insurance market. 41 pp.

2011:14 Hans A Holter, Accounting for Cross-Country Differences in Intergenerational Earnings Persistence: The Impact of Taxation and Public Education Expenditure. 56 pp.

2012:1 Stefan Hochguertel and Henry Ohlsson, Who is at the top? Wealth mobility over the life cycle. 52 pp.

2012:2 Karin Edmark, Che-Yuan Liang, Eva Mörk and Håkan Selin, Evaluation of the Swedish earned income tax credit. 39 pp.

2012:3 Martin Jacob and Jan Södersten, Mitigating shareholder taxation in small open economies? 15 pp.

2012:6 Spencer Bastani, Gender-Based and Couple-Based Taxation. 55 pp.

2012:7 Indraneel Chakraborty, Hans A. Holter and Serhiy Stepanchuk, Marriage Stability, Taxation and Aggregate Labor Supply in the U.S. vs. Europe. 64 pp.

2012:8 Niklas Bengtsson, Bertil Holmlund and Daniel Waldenström, Lifetime versus Annual Tax Progressivity: Sweden, 1968–2009. 56 pp.

2012:9 Firouz Gahvari and Luca Micheletto, The Friedman rule in a model with nonlinear taxation and income misreporting. 36 pp.

2012:10 Che-Yuan Liang and Mattias Nordin, The Internet, News Consumption, and Political Attitudes. 29 pp.

2012:11 Gunnar Du Rietz, Magnus Henrekson and Daniel Waldenström, The Swedish Inheritance and Gift Taxation, 1885–2004. 50 pp.

2012:12 Thomas Aronsson, Luca Micheletto and Tomas Sjögren, Public Goods in a Voluntary Federal Union: Implications of a Participation Constraint. 7 pp.