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REGIONAL INCOME AND SECESSION:
CENTER-PERIPHERY RELATIONS IN EMERGING MARKET ECONOMIES

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Abstract

Central and peripheral regions within the formerly socialist economies have experienced large income gains and losses during the transition to a market economy. In several instances, changes in regional income have fueled secessionist movements in the periphery. This paper analyzes the relationship between changes in regional income and secessionist pressures in the periphery. A model of center-periphery relations in a fiscal federation is constructed. The center controls federal tax policy and supplies federal public goods and the periphery can secede. The model predicts that small changes in regional income have no impact on the periphery’s incentive to secede when the periphery is only negligibly better off remaining in the federation and earns no fiscal surplus. When the periphery earns a fiscal surplus, the impact of an increase in income on secessionist pressures in the periphery depends upon how the center adjusts the federal tax rate. When public and private goods are substitutes for the center, the federal tax rate is decreasing in central income and the periphery’s incentive to secede falls. However, when public and private goods are complements, the federal tax rate is increasing in central income and the periphery’s incentive to secede may be increasing or decreasing. The impact of a change in peripheral income on the periphery’s incentive to secede depend upon the induced adjustments in the federal tax rate and the periphery’s ability to supply its own public goods after separation. Finally, when the periphery becomes sufficiently rich, the center may abandon mandatory taxation and revert to a system of voluntary contributions. The implications of this model for developments in the peripheral Russian regions of Bashkortostan, Chechnia, Tatarstan and Sakha (Yakutia) are discussed.

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1. Introduction

Central and peripheral regions within the formerly socialist economies have experienced large income gains and losses during the transition to a market economy. In several instances, changes in regional income have fueled secessionist movements in the periphery. Wallich (1994) documents that many resource-rich peripheral regions in Russia reaped huge income windfalls during the 1992-92. One reason for this is that the Russian federal government allowed its resource-rich regions to export a significant share of their products at world market prices. However, following these income gains, several of these regions withheld federal taxes, ignored federal export regulations, and even issued formal declarations of independence (Litvack (1994), 221-22). Income growth in secessionist regions in 1992 is listed in Table 1 (for Tables and Figures see pages 22-28). Despite the overall fall in income in the Russian Federation in 1992, all of these regions experienced substantial income gains. Bookman ((1992), 95-97) also observes that secessionist demands within the former Yugoslav republic of Slovenia grew as it became more prosperous.

Secessionist movements have also been observed in peripheral regions that have suffered losses in income and have become poorer relative to the center. After the Velvet Revolution of 1989 in the former Czechoslovak Republic, the peripheral region of Slovakia suffered declines in per-capita income for several years (World Bank (1991)). Furthermore, as the central region in Czechoslovakia, the Czech Republic, began to recover from the disruptions following the fall of the former Communist leadership, Slovakia become poorer relative to the center (World Bank (1991)). Nevertheless, Slovak politicians who pushed for a secession received strong support from their constituents.

The objective of this paper is to analyze the relationship between changes in regional income and secessionist pressures in the periphery. In models of fiscal federations, taxes are determined by a political process that reflects the constituents' interests. In federations in which democratic institutions are highly developed, tax policy and resource allocation is determined by a median voter within regions or within the whole federation (see Bos (1979); Austin (1994a); Bolton and Roland (1994); Casella (1994)). In fiscal federations in which the distribution of political influence is uneven, the tax rate is determined by a small coalition maximizing its fiscal surplus (see Buchanan and Faith (1987)). In order to capture the legacy of socialist institutions for emerging market economies, this paper follows Buchanan and Faith and allows the central government to determine tax and spending policy. The Former Soviet Union (FSU) and other former socialist economies were highly centralized fiscal federations in which the central government had almost monopoly control over tax policy and the supply of public goods such as transport, communications, defense and internal order (see Bahry (1987); Berkowitz and Mitchneck (1992)). The development of democratic institutions during the transition which allow citizens in peripheral regions to influence fiscal policies has been slow (Bird, Ebel and Wallich (1995)). Thus, threats of withholding taxes and secession have become important ways for peripheral regions to influence centrally controlled policies.
An innovation of this paper is that any region can make payments to the federation exceeding its mandatory obligations. These additional payments have been observed in the former socialist economies. One example is that the Czech Republic made payments exceeding its obligations for federally financed unemployment and retraining programs in the two years before the dissolution of the former Czechoslovak federation (see Ham, Svejnar and Terrell (1995)). Another example is that the Russian republic made implicit transfers to almost all of the other republics when the Soviet Union still existed by selling its goods at prices much lower than world market prices (see Austin (1994) for a citation of the Soviet data; see Marrese and Vanous (1983) for an analysis of this transfer policy in trade relations between the FSU and countries in Eastern Europe). Treisman (1995), in a clever statistical analysis, concludes that the central government in the Russian Federation in 1992 tended to make additional payments financing social and investment projects to regions which made the most credible threats of secession. One interpretation of these over-payments is that they reflect the price that the central governments in the former Czechoslovak Federation, the FSU and the Russian Federation were willing to pay to keep the federation intact.

This study uses the theoretical literature on free-riding in economies with public goods that has been inspired by Olson (1965) and Olson and Zeckhauser (1965). Bergstrom, Blume, and Varian (1986) contains one of the most complete treatments of the Nash equilibrium model of voluntary public goods supply. This model is useful for formally analyzing the problem of free-riding. Variants of this model have been applied to the problems of fiscal federalism by Williams (1966), Pauly (1970), Boskin (1973), Steinberg (1987), Boadway, Pestieau, and Wildasin (1989), and Wildasin (1991). All of these authors devise policies for increasing the supply of public goods under the assumption that regional governments do not have the option to secede. While this assumption is reasonable in some countries; in others, such as the formerly socialist economies of Eastern Europe and the FSU, the political situation is unstable and the threat of secession is very real. This paper analyzes the impact of a peripheral region’s threat of secession on welfare and resource allocation in a highly centralized fiscal federation.

In such a highly centralized fiscal federation, Buchanan and Faith (1987) show that a central government always sets a tax rate at which the periphery’s welfare in the federation is only negligibly higher than its welfare in a secession. Thus, the periphery reaps no “fiscal surplus” in the federation. This paper will show that the periphery earns a fiscal surplus only when its welfare in a secession is sufficiently high. If the periphery’s exit option is sufficiently low, then its welfare in the federation will be strictly greater than in a secession and it reaps a fiscal surplus.

The model makes several important predictions about the impact of a change in regional income on secessionist tendencies in the periphery. When the periphery earns a fiscal surplus, small changes in regional income have no impact on a region’s incentive to secede. This is because the central government adjusts its tax and spending, at the margin, to keep the federation intact. When the periphery, however, earns a fiscal surplus, the impact of an increase in income in either the center or periphery depends upon whether or not the demand for public goods is stronger in the center; whether or not public and private goods are substitutes or complements for the central government and the periphery’s welfare in a secession. For example, suppose that the demand for public goods is stronger in the center, public
and private goods are complements for the central government and the periphery’s welfare in a secession is high. Then, an increase in the periphery’s income fuels secessionist tendencies. However, an increase in central income is ambiguous. In this latter case, the periphery becomes more secessionist only if the disadvantages of a higher tax rate swamp the gains from additional public goods.

This paper is organized as follows: A three stage model of a fiscal federation with a central and peripheral region is developed in the next section; Section 2 analyzes central tax policy and the periphery’s incentive to secede when the demand for public goods is stronger in the center; Section 3 also argues that these results shed light on several secessionist movements the Russian Federation; Section 4 briefly considers the case in which demand for public goods is stronger in the periphery and discusses its implications for the “single-channel” tax system in the Russian republics of Bashkortostan and Tatarstan; Section 5 concludes.

2. A fiscal federation

The original fiscal federation consists of the central and peripheral government which are located in the central and peripheral region. The maintenance or breakup of the fiscal federation is described as a three stage game. The central government sets federal taxes in stage 1. In stage 2, the central and peripheral governments simultaneously choose to pay at least their federal taxes or to secede. If both regions pay at least their federal taxes, the central government supplies public goods in stage 3. However, if at least one region secedes, then the federation ceases to exist and both regions supply their own public goods in stage 3.2

The central and peripheral governments represent the constituents in their own region. Constituents in each region are immobile and have collective preferences defined over a private good, \( x_i \), and a pure public good, \( G \). Preferences are represented by a constant elasticity of substitution (CES) utility function

\[
u^i(x_i, G) = (n_i x_i^{1/(\sigma_i)} + G^{1/(1-\sigma_i)})^{1/(1-\sigma_i)}
\]

where \( n_i \) is a preference parameter and \( \sigma_i \in (0, +\infty) \) denotes the elasticity of substitution. The subscript \( i = c, p \) denotes the central and peripheral region.

The central and peripheral regions have income endowments denoted \( \omega_c \) and \( \omega_p \). The central region has the power to set taxes while the periphery can either choose to meet its obligations or to secede. The center cannot discriminate in its tax policy and is limited to choosing a uniform tax rate on
The federation is intact when each region pays its mandatory taxes, \( t \omega_i \), and divides its after-tax income, \( (1 - t)\omega_i \), between consumption of the private good and voluntary payments to the federation, \( g_i - t \omega_i \geq 0 \). The central region uses a linear technology for providing a federal public good: \( G = g_c + g_p \). Let \( g_i \) denote the other region’s payment to the federation which is exogenous by the Nash equilibrium assumption. If a region remains in the federation, its payment, \( g_i \), is computed by solving:

\[
\text{choose } g_i \geq 0: \max u'(x, G = g_i + g_{-i}) \tag{2}
\]

subject to:

\[
x_i + g_i = \omega_i \tag{2.1}
\]

\[
g_i \geq t \omega_i \tag{2.2}
\]

where equations (2.1) and (2.2) are the regional budget and federal tax constraints. Substituting eq (2.1) into the utility function and adding \( g_i \) to both sides of eq (2.2), region i’s maximization problem in eqs (2), (2.1) and (2.2) is equivalent to:

\[
\text{choose } G \geq 0: \max u'(\omega_i + g_{-i} - G, G), \text{ s.t. } G \geq g_{-i} + t \omega_i. \tag{3}
\]

A region’s demand for public goods, \( G_i \), and its payments to the federation, \( g_p \), is a function of its income, preferences, the federal tax rate, \( t \), and its conjecture about the other region’s payments:

\[
G_i = \max[a_i(\omega_i + g_{-i}), g_{-i} + t \omega_i], \tag{4.1}
\]

\[
g_i = G_i(a_p, \omega_i, g_{-i}) - g_{-i} = \max[a_i(\omega_i - (1 - a_i)g_{-i}), t \omega_i], \tag{4.2}
\]

where \( a_i = a_i(n_{e}, \omega_i) \) is the optimal share of income allocated to public goods:

\[
a_i = \frac{1}{1 + n_{e}} \tag{5}
\]

According to eqs (4.1) and (4.2), a region pays more than its mandatory taxes if, and only, if its demand for public goods net of its mandatory taxes exceeds the other region’s contributions: \( G_i - t \omega_i > g_{-i} \).

If a Nash equilibrium exists, then each region’s conjecture about the other region’s payments to the federation is correct and the equilibrium supply of public goods is a function of regional incomes, \( \omega_i \).

---

\(^3\) This assumption limits the center’s powers of taxation. It is employed by Buchanan and Faith (1987) and Guesnerie and Oddou (1981). In fact, in the Russian Federation, the key profit tax and value added tax rates are very similar in the different regions. Tax rates on profits and wages were also quite similar in the Czech and Slovak republics in the former Czechoslovak republic.
regional preferences, \( \alpha \), and the tax rate: \( G^* = G^*(\omega, \alpha, t) = g^0_\omega(\omega, \alpha, t) + g^0_\omega(\omega, \alpha, t) \). Substituting eq (4.1) into eqs (3) and (1), a region's welfare in the federation is

\[
F^i = u^i(\omega_i) + g^0_\omega(\omega_i, t_1) - G^i(t_1), G^i(t_1).
\]

where, for simplicity, the income and preference parameters are suppressed in the expressions for public goods and regional payments.

A region secedes when it withholds all mandatory taxes and allocates its income between the private good and a regionally provided public good, \( G^r \). In order to capture the efficiency gains or losses of separation, a region's post-separation income is denoted \( \chi^i \omega_i \). When there are economies of scale associated with federal standardization that exceed the benefits of catering to local tastes, there are efficiency losses and \( \chi^i < 1 \). Efficiency losses might arise when the federal government is the primary provider of public goods such as defense and a stable and uniform currency. However, when the gains from local provision outweigh the economies of federal standardization, there are efficiency gains of separation: \( \chi^i > 1 \). Such gains might occur when the federation supplies public goods such as internal security, income redistribution, cultural programs and economic reforms. More generally, there are efficiency gains of separation when a region gains control over its natural resources or when a region can free ride off of expenditures in the other region after seceding. However, there are efficiency losses when a secession would be followed by limited access to the federal transport and communications systems, the introduction of multiple and non-exchangeable regional currencies, and/or the breakdown of traditional trade patterns.4

A region which secedes solves the program

\[
\text{choose } (x_i, G_s) > 0: \quad \max \ u^i(x_i, G_s)
\]

\[
\text{s.t. } x_i + G_s = \chi^i \omega_i.
\]

By simple computation, welfare in a secession is

\[
S^i(\chi^i \omega_i) = \chi^i \omega_i (1 + n_i^{\omega_i})^{-\frac{1}{n_i}}.
\]

A region secedes when \( S^i > F^i \). By inspection of eq (8), an increase in either income or the efficiency gains of separation improves a region's exit option.

It is straightforward to establish the existence of a unique equilibrium in stages 2 and 3. In stage 2 the federal tax rate is given and each region either pays at least its mandatory federal taxes or secedes. If each region pays its mandatory taxes, then federal public goods are provided in stage 3. Otherwise,

4 See Bolton and Roland (1994) for an argument that secession is inherently inefficient. Riviere (1996) models the efficiency or inefficiency of federally provided public goods by introducing "scale effects."
there is a secession and each region provides its own public good in stage 3. If secession is not an option for either region, the analysis in Bergstrom, Blume and Varian ((1986), Theorems 2 and 3) and Andreoni and Bergstrom ((1995), Theorem 1) implies that a unique equilibrium exists for any t: $g^*_c(t) \geq t\omega_c$, $g^*_p(t) \geq t\omega_p$. This implies that there is a unique stage 2 equilibrium. When $S^c \leq F^c$, and $S^p \leq F^p$, the federation is intact and there is a unique equilibrium in regional payments in stage 2 and in the supply of public goods in stage 3: $G^*(t) = g^*_c(t) + g^*_p(t) \geq t(\omega_c + \omega_p)$. When $S^i > F^i$ for any region, the federation separates into two countries.5

This paper focuses on how the central government manipulates the tax rate in stage 1 in order to keep the federation intact. Thus, the analysis is initially limited to the case in which each region pays at least its mandatory federal taxes in stage 2. Using eq (3) for $i = c,p$ and any $t \in [0, 1)$, then

$$g^*_i(t) > t\omega_i = \partial u_i/\partial x_i = \partial u_i/\partial G,$$

(9.1)

$$g^*_i(t) = t\omega_i = \partial u_i/\partial x_i = \partial u_i/\partial G.$$

(9.2)

Eqs (9.1) and (9.2) say that in stage 2 a region over-pays taxes so as to equate its marginal utility of public and private goods. However, a region pays only its mandatory taxes when its marginal utility of private goods exceeds its marginal utility of public goods in the federation. It is straightforward to compute the equilibrium supply of federal public goods in stage 3.

In stage one, the central government picks a tax rate in order to maximize welfare in its region by solving the program:

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5 The more general result is Andreoni and Bergstrom (1995), Theorem 1, which proves that a Nash equilibrium exists and is unique when preferences are continuous and strictly convex and the public and private goods are both normal. The CES utility function used in this paper satisfies all of these restrictions.

6 In the alternative game a unique stage two equilibrium holds as well. However, when $S^c \geq F^c$ and $F^p < S^p$ then the center remains in the federation and the periphery secedes. The federation ceases to exist only if $S^c > F^c$ and $S^p > F^p$. The results of this paper hold for this setup.
choose $t \in [0, 1]$: max $u_c'(\omega_c - G^*(t) + g_p^*(t), G^*(t)) \tag{10}$

s.t. $g_c^*(t) = G^*(t) - g_p^*(t) \geq t\omega_c$, \tag{10.1}

$g_p^*(t) \geq t\omega_p$, \tag{10.2}

$F^c \geq S^c$, \tag{10.3}

$F^c \geq S^p$. \tag{10.4}

Equations (10.1) and (10.2) are the center’s and periphery’s federal tax constraints. Equations (10.3) and (10.4) are the center’s and periphery’s secession constraints. The center secedes when it cannot find a tax rate satisfying its secession constraint. The center allows the periphery to secede when it cannot find a tax rate satisfying the periphery’s secession constraint. In order to focus on secessionist pressures in the periphery, this paper assumes that the central secession constraint is non-binding. In a fiscal federation which remains intact, the periphery reaps a “fiscal surplus” when its secession constraint is non-binding and earns no fiscal surplus when its secession constraint binds.

3. Tax policy when the center has the higher demand for public goods

In fiscal federations in which the center has the power to tax and supply public goods, the center’s demand for public goods is often relatively stronger than the periphery’s demand. In the Former Soviet Union (FSU), well-connected citizens in the Russian Republic may have had a higher preference for public goods such as order, transport and communications than the other republics. The Russian Federation and, in particular, the megacity of Moscow was situated in the center of the financial, transport and communications network in the FSU. Maintenance of order in the Soviet empire provided the benefits of access to people and government officials in Moscow that were not available to citizens located in the non-Russian republics and the peripheral regions in the Russian Republic. If public goods are normal goods, a relatively high central preference for public goods coupled with a concentration of income at the center would tend to make the demand for public good stronger in the center. In this case, as will be shown in this section, the center might over-pay taxes to keep the federation intact.

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7 This would hold when the central region’s efficiency gains from separation are low.

8 This holds with a CES utility function. Normality is a standard assumption in the literature on public goods (see Bergstrom, Blume and Varian (1986)).

9 Clearly, the Russian Federation and the city of Moscow in particular, were the richest regions in the FSU.
In order to measure the center's demand for public goods, suppose that the periphery is constrained to pay no more than its mandatory taxes: \( g_p = t\omega_p \). In this case, equations (4.1) and (5) can be manipulated to compute the lowest tax rate at which the center pay only its mandatory taxes:

\[
t^c = \frac{\sigma_c}{1 + (1 - \alpha_c)(\omega_c/\omega_p)} = \frac{1}{1 + (\alpha_c)^n((\omega_c/\omega_p) + 1)}
\]

For any \( t < t^c \), the center over-pays and for any \( t \geq t^c \) the center pays only its mandatory taxes. Similarly, if the center was constrained to pay no more than its mandatory taxes, then there is a minimum tax rate at which the periphery pays only its mandatory taxes:

\[
t^p = \frac{\sigma_p}{1 + (1 - \alpha_p)(\omega_p/\omega_c)} = \frac{1}{1 + (\alpha_p)^n((\omega_p/\omega_c) + 1)}
\]

Clearly, demand for public goods is stronger in the central region when \( t^c > t^p \). This always holds if the central region has a stronger preference for public goods: \( \alpha_c > \alpha_p \), and is at least as rich as the periphery: \( \omega_c \geq \omega_p \). In the last years of the FSU and during the brief history of the Russian Federation, many of the peripheral regions have become richer than Moscow (the central region). This change in relative income occurs because regions have discovered and gained control over vast natural resources on their territory. Nevertheless, the central region's demand for public goods is stronger when it is poorer than the periphery but its preference parameter, \( \alpha_c \), is sufficiently higher.

To compute the center’s optimal tax policy, the impact of the tax rate on the equilibrium supply of public goods and over-payments in later stages of the game must be determined. In order to study the most interesting situations, the exogenous parameters are limited so that no region free-rides in a voluntary contributions equilibrium. Therefore, if \( t = 0 \), each region pays

\[
g_c^*(t = 0) = \frac{\sigma_c\omega_c - (1 - \alpha_c)\sigma_c\omega_p}{1 - (1 - \alpha_c)(1 - \alpha_p)} > 0, \quad (A2)
\]

\[
g_p^*(t = 0) = \frac{\sigma_p\omega_p - (1 - \alpha_p)\sigma_c\omega_p}{1 - (1 - \alpha_c)(1 - \alpha_p)} > 0.
\]

Re-arranging (A2), the income and preference disparities between the two regions are limited:
If this assumption on parameters was relaxed, then regimes in which some region completely free-rides in the absence of mandatory taxation would exist. These cases could be analyzed. However, they add nothing to the basic results of the paper and are ignored.

Figure 1 illustrates the relationship between the central tax rate and regional welfare when the periphery’s secession is non-binding. In the low tax range, each region over-pays its federal taxes. A region pays exactly what it would pay if there was no mandatory taxation and marginal changes in the tax rate have no impact on the supply of public goods and on regional welfare:

\[ 0 \leq t < \frac{g_p(t = 0)}{\omega_p}, \quad \text{and} \]
\[ g_c^*(t) = g_p^*(t = 0) > t \omega_c, \quad g_p^*(t) = t \omega_p, \quad G^*(t) = \frac{\omega_c + \omega_p}{1 - (1 - \alpha_c)(1 - \alpha_p)}. \]

In the middle tax range, the periphery pays only its mandatory taxes while the central region, which has the relatively stronger demand for public goods, over-pays:

\[ \frac{g_p(t = 0)}{\omega_p} \leq t < t^c, \quad \text{and} \]
\[ g_c^*(t) = \alpha_c \omega_c - t(1 - \alpha_c) \omega_p > t \omega_c, \quad g_p^*(t) = t \omega_p, \quad G^*(t) = \alpha_c(\omega_c + t \omega_p). \]

An increase in the tax rate increases the mandatory payments from the periphery more than the decline in payments from the center and the supply of public goods is increasing in the tax rate. Therefore, small increases in \( t \) increase welfare in the center and decrease welfare in the periphery.

In the high range, each region pays its mandatory taxes and the supply of public goods is increasing in \( t \):

\[ t \geq t^c, \quad \text{and} \]
\[ g_c^*(t) = t \omega_c, \quad g_p^*(t) = t \omega_p, \quad G^*(t) = t(\omega_c + \omega_p). \]

Welfare in the periphery continues to fall as \( t \) increases. However, there is a unique tax rate, \( t^{*m} \), which maximizes the center’s welfare. Thus, \( t^{*m} \) is the center’s optimal tax when the periphery’s secession constraint is non-binding. By simple computation,

\[ t^{*m} = \frac{1}{1 + n^{*m}((\omega_p/\omega_c)^{-1} - \tau_c) \omega_c} = \frac{1}{1 + ((1/\alpha_c) - 0)(1 + (\omega_p/\omega_c)^{-1} - \tau_c)}. \]

Recalling the expression for \( t^c \) in eq (11.1), then \( t^{*m} > t^c \), when \( \sigma_c \neq 1 \), and \( t^{*m} = t^c \), when \( \sigma_c = 1 \).

In figure 1 and for the rest of the paper it is assumed that
It is straightforward to trace the center’s optimal tax, \( t' \), when the periphery’s secession constraint is binding. By inspection of figure 1, central welfare is increasing in \( t \) while welfare in the periphery is decreasing in the tax range of \( t \in \{ g_P'(t = 0)/\omega_P, t^m \} \). Therefore, the center would set \( t' \) lower than \( t^m \) when the periphery’s secession constraint binds. This is illustrated in figure 2, where \( S^P(\chi^p^m, \omega_P), S^P(\chi^p\omega_P), \text{ and } S^P(\chi^p, \omega_P) \) denote the periphery’s secessionist welfare equal to its welfare in a federation with tax rates of \( t^m, t^p, \text{ and } t = 0 \). When \( \chi^p < \chi^p_m \), the periphery’s secession constraint is non-binding. The periphery’s secession binds when \( \chi^p > \chi^p_m \). If \( \chi^p_m < \chi^p < \chi^p^e \), the center chooses a \( t' : t^m > t' > t^p \), and each region pays only its mandatory taxes. When \( \chi^p < \chi^p < \chi^p_0 \), the center chooses a \( t' : t^p > t' > g_P'(t = 0)/\omega_P \), and over-pays its taxes. When \( \chi^p > \chi^p_0 \), the center lets periphery secede. These results are formally stated in the next proposition.

Proposition 1. If \( t^e > t^p \) and \( \sigma_c \neq 1 \), then there exists a unique \( t^* = t^*(\chi^p) \):

I. if \( 0 < \chi^p < \chi^p_m \), then \( t^* = t^m > t^e \);
   the periphery reaps a fiscal surplus, and \( \partial t^*/\partial \chi^P = 0, \partial G^*(t^*)/\partial \chi^P = 0 \);
II. if \( \chi^p_m < \chi^p < \chi^p^e < \chi^p_0 \), then \( t^* < (g_P'(t = 0)/\omega_P, t^m) \);
   the periphery reaps no fiscal surplus, and \( \partial t^*/\partial \chi^P < 0, \partial G^*(t^*)/\partial \chi^P > 0 \); furthermore,
   if \( \chi^p_e < \chi^p < \chi^p_0 \), then the center over-pays;
III. if \( \chi^p < \chi^p_0 \), then the center lets the periphery secede.

The results of Proposition 1 are richer than those obtained by Buchanan and Faith (1987). Buchanan and Faith’s central government ("the sharing coalition") always sets the tax rate so that the periphery has no fiscal surplus. The center maximizes its total tax income net of the cost of supplying public goods and sets a uniform tax rate, but cannot over-pay taxes. In this paper, the central government maximizes its constituents’ utility, sets a uniform tax and can make over-payments. When the periphery’s efficiency gains of separation and overall exit option are low: \( \chi^p < \chi^p_m \), the central allows the periphery...
to reap a fiscal surplus. When the periphery's efficiency gains of separation are in the intermediate range of $\chi^e < \chi^p < \chi^r$, the optimal tax is similar to Buchanan and Faiths' result. The periphery earns no fiscal surplus and there are no over-payments. However, when $\chi^r < \chi^p < \chi^e$, the periphery earns no fiscal surplus and the center over-pays to keep the periphery in the federation. When $\chi^p > \chi^p$, the center cannot keep the periphery in. In such a situation, the center may forego its monopoly over tax policy or might consider direct payments to the federation, instead of over-payments for public goods, in order to keep the federation intact. These changes in institutions, however, are beyond the scope of this paper.

What, then, is the impact of a change in regional income on the periphery's incentive to secede? Let $\Psi^p = S^p - F^p$ denote the periphery's incentive function, where the incentive to secede increases (decreases) if, and only if, $\Psi^p$ increases (decreases).

When $\chi^p > \chi^p > \chi^e$, the periphery earns no fiscal surplus and $\Psi^p = 0$. Following a small increase in either $\omega_c$ or $\omega_p$, the center will adjust the tax rate so that the periphery continues to earn no fiscal surplus. Therefore, small changes in income have no impact on the periphery's incentive to secede.

When $\chi^p < \chi^p$, the periphery reaps a fiscal surplus:

$\Psi^p = S^p(\chi^p) - F^p(t^{e,m}) = $

\begin{align*}
\chi^p \omega_p (1 + n^p_\omega \tau - 1) - u^p((1 - t^{e,m})\omega_p, t^{e,m}(\omega_c + \omega_p)) > 0.
\end{align*}

By inspection of eq (16), the level of central income has no impact on the periphery's welfare in a secession. Therefore, the impact of an increase in $\omega_c$ is

$$\delta \Psi^p / \delta \omega_c = (- \partial u^p / \partial \omega_c) + (- \partial u^p / \partial t^* \partial t^* / \partial \omega_c),$$

where the first and second terms are the direct and indirect effects.

The direct effect ignores the impact of an increase in $\omega_c$ on the tax rate. The direct effect is that the supply of public goods in the federation increases: $\partial G^*(t^{e,m}) = t^{e,m} > 0$, which means that welfare in the periphery increases: $\partial u^p / \partial \omega_c = t^{e,m} \partial u^p / \partial G > 0$. Therefore, the direct effect is negative.

The indirect effect incorporates the impact of a change in $\omega_c$ on the tax rate. It has already been shown that $\partial u^p / \partial t < 0$: $\chi^p < \chi^p$. Therefore, the sign of the indirect effect equals the sign of $\partial t^{e,m} / \partial \omega_c$.

Differentiating the expression for $t^{e,m}$ in eq (15):

which implies that
\[ \delta t^{c,m} / \delta \omega_c = (1 - \sigma_c) - \frac{n_c \sigma_c (t^{c,m})^2}{(1 + (\omega_f / \omega_c))^\sigma_c \omega_c^2} \]  

(18)

\[ \text{sgn indirect effect} = \text{sgn} \delta t^{c,m} / \delta \omega_c = \text{sgn}(1 - \sigma_c) \]  

(18*)

Eq (18*) says that the tax rate and indirect effect is positive (negative) when the center’s elasticity of substitution exceeds (is less than) unity. The overall impact of an increase in central income is summarized in table 2.

When \( \sigma_c > 1 \), an increase in the center’s income level reduces the periphery’s incentive to secede. By the direct effect, the periphery’s welfare in the federation increases because the overall supply of public goods increases. By the indirect effect, the periphery gains welfare because the federal tax rate falls.\(^{11}\) When \( \sigma_c = 1 \), a small change in central income has no impact on the tax rate. The periphery’s incentive to secede falls since it receives more federal public goods with no increase in its tax obligations. When \( \sigma_c < 1 \) an increase in central income results in an increase in the tax rate and the overall supply of public goods. However, the impact on the periphery’s incentive to secede is ambiguous. If the periphery’s losses from a higher tax rate swamp its gains from additional public goods, an increase in central income can increase the incentive to secede.

According to eq (16), welfare in the periphery in and out of the federation is a function of \( \omega_p \). The impact of an increase in \( \omega_p \) is

\[ \delta \psi / \delta \omega_p = (\partial S_p / \partial \omega_p - \partial \psi / \partial \omega_p) + (-\partial u_p / \partial \tau + \partial \psi / \partial \omega_p), \]  

(19)

where the first (bracketed) and second terms are the direct and indirect effects.

It follows from the previous analysis that the sign of the indirect effect is the same as the sign of \( \partial t^{c,m} / \partial \omega_p \):

\[ \delta t^{c,m} / \delta \omega_p = - (1 - \sigma_c) - \frac{n_c \sigma_c (t^{c,m})^2}{(1 + (\omega_f / \omega_c))^\sigma_c \omega_c^2} \]  

(20)

which implies that

---

\(^{11}\) When \( \sigma_c > 1 \), the supply of federal public increases according to the direct effect and decreases according to the indirect effect. Therefore, the impact of an increase in \( \omega_c \) on the supply of public goods is ambiguous.
\[ sgn \text{ indirect effect} = sgn \frac{\delta t^c - \delta \omega_p}{\delta \omega_p} = sgn(\sigma_c - 1) \] (20*)

When \( \sigma_c > 1 \), the center raises the tax rate following an increase in income in the periphery. However, when \( \sigma_c < 1 \), the center lowers the tax rate. Therefore, by the indirect effect is positive (negative) when the center’s elasticity of substitution is greater than (less than) unity.

Analysis of the direct effect, \( \partial S^p / \partial \omega_p - \partial u^p / \partial \omega_p \), is more complicated. The effect is positive when the marginal utility of income in a secession is higher than in a federation. As \( \chi^p \) increases the marginal utility income in a secession and increases the likelihood that the direct effect is positive. The overall impact of an increase in peripheral income is summarized in table 3.

It can be argued that all of the secessionist Russian regions listed in table 1 which reaped substantial gains in regional income also had moderately high efficiency gains of separation. The richest regions of Sakha, Bashkortostan and Tatarstan all have large reserves of exportable natural resources: Sakha produces about 99% of Russia’s diamonds and accounts for about 25% of world supply (Wallich (1994), p.22); Tatarstan and Bashkortostan have huge oil reserves. During the Soviet era, development and export of natural resources was tightly controlled by Moscow. Sakha and Bashkortostan de jure remained in the federation when they signed the Federal Treaty in March of 1992. However, according to these agreements, both regions gained preferential control over their natural resources as well as “independence in international and foreign economic ties, tax policy, legal matters and other areas.” (Slider (1994), p.247) Tatarstan refused to sign this agreement and unilaterally declared its independence which, of course, meant control over its natural resources. This control implies that each of these Republics obtained the resources to secede. However, the efficiency gains to separation in each republic are estimated to be moderately high since each can only gain access to world markets by travelling over Russian land.\(^{12}\)

The Chechen-Ingush republic is one of the poorest regions in 1992. It, however, has moderately high efficiency gains of separation since it lies on a strategic route for the transport of oil via pipeline from Kazakhstan and Azerbaijan and it also has its own capacity for producing and refining oil. With the election of Jokhar Dudaev as president in October of 1991, the parliament declared the independence of Chechnia.\(^{13}\) Following these developments, the Russian federal government sent in troops. Many of the federal policies preceding the war between Russia and Chechnia were designed to dampen Chechnia’s efficiency gains of separation. In 1992 the federal government cut off air transport to Chechnia as part

\(^{12}\) Bashkortostan and Tatarstan are negotiating with the Ukraine and other foreign countries in order to acquire the capacity to ship its oil. If these negotiations are successful, then the efficiency gains from separation in Bashkortostan and Tatarstan will surely increase.

\(^{13}\) As many Russian and Ingush voters boycotted the presidential elections, the Russian parliament declared Dudaev’s election as invalid.
of an economic blockade. While Chechnia sought to establish trade relations with other Russian regions such as Volgograd, Astrakhan, Rostov, Krasnodar and Stavropol, the federation established a customs station on the northern border of Chechnia in an effort to control trade flows (Slider (1994) pp.244-45).\(^\text{14}\) Federal threats of military intervention carried a clear message that the oil and transport capacity necessary for an adequate standard of living in a secessionist state would be destroyed if Chechnia continued to defy federal policies.

As more information and data becomes available it will be possible to analyze the direct and indirect effects of an increase in income in the periphery. The oil pipeline in Bashkortostan and Tatarstan is a potentially useful case study. A reliable pipeline system is a key input to the public good of order. There is order when there is a reliable flow of oil which is critical for heating, transport, lighting and the operation of industry. While disruption of the pipeline system can lower revenues for the specific region which exports the oil, this disruption also lowers the overall level of order in the fiscal federation. The pipeline is an impure public good since a pipeline can become congested as the demand for its services increases. Nevertheless, the benefits of a reliable oil pipeline system are enjoyed both in the oil rich periphery and in the center.

Bashkortostan and Tatarstan have become richer because they have gained more freedom to export their oil and because oil is still a lucrative export. Furthermore, there have been discoveries of oil reserves in the Caspian sea and Kazakhstan. Currently, many of the ex-Soviet republics located around the Caspian Sea and in Central Asia depend almost completely on the Russian pipeline to export their oil. Thus, Bashkortostan and Tatarstan may gain substantial revenues in the future for transporting oil across their territories.\(^\text{15}\) The Russian federal government is increasing the capacity of the current pipeline and is proposing a new through the port city of Konigsberg. Thus, a direct effect of an increase in income in Bashkortostan and Tatarstan has been an increase in the public good of oil pipeline capacity. A reasonable hypothesis is that the direct effect has lowered secessionist tendencies in Bashkortostan and Tatarstan. This is supported by evidence that "Moscow's threat to shut off the pipeline to and from Tatarstan seemed to be the greatest single motivator for Tatarstan's willingness to agree to the terms of..." the Federal treaty. (Clark and Graham (1994), p.334) Thus, Moscow seems to have a credible threat of denying any region which secedes access to the pipeline.

There is some scattered evidence that the indirect effect of the increase in income in Bashkortostan and Tatarstan has also lowered their secessionist tendencies. The most important tax sources in Russia are the value-added tax (VAT), the profit tax and personal income tax. Between 1992 and 1994, every region, in principle, was allowed to keep a larger share of the value-added tax and profit tax collected

\(^{14}\) This is a plausible interpretation, since the customs station was established on the border of Chechnia and the Stavropol Krai, which is located between Chechnia and Astrakhan, Volgograd, Rostov and Krasnodar.

\(^{15}\) For a discussion of how Russia is competing with the Georgians and Turks to keep its monopoly over the pipeline, see G. Bovt (1995) and C. Freeland and R. Corzine (1995).
on its territory. Furthermore, all personal income tax payments flowed directly into the regional budgets. Thus, between 1992 and 1994, regional budgets share of gross domestic product increased from 14.6% to 17.5% while the federal share fell from 16% to 12.7% (World Bank (1995), pp.13-18 and tables 2.1 and 2.2). Furthermore, starting in 1994 the federal government put Bashkortostan and Tatarstan on "single-channel" tax system. This tax system considerably lowered mandatory tax payments and is discussed in the next section.

4. Tax policy with the periphery has a stronger demand for public goods

Consider a fiscal federation in which \( \alpha_c > \alpha_p \) and the center has a stronger preference for public goods. If income in the periphery becomes sufficiently greater than income in the center, then the demand for public goods becomes stronger in the periphery. This section briefly consider the optimal tax policy and the impact of changes in regional income on the periphery's incentive to secede when \( t^c < t^p \).

Figure 3 portrays the different tax regimes. In the low tax range, each region over-pays its federal taxes and marginal tax changes have no impact on federal resource allocation and welfare:

\[
0 \leq t < \frac{g_c^{\dagger}(t = 0)}{\omega_c}, \quad \text{(21)}
\]

\[
g_c^*(t) = g_c^*(t = 0) > t\omega_c, \quad g_p^*(t) = g_p^*(t = 0) > t\omega_p, \quad G^*(t) = \frac{(\alpha_c\alpha_p)(\omega_c - \omega_p)}{1 - (1 - \alpha_c)(1 - \alpha_p)}. \]

In the middle tax range, the center pays only mandatory taxes while the periphery over-pays:

\[
\frac{g_c^{\dagger}(t = 0)}{\omega_c} \leq t < t_p \quad \text{(22)}
\]

\[
g_p^*(t) = \alpha_p\omega_p - t(1 - \alpha_p)\omega_c > t\omega_p, \quad g_c^*(t) = t\omega_c.
\]

Marginal increases are followed by a fall in the periphery's over-payments and an increase in the supply of public goods. Therefore, the welfare in the center is decreasing while welfare in the periphery is increasing in the tax rate.

In the high range, each region pays its mandatory taxes:

\[
t \geq t_p \quad \text{(23)}
\]

\[
g_c^*(t) = t\omega_c, \quad g_p^*(t) = t\omega_p, \quad G^*(t) = t(\omega_p + \omega_c).
\]

Welfare in the center is decreasing in \( t \) while welfare in the periphery is maximized at \( t^m \).
\[ t^{p.m} = \frac{1}{1 + \sigma_p^*(1 + \omega_0 \omega_p)^{1 - \sigma_p}} \]  

(24)

By eq (11.2), \( t^{p.m} > t^p \), when \( \sigma_p \neq 1 \), and \( t^{p.m} = t^p \), when \( \sigma_p = 1 \). In order to consider the most general cases, it is assumed that

\[ \sigma_p \neq 1. \quad (A4) \]

When \( t^e < t^p \), central welfare is decreasing while peripheral welfare is increasing over the tax range of \( t \in (g_c(t = 0)/\omega_c, t^{p.m}) \). It follows that the center sets the lowest possible tax rate that will keep the periphery in the federation. The impact of an increase in the periphery's exit option and tax policy is illustrated in figure 4, where \( S^p(\chi^p_0, \omega_p) = F^p(t = 0); S^p(\chi^p t^p, \omega_p) = F^p(t^p), \) and \( S^p(\chi^{p.m}, \omega_p) = F^p(t^{p.m}) \).

When \( \chi^p < \chi^e \), the periphery's secession constraint does not bind and the optimal tax rate is zero. When \( \chi^p \in (\chi^e_0, \chi^e_{t^p}) \), the periphery earns no "fiscal surplus" and the optimal tax lies in the middle range of \( t^* (g_c(t = 0)/\omega_c, t^p) \). The center pays only its mandatory taxes while the periphery over-pays. As \( \chi^p \) increases, the center raises the tax rate and provides more public goods in order to accommodate the periphery. When \( \chi^p \in (\chi^e_{t^p}, \chi^e_{p.m}) \), the periphery earns still earns no "fiscal surplus" and the optimal tax is in the high range of \( t^* (t^p, t^{p.m}) \) where each region pays only its mandatory taxes. As \( \chi^p \) increases, the center continues to accommodate the periphery by raising the tax rate and supplies more public goods. Once \( \chi^p > \chi^e_{p.m} \), the center is unable to keep the periphery in the federation. This formally stated in the next proposition.

Proposition 2. If \( t^e > t^p \) and \( \sigma_p \neq 1 \), then there exists a unique \( t^* = t^*(\chi^p) \):

I. if \( 0 < \chi^p < \chi^e_0 \), then \( t^* = 0 ; \) the periphery reaps a fiscal surplus, and \( \partial t^*/\partial \chi^p = 0, \partial G^*(t^*)/\partial \chi^p = 0 ; \)

II. if \( \chi^e_0 < \chi^p < \chi^e_{t^p} < \chi^e_{p.m} \), then \( t^* \in (g_c(t = 0)/\omega_c, t^{p.m}) ; \) the periphery reaps no fiscal surplus, and \( \partial t^*/\partial \chi^p > 0, \partial G^*(t^*)/\partial \chi^p > 0 ; \) furthermore, if \( \chi^e_0 < \chi^p < \chi^e_{t^p} \), then the periphery over-pays;

III. if \( \chi^e_{p.m} < \chi^p \), then the center lets the periphery secede.
There is a striking difference in central policy when demand for public goods is either stronger in the center or periphery. When demand is stronger in the center, the center sets a high tax rate of $t^m$ when the periphery’s exit option is low. As the periphery’s exit option binds, the center lowers the tax rate and the supply of public goods. If the periphery’s exit option becomes sufficiently high, the center continues to lower the tax rate and makes over-payments. Eventually, the periphery secedes.

When demand is stronger in the periphery, the center sets the tax rate at zero and public goods are financed with voluntary contributions from the region. Once the periphery’s secession constraint binds, the center sets a positive tax rate and the periphery over-pays. As the periphery’s exit option increases, the center accommodates the region by raising the tax rate and supplying more public goods. Eventually, the tax is rate so high that both regions pay only its mandatory taxes. Beyond a critical $\chi^p$, the periphery secedes.

The “single-channel” tax system which was legally introduced in Bashkortostan and Tatarstan in 1994 is an example of federal-peripheral cost-sharing arrangement in which the mandatory tax rate is zero. These mineral rich republics keep all tax revenues collected on their territories and pay a negotiated amount of their revenues each month to the central government. These payments finance public goods such as transport, redistribution and defense. According to World Bank analysts, the mineral rich republic forced the federal government to accept the single-track system. This arrangement has allowed Bashkortostan and Tatarstan to pay no taxes in the first half of 1994 (see World Bank (1995), pp.16-18). The results of proposition 2 suggest that such a tax system which depends upon solely upon voluntary payments could be in the center’s best interests when the peripheral regions on the single-track system become sufficiently rich and find it advantageous to use federally provided public goods. Tatarstan formally adopted this system in February of 1994; Bashkortostan formally adopted it in August. Both regions made substantial payments into the federal budget in the second half of 1994 (Institut Ekonomicheskogo Analiza (1995)).

It is straightforward to analyze the impact of an increase in income on the periphery’s incentive to secede. When $\chi^p < \chi^p < \chi^{m}$, the periphery earns no fiscal surplus and small changes in either central or peripheral income have no impact on its incentive to secede.

When $\chi^p < \chi^p$, the periphery earns a fiscal surplus:

$\psi^p = S^p(\chi^p) - F^p(0) > 0,$

where $S^p(\chi^p \omega_p)$ is defined in eq (8) as

$S^p(\chi^p \omega_p) = \chi^p \omega_p (1 + n_p^0)^{-1}.$
and federal welfare is computed:

\[ F^p(0) = \frac{\varepsilon_p (\omega_c - \omega_p)}{1 - (1 - \varepsilon_p)(1 - \varepsilon_c)} \frac{1}{1 + \eta_c^{\gamma_c}}. \tag{26} \]

By inspection of eqs (25), (8) and (26), the periphery's incentive to secede falls with small increases in central income. This holds because an increase in \( \omega_c \) has no impact on welfare in a secession but increases the periphery's welfare level within the federation.

The impact of an increase of \( \omega_p \) on the periphery's incentive to secede is ambiguous as it raises welfare in and out of the federation. Substituting eqs (8) and (26) into (25) and differentiating with respect to \( \omega_p \), the incentive effect can be signed:

\[ \text{sgn} \frac{\partial F^p}{\partial \omega_p} = \text{sgn} \frac{\partial^2 \varepsilon_p}{1 - (1 - \varepsilon_p)(1 - \varepsilon_c)} \]

where \( \frac{\partial^2 \varepsilon_p}{1 - (1 - \varepsilon_p)(1 - \varepsilon_c)} < 1 \). Therefore, when the periphery's efficiency gains of separation are sufficiently lower than unity, an increase in own income decreases its incentive to secede. Beyond this threshold, however, the periphery will become more secessionist as it accumulates more income.

5. Conclusions

This paper has developed a model of a highly centralized fiscal federation. Following Buchanan and Faith (1987), the center sets the tax rate while the periphery can secede. An innovation is that any region can over-pay its federal taxes in order to increase the supply of public goods. Such over-payments are observed in the former socialist economies in the FSU and Eastern Europe. In the Buchanan and Faith model, the central government always sets a tax rate at which the periphery's welfare in the federation is negligibly higher than welfare in a secession. The model in this paper delivers this prediction only when the periphery's exit option is sufficiently high. Furthermore, there are cases when the periphery earns no fiscal surplus and some region over-pays its federal taxes. Finally, if the periphery's exit option is low, then the welfare in the federation will be strictly greater than in a secession. Thus, contrary to the analysis in Buchanan and Faith, there are cases when the periphery reaps a fiscal surplus.

The model makes predictions about the impact of changes in regional income on the periphery's incentive to secede. In cases in which the periphery earns no fiscal surplus, a small change in income in either the center or periphery has no impact on secessionist tendencies in the periphery. This is because the center can adjust the tax rate so as to keep the periphery in the federation. However, when the periphery earns a fiscal surplus, then small changes in either region's income can fuel or dampen secessionist tendencies in the periphery. The impact of an increase in income in either the center or periphery depends on: 1) the efficiency gains of separation in the periphery; 2) whether or not the public
and private goods are complements for the central government; 3) whether or not the demand for public goods is stronger in the center or periphery. It has been argued that these three factors are useful for organizing a case study of secessionist movements.

In future work, it would be useful to extend this model to incorporate more than one peripheral region into the fiscal federation. This would be a much more realistic. Furthermore, this model could generate predictions about fiscal relations between peripheral regions. Finally, this model ignores the issue of tax compliance. An avenue for future is to determine how the center can use control over the provision of public goods such as oil pipeline, port facilities and defense to enforce compliance.

References


Casella, A., 1994, The role of market size in the formation of clubs, Mimeo.


Corzine, R. and C. Freeland, 1995, Russia steps up pressure on Azeri oil, Financial Times, September 5, pp. 1, 23.


Institut Ekonomicheskogo Analiza, 1995, Finansovaya Stabilizatsiya v Rossii, Moskva, May, pp.50-54.


Tregubova, V., 1995, Yakutia and Russia ‘delimit powers.’ The signing of 'special traties’ Continues Segodnya (Today) 18 April, in Russian, p.2.


Table 1: Secessionist Regions in the Russian Federation (1992)*

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>The Russian Federation</td>
<td>average: 1,198</td>
<td>average: 1,133</td>
<td>-5%</td>
</tr>
<tr>
<td>Sakha (Yakutia) Republic</td>
<td>3,946.8</td>
<td>5,766.5</td>
<td>46%</td>
</tr>
<tr>
<td>Bashkorstan Republic</td>
<td>1,099.1</td>
<td>2,729.8</td>
<td>148%</td>
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<tr>
<td>Tatarstan Republic</td>
<td>938.5</td>
<td>2,469.5</td>
<td>163%</td>
</tr>
<tr>
<td>Chechen-Ingush Republic</td>
<td>366.7</td>
<td>473.3</td>
<td>29%</td>
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</table>

* This data is taken from Le Houerou, 1994, Annex 5, table 3, and excludes regional privatization revenues. Following the work of Le Houerou (1994) and Wallich (1994), per capita budget revenues are used as a proxy of regional income. There are several reasons for this (Le Houerou, 1994, p.12). First, with the exception of the new value added tax used during part of 1992, the traditional practice of equalizing budget revenues among the regions by equalizing tax sharing rates between the center and regions was no longer implemented. Secondly, since per capita budget revenues are positively related to regional average monthly wages, they are a reasonable indicator of the level of regional income. Furthermore, social expenditures of enterprises are also positively correlated to budget revenues, so that this relationship would be stronger if non-cash benefits were included in wages.
Figure 1: $f^*(P)$ and $f^*(s)$.
Figure 2: $I^c > P$ and $a_{12} = 1$
Table 2:
The impact of an increase in $\omega_e$ on the periphery's incentive to secede

<table>
<thead>
<tr>
<th>$\sigma_e$</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Overall effect</th>
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<tbody>
<tr>
<td>$\sigma_e &gt; 1$</td>
<td>$-$</td>
<td>$-$</td>
<td>$-$</td>
</tr>
<tr>
<td>$\sigma_e = 1$</td>
<td>$-$</td>
<td>0</td>
<td>$-$</td>
</tr>
<tr>
<td>$\sigma_e &lt; 1$</td>
<td>$-$</td>
<td>$+$</td>
<td>$?$</td>
</tr>
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</table>
Table 3:
The impact of an increase in $\omega_f$ on the periphery's incentive to secede

<table>
<thead>
<tr>
<th>$\sigma_e$ and $\chi^p$</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Overall effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\sigma_e &gt; 1$ and $\chi^p$ low</td>
<td>-</td>
<td>+</td>
<td>?</td>
</tr>
<tr>
<td>$\sigma_e &gt; 1$ and $\chi^p$ high</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>$\sigma_e = 1$ and $\chi^p$ low</td>
<td>-</td>
<td>0</td>
<td>-</td>
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<tr>
<td>$\sigma_e = 1$ and $\chi^p$ high</td>
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<tr>
<td>$\sigma_e &lt; 1$ and $\chi^p$ low</td>
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<tr>
<td>$\sigma_e &lt; 1$ and $\chi^p$ high</td>
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<td>-</td>
<td>?</td>
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</tbody>
</table>
Figure 4: $t^P$ and $\sigma_2 = 1$