Interregional Transfers, Vertical Fiscal Gap and Accountability*

Otto F. M. Reich†
Department of Commerce
Massey University
This version: December 2007

Abstract

This paper investigates the effects of two alternative interregional transfer systems, an occasionally constitutionally enshrined principle of federations, on political accountability at the provincial level. A two-period, two-province agency model of asymmetric information is studied. In equilibrium provincial reelection rates are higher in the rich than in the poor province, and reelection rates across provinces are higher in the good than in the bad state of the world. Depending on the state of the world a reduction in the scope for graft may increase or decrease reelection rates. While stronger in the rich province, the direction of the effects is the same across provinces. In contrast thereto, variations in the vertical fiscal gap and changes in the degree of interregional redistribution imply that reelection rates move in opposite directions across provinces. There is some evidence that voters are better off with a federal government engaging in provincial public good delivery than with a federal government writing cheques to provincial governments.

JEL Classification: H77, D72
Keywords: Accountability, Fiscal Federalism, Interregional Transfers, Vertical Fiscal Gap, Voting Behaviour

*I am grateful to Al Slivinski, Ig Horstmann, Jim Davies and Steffen Lippert as well as seminar participants at Massey University and conference participants at the 2007 Australasian Economic Theory Workshop for comments. The usual disclaimer applies.

†Department of Commerce, Massey University, Auckland, New Zealand. E-mail: o.f.reich@massey.ac.nz
1 Introduction

In many countries – whether federations, on which this paper focuses, or unitary states – intergovernmental and interregional transfer programs\(^1\) are in place. It is the purpose of these programs to address vertical and horizontal fiscal imbalances. Given an assignment of tax instruments and expenditure responsibilities to levels of government within a federation, we may define vertical fiscal imbalance, following Bird and Tarasov (2002), as the resulting difference between expenditure and own-source revenues at different levels of government. Following the same source, the notion of horizontal fiscal imbalance may be defined as the difference in the resources available to governments at the same (subnational) level, where this difference stems from the heterogeneity in wealth of subnational jurisdictions.

In Canada, as in other nations, federally sponsored intergovernmental transfer programs are financed from general federal government revenue and take a variety of forms. Most prominent among these programs in Canada are the Canada Health and Social Transfer (CHT and CST) programs and the Equalization Transfer. With the CHT and CST\(^2\) programs the federal government supports the provision of provincial public services in the health, education, and welfare sectors on an equal per capita basis. Notwithstanding the federally sponsored 1984 Canada Health Act\(^3\), responsibility for these sectors is assigned to the provinces by the Canadian constitution\(^4\). Being financed out of general federal government revenue these transfers can be said to address both vertical and horizontal fiscal imbalances. There are other federally administered programs for regional development, industrial development, and employment insurance. All of the aforementioned federal programs have an “equalization” component in implicitly transferring income from successful provinces to laggard provinces. In doing so, these programs address the constitutional “commitment to promote equal opportunities” in the Canadian federation.

While the federal programs discussed in the previous paragraph imply income

---

\(^1\) In a survey of intergovernmental transfer programs in developed federations, Bird and Tarasov (2002) include Australia, Austria, Belgium, Canada, Germany, Spain, Switzerland, and the United States.

\(^2\) The Canada Social Transfer (CST) is a federal block transfer to provinces and territories in support of post-secondary education, social assistance and social services, including early childhood development, early learning, and childcare. For a description of these programs, see, for instance, Rosen, Dahlby, Smith, and Booth (2002) who discuss the federal CHST payments that preceded the CHT and CST payments.

\(^3\) This act lays down principles that provincial health plans must satisfy to qualify for federal grants.

\(^4\) Section 93, see for instance Pilette (1993), of the 1867 Canada Constitution Act assigns exclusive jurisdiction for education to the provinces.
transfers from “have” to “have-not” provinces, the Equalization Transfer, which is enshrined as equalization payments in the Canadian Constitution\textsuperscript{5}, explicitly addresses the horizontal fiscal imbalance in the Canadian federation. It does so because only “have-not” provinces benefit from equalization payments\textsuperscript{6} whereas all provinces benefit from the programs mentioned in the previous paragraph. In contrast to other transfers, equalization payments are unconditional\textsuperscript{7}. While interregional transfer programs may be constitutionally anchored, their design is up to policy makers. Two polar cases of transfer programs are considered in this paper.

Tables 1 and 2 in appendix B give an impression of the sums involved in the Canadian equalization program. In the 2006/07 fiscal year the province of Prince Edward Island obtains the highest per-capita payments from equalization (Can $ 2102 per-capita); in absolute terms the province of Québec obtains the highest payments (Can $ 5.5 Bill, $ 725 per-capita). Figures 1 and 2 in appendix B give an impression to what extent the Atlantic provinces relied on equalization payments and more generally transfers by the federal government as a source of revenue over the last decade. Unconditional transfers, in other words equalization payments, amounted to 38% of Prince Edward Island’s own-source revenue\textsuperscript{8} in 2004. This number was as high as 42% in the ’90s. Among the Atlantic provinces Nova Scotia relied the least on equalization payments, with only 25%. Newfoundland, where federal transfers amounted to 61% of own source revenue, relied most heavily on federal transfers (equalization payments and other transfers such as the CHT and CST payments), as a source of

\textsuperscript{5}\textsuperscript{5}The 1982 Canadian Constitution Act’s part III, section 36 on equalization and regional disparities is comprised of two subsections which are quoted below:

1. **Commitment to promote equal opportunities**: Without altering the legislative authority of Parliament or of the provincial legislatures, or the rights of any of them with respect to the exercise of their legislative authority, Parliament and the legislatures, together with the government of Canada and the provincial governments, are committed to
   (a) promoting equal opportunities for the well-being of Canadians;
   (b) furthering economic development to reduce disparity in opportunities; and
   (c) providing essential public services of reasonable quality to all Canadians.

2. **Commitment respecting public services**: Parliament and the government of Canada are committed to the principle of making equalization payments to ensure that provincial governments have sufficient revenues to provide reasonably comparable levels of public services at reasonably comparable levels of taxation.

\textsuperscript{6}\textsuperscript{6}Out of the 10 provinces, Alberta and Ontario are the only provinces that did not benefit from equalization payments over the last 15 years.

\textsuperscript{7}\textsuperscript{7}Bird and Tarasov (2002) note that the CHST is effectively an unconditional transfer too.

\textsuperscript{8}\textsuperscript{8}Own source revenue refers to revenue raised by the provincial government excluding federal government revenue raised in that province and excluding federal transfers.
revenue. With a ratio equal to 43%, Nova Scotia relied also in this broader category the least on federal transfers.

The vertical fiscal imbalance in Canada, according to the measurements conducted by Bird and Tarasov (2002), is not particularly large. In only raising the fiscal capacities of below average provinces\(^9\), the equalization program is also not as far reaching as it could be and as it is in other federations. For instance, the program does not tax provinces with above average fiscal capacities\(^{10}\). The objective of the equalisation system in Australia\(^{11}\), in contrast, is to fully equalize the revenue-raising capacity and expenditure needs of its states. Nonetheless, there is a lively discussion with respect to federal-provincial fiscal relations in Canada\(^{12}\).

In Canada, as in other federations\(^{13}\), programs to address horizontal and vertical fiscal imbalances, where the latter imbalance is also referred to as vertical fiscal gap, have been argued to create an intransparent policy environment lacking in accountability\(^{14}\). Illustrative of this point is the observation of the Canadian Expert Panel on Equalization and Territorial Formula Financing in its 2006 findings\(^{15}\):

In spite of the fact that the federal government will spend well over $11 billion on Equalization in 2006/07, Equalization has been largely ignored by the vast majority of Canadians and it is understood by only a select few academics, experts, and finance officials across the country;

Given the formal assignment of expenditure responsibilities and the variety and complexity of transfer programs, accountability of the various levels of governments suffers. Closer matching of spending and revenue-raising capacities can strengthen accountability. It can do so by reducing voters’ uncertainty about the environment in which politicians operate when providing public goods and services. In the model

---

\(^9\)The average is determined by a five-province-standard (RFPS) including British Columbia, Manitoba, Saskatchewan, Ontario and Québec.

\(^{10}\)This is, for instance, the case in Germany’s system of “horizontalem Finanzausgleich”. See Bird and Tarasov (2002). Moreover, the program could be much more expensive if also resource capacity differences were fully equalized as it was the case under the former RNAS (Representative National Average Standard) approach. See Smart (2005b).

\(^{11}\)See OECDaus (2006).


\(^{13}\)See, for instance, the 2006 OECD country surveys for Australia, Canada, and Germany; OECDaus (2006), OECDcan (2006b), and OECDger (2006).

\(^{14}\)See also the newspaper column “Fiscal imbalance is about accountability” by Booth (2006).

below, the panel’s observation is reflected in the assumption that provincial voters are imperfectly informed about the revenue side of provincial budgets.

In this paper the effect of interregional transfers on political accountability at the provincial level is explored. The emphasis thereby lies in how these transfers interact with the voter’s means of disciplining politicians, the voter’s power to reelect. A two-period, two-province political-agency model of asymmetric information is studied. Its results are summarized in the following paragraph.

The results are based on a setup in which the federal government takes the form of an exogenous transfer rule and feature equilibria in which provincial reelection rates are higher in the rich than in the poor province, and in which reelection rates across provinces are higher in the good than in the bad state of the world. Comparative statics indicate that a reduction in the scope for graft increases reelection rates when policies indicating the bad state of the world are observed and decreases reelection rates when policies indicating the good state are observed. While stronger in the rich province, the direction of the effects is the same across provinces. In contrast thereto, variations in the vertical fiscal gap and changes in the degree of interregional redistribution imply that reelection rates move in opposite directions across provinces. Based on the comparison of two polar ways of effecting interregional transfers, there is some evidence that provincial voters may be better off with a federal government engaging in provincial public good delivery than with a federal government writing cheques to provincial governments.

The rest of the paper is structured as follows. Section two briefly discusses related literature. Section three introduces the model, characterizes its equilibria and presents comparative statics. Section four discusses implications and concludes. Appendix A contains proofs.

2 Related Literature

This paper seeks to contribute to the current discussion regarding political accountability in public good provision in federal systems\(^\text{16}\). More specifically this paper also relates to the literature on informational asymmetries in federal systems\(^\text{17}\). The vast literature on fiscal federalism is reviewed elsewhere\(^\text{18}\). Also, while the literature on


\(^{17}\)A recent trend according to Wilson and Janeba (2005)

\(^{18}\)See, for instance, Oates (1999) reviewing the literature on fiscal federalism.
horizontal interactions of subnational governments is large\textsuperscript{19}, the literature on vertical interactions between levels of government in federal systems is relatively scant.

In studying accountability in federal systems this paper is related to papers by Seabright (1995) and Joanis (2007). Seabright studies an incomplete contracts model of a federation and derives a tradeoff between policy coordination (centralization) and accountability (decentralization). The author’s paper features cross-jurisdictional externalities. In this paper, there are no cross-jurisdictional externalities and, in contrast to Seabright, this model provides some evidence that, in an environment where the federal government is constitutionally committed to making interregional transfers, voters may be better off with federally provided public goods. Joanis (2007) also studies a two-period, two-province political agency model. While voters in his model are imperfectly informed about governments’ contribution to a jointly provided public good, the model studied here features voters that are imperfectly informed about the amount of provincial revenues. In the version of Joanis (2007) model that features Leviathan-politicians only, the author finds that decentralization leads to more rent seeking than centralization. Though the motivation is different, misappropriations of resources are lower under federal provision in this model too. Moreover, in closer matching between revenues and expenditures at different levels of government, federal provision eliminates the voters’ uncertainty about the state of provincial revenues. Accountability of provincial governments is improved. This follows because there are less opportunities for the misappropriation of resources on part of provincial politicians; also, in a model in which politicians care about both ego-rents and rents from the misappropriation of resources, disciplining politicians becomes easier. With regard to the latter implication, this paper is also related to the literature on fiscal centralization\textsuperscript{20}, part of the fiscal federalism literature. To the extent that this model provides evidence in favour of federally provided public goods, the argument here is information driven and not due to cross-jurisdictional externalities.

3 Model

I study a political agency model elements\textsuperscript{21} of which correspond to Besley and Smart (2007). Consider a federation made up of two provinces, labelled \( r \) and \( p \) for rich and poor, with representative voters whose endowment incomes are given by \( y_r \) and \( y_p \) in

\textsuperscript{19}Wilson (1999) reviews the literature on tax competition.

\textsuperscript{20}See Oates99.

\textsuperscript{21}Besley and Smart (2007) study a political agency model in the tradition of Barro (1973) and Ferejohn (1986). See also Persson and Tabellini (2002) on electoral accountability and political agency models.
every period of two periods, and in which \( y_r > y_p \). The provincial voters’ per-period payoffs from private consumption \( c_i \) and provincially provided public goods \( g_i \) are given by

\[
u(c_i, g_i) = b(c_i) + d(g_i)
\]

for \( i \in \{p, r\} \), where \( b'(c), d'(g) > 0 \) and \( b''(c), d''(c) < 0 \). Also assume that voters discount period 2 payoffs at rate \( \delta \in (0, 1) \). Provincial governments are respectively represented by an office-motivated politician whose type is private information. Politicians are either corrupt or virtuous. Politicians’ types are indicated by \( j \in \{c, v\} \). A politician is virtuous with probability \( p \in (0, 1) \). Politicians’ per-period payoffs are given by

\[
v_j(R, r_i, c_i, g_i) = R + (1 - \iota_j) r_i + \iota_j u(c_i, g_i),
\]

where

\[
\iota_j = \begin{cases} 
1, & \text{if } j = v \\
0, & \text{if } j = c.
\end{cases}
\]

In equation (2) \( R > 0 \) denotes ego-rents. Both virtuous and corrupt politicians enjoy ego-rents when holding office. Depending on a politician’s type, the second component of a politician’s per-period payoff is given by the amount of misappropriated resources \( r_i \), if \( j = c \), or by the representative voter’s utility, if \( j = v \). Taking federal transfers \( T_i \) and the federal tax rate \( \tau \) as given, provincial politician \( i \) chooses the amount of public good \( g_i \), the proportional income tax rate \( t_i \in [0, 1 - \tau] \), and rents \( r_i \) such that the provincial budget constraint

\[
T_i + t_i y_i = g_i + r_i, \ i \in \{p, r\},
\]

holds. The federal government is represented by an exogenous transfer mechanism. More precisely it takes the form of a transfer rule mapping federal tax revenue \( \tau(y_p + y_r) \) into provincial transfers:\footnote{More generally the transfer rule could take the following form: \( T^\theta(\tau, y_p, y_r) = (1 - c(t_p, t_r))\tau(y_p + y_r)\theta, c(t_p, t_r)\tau(y_p + y_r)\theta) = (T^\theta_p, T^\theta_r) \), where \( \tau \in (0, 1) \) is the uniform federal income tax rate, and \( \theta \in \{a, 1\} \), where \( a \in (0, 1) \). The realization of \( \theta \) is unknown to voters, but known to politicians. Voters, however, are aware of the distribution of \( \theta \), \( P(\theta = 1) = q \in (0, 1) \). Total provincial income could depend on (relative) tax effort and capacity. One may, therefore, also include (relative) provincial incomes. In (4) \( c(t_p, t_r) = \frac{1}{2} \).}

\[
T^\theta(\tau, y_p, y_r) = \left( \frac{\tau(y_p + y_r)\theta}{2}, \frac{\tau(y_p + y_r)\theta}{2} \right) = (T^\theta_p, T^\theta_r),
\]

where \( \tau \in (0, 1) \) is the uniform federal income tax rate, and \( \theta \in \{a, 1\} \), where \( a \in (0, 1) \). The realization of \( \theta \) is unknown to voters, but known to politicians. Voters, however, are aware of the distribution of \( \theta \), \( P(\theta = 1) = q \in (0, 1) \). Total provincial
revenue $T_{i}^{\theta} + t_{i}y_{i}$ is therefore unobservable to the voter. While the voter in province $i$ knows the amount of taxes $t_{i}y_{i}$ raised by the provincial government in province $i$, he has imperfect information about federal transfers $T_{i}^{\theta}$. Federal transfers may be high, if $\theta = 1$, or low, if $\theta = a$. The degree by which $a$ differs from unity may reflect revenue absorbed by the federal government. Depending on the state of the world it is more or less costly for the federal government to conduct its business.

Two observations are in order before summarizing the structure of the game. Note first that the degree by which $a$ differs from unity determines the scope for misappropriations by a corrupt provincial politician pretending the realized state is $\theta = a$ when the true state is $\theta = 1$. In that case such a politician is lining his pockets with an amount equal to $r = \frac{(1-a)r_{i}(y_{p}+y_{r})}{2}$. Second, since the federal government does not provide any public goods\footnote{The model, at this stage, abstracts from federal public good provision.} itself, the size of $\tau$ is a measure of the vertical fiscal gap – the excess of federal government revenue over its expenditure obligations for publicly provided goods.

In the following, the sequence of events in the two period game is described: At the beginning of period 1, there are two politicians in place. They represent the provincial governments in either province. Their respective types are unknown to the voters in either province. Provincial politicians – in contrast to voters aware of the realization of $\theta$ – choose provincial tax rates $t_{i}$, the level of publicly provided goods $g_{i}$, and possibly $r_{i}$ taking the federal tax rate $\tau$ and federal transfers $T_{i}^{\theta}$ as given. First period payoffs are realized. Subsequent to observing $(\tau, t_{i}, g_{i})$, provincial voter $i$ updates his beliefs regarding the incumbent politician’s type. Having updated their beliefs, voters in each province decide whether to reelect the incumbent politician or replace the incumbent politician with a new politician. In period 2, then, politicians choose policies, period two payoffs are realized, and the game ends.

### 3.1 Equilibrium

The model outlined in the previous section is a game of incomplete information with respect to the strategic interaction between provincial politician $i$ and representative voter $i$. The equilibrium notion used to analyse this game is perfect Bayesian equilibrium\footnote{For a definition of perfect Bayesian equilibrium see Mas-Colell, Whinston, and Green (1995) or Fudenberg and Tirole (1991).} (henceforth PBE).

As a benchmark, equilibria in the game without any transfers – the case of two independent provinces – are characterized. This means setting $\tau = 0$ such that $T_{i}^{\theta} = 0$.\footnote{The model, at this stage, abstracts from federal public good provision.}
Consider the \textit{one-shot} game first. A \textit{virtuous} politician’s optimal policy choice \((t^*_i, g^*_i)\) solves

\[
\max_{\{t_i, g_i\}} v_v(R, r_i, c_i, g_i) = R + u(c_i, g_i) = R + b(c_i) + d(g_i),
\]

subject to

\[
c_i + g_i = y_i, \quad \text{and} \quad t_i y_i = g_i.
\]

Hence, \((t^*_i, g^*_i)\) are defined by

\[
b'(1 - t_i)y_i) = d'(t_i y_i), \quad \text{and} \quad t_i y_i = g_i^*.
\]

A virtuous politician implements the voter’s most preferred policy. Given strict concavity of the voters’ payoff functions, we have

\[
c_r > c_p, \quad \text{and} \quad g_r > g_p;
\]

private consumption as well as consumption of publicly provided goods is higher in the rich than in the poor province. However, depending on functional forms, tax rates may be higher in the rich or the poor province\(^{25}\).

A \textit{corrupt} politician’s optimal policy choice is \(t^{c*}_i = 1\) and \(r^{c*}_i = y_i\) implying \(c^{c*}_i = g^{c*}_i = 0\).

Turning to the \textit{two-period} game, note that a virtuous politician is a perfect agent for the voter; that is, he implements the voter’s most preferred policies, defined in (5), in every period. A corrupt incumbent may choose type-revealing policies \((t^{c*}_i, r^{c*}_i)\) in period 1 or mimic a virtuous politician. The separation constraint – it separates pooling from separating perfect Bayesian equilibria – involves a corrupt incumbent’s payoff to either policy and is given by

\[
\frac{R + \delta[R + y_i]}{R + y_i} < \frac{R}{R + y_i}.
\]

\(^{25}\)We have

\[
\frac{\partial t^*_i}{\partial y_i} = \frac{(1 - t^*_i)b''((1 - t^*_i)y_i) - d''(t^*_i y_i)t^*_i}{[b''((1 - t^*_i)y_i) + d''(t^*_i y_i)]y_i}
\]

which implies

\[
\frac{\partial t^*_i}{\partial y_i} > 0 \iff (1 - t^*_i)b''((1 - t^*_i)y_i) - d''(t^*_i y_i)t^*_i < 0.
\]

Note that if \(b(x) = d(x)\), then \(t^*_p = t^*_r = .5\).
Hence, corrupt politicians separate if, *conditional on certain reelection*, the benefit of mimicking is less than the cost of mimicking whereby the benefit of mimicking is given by tomorrow’s discounted prestige-value of holding office $\delta R$, and the cost of mimicking is given by the loss in benefits from misappropriations $(1 - \delta)y_i$ due to discounting; that is, if (6) holds, then a corrupt politician is recognized and ousted at the end of the first period. In contrast, if $\delta R \geq (1 - \delta)y_i$, then a corrupt politician prefers to mimic a virtuous politician such that the voter’s updated beliefs with respect to the incumbent’s type are unchanged. The voter is therefore indifferent between reelecting the incumbent and ousting the incumbent. For a corrupt politician to prefer mimicking to separating, the voter in province $i$ – after observing policies $(t^*_i, g^*_i)$ – must reelect with probability $\rho^*_i$, where\(^{26}\)

$$\rho^*_i \geq \frac{y_i}{\delta[R + y_i]}.$$  

(7)

We summarize the set of equilibria for the game without federal transfers in the following proposition.

**Proposition 1** (no federal transfer, $\tau = 0$). There are two types of equilibria: (1) separating equilibrium, (2) pooling equilibrium.

1. If  
$$\delta R < (1 - \delta)y_i,$$

then corrupt politician $i$ chooses separating policies $(t^*_i, r^*_i)$.

2. If  
$$\delta R \geq (1 - \delta)y_i,$$

then corrupt politician $i$ chooses mimicking policies $(t^*_i, g^*_i)$, and voter $i$ reelects with probability $\rho^*_i$, where

$$\rho^*_i \in \left[\frac{y_i}{\delta[R + y_i]}, 1\right].$$

In a separating equilibrium (1), the voter recognizes the incumbent’s type. He reelects the incumbent upon observing policies $(t^*_i, g^*_i)$ and replaces the incumbent upon observing policies $(t^*_i, r^*_i)$. In a pooling equilibrium (2), both types of politicians choose policies $(t^*_i, g^*_i)$ in the first period. Hence, the voter’s beliefs regarding

\(^{26}\)Denoting the probability of reelection chosen by voter $i$ by $\rho_i$, the incumbent’s payoff from mimicking is $R + \rho_i\delta[R + y_i]$, and his payoff from separating is $R + y_i$ which implies that $\rho_i = \frac{y_i}{\delta[R + y_i]}$ leaves a corrupt incumbent indifferent between mimicking and separating.
the incumbent’s type are unchanged, and he is indifferent between replacing and re-electing the incumbent. In equilibrium, the voter reelects with probability at least $\rho_i^*$. Doing so, a corrupt politician can be disciplined and mimics a virtuous politician. Since the voter discounts future payoffs, he prefers disciplining a corrupt politician to forcing separation which he could do by reelecting with probability $\rho_i < \rho_i^*$.

**Corollary 1.** In case of a pooling equilibrium (2), we have

$$\frac{y_r}{\delta[R + y_r]} = \rho_{r, \min}^* > \rho_{p, \min}^* = \frac{y_p}{\delta[R + y_p]}.$$  

Note that the minimum re-election rate consistent with a pooling equilibrium $\rho_{i, \min}^*$ is higher in the rich province than in the poor province. This follows because straying from the path of virtue is more tempting to a corrupt politician in the rich province than in the poor province\(^{27}\). Reelecting the incumbent in the rich province with a higher probability compensates him for resisting the temptation.

Consider now the game with interregional transfers and recall that transfers proceed according to the transfer function in (4). In the one-shot game, the following results arise: Given federal policies $(\tau, T_i^\theta)$, a virtuous politician implements the policy $(t_i, g_i)$ that maximizes the representative voter’s utility. In other words, he chooses state dependent policies $(t_i^\theta, g_i^\theta)$ which are defined by the following conditions:

$$b'((1 - t_i^\theta - \tau) y_i) = d'(g_i^\theta)$$
$$T_i^\theta + t_i^\theta y_i = g_i^\theta.$$  

A corrupt politician gets ego-rents $R$ from being in office and cares in addition about rents $r$. He, therefore, maximizes rents and does so in choosing provincial tax rates as high as possible. In particular, corrupt politician $i$ chooses

$$t_i^c = t_c^c = (1 - \tau), \quad r_i^c(\theta) = T_i^\theta + t_i^c y_i,$$

implying $c^c = g^c = 0$ by the provincial budget constraint. Clearly, voters in either province learn the politician’s type at the end of the period. In a two period game in which the period 1 incumbent may be reelected, the results characterizing the one-shot game describe period 2 play on part of each possible politician.

\(^{27}\)Note that $R$ is assumed to be equal across provinces; however, allowing for $R_r \geq R_p$, the corollary continues to hold as long as $\frac{R_r}{R_p} \leq \frac{y_r}{y_p}$. Putting it differently, the result continues to hold, when allowing for higher ego rents from holding office in the rich province than in the poor province, as long as ego rents rise less than proportional to provincial income.
Turning to the two-period game, note again that a virtuous politician is a perfect agent for the voter. Consider a corrupt incumbent in period 2, in province $i$, when the state is $\theta = 1$: If

$$R + \frac{(1-a)\tau(y_p + y_r)}{2} + \delta[R + E_\theta r_c^i(\theta)] \leq R + r_c^i(1),$$

Payoff from mimicking and certain reelection

which can be rewritten as

$$\delta[R + E_\theta r_c^i(\theta)] \leq r_c^i(a),$$

then type $c$ politicians separate. The LHS in the inequality preceding inequality (8) spells out a corrupt incumbent’s payoff from mimicking a virtuous incumbent who chooses policies $(t^a_i, g^a_i)$. In particular, assuming the corrupt incumbent is reelected with certainty, his present discounted payoff is equal to the sum of today’s ego-rents $R$, today’s rents from the diversion of resources $\frac{(1-a)\tau(y_p + y_r)}{2}$, tomorrow’s discounted ego-rents $\delta R$ and tomorrow’s expected, discounted rents from the diversion of resources $\delta E_\theta r_c^i(\theta)$. The RHS in the same inequality spells out a corrupt incumbent’s payoff from separating. Since his type is revealed, he is not reelected such that his payoff is equal to the sum of today’s ego-rents $R$ and today’s rents from the diversion of resources $r_c^i(1) = T^1_i + t^c y_i$.

Note that the separation constraint in (8), analogous to the benchmark case without transfers, is province specific. Assuming that $\tau < 1$, both the payoff from mimicking and the payoff from separating are higher in the rich province. The former is higher because tomorrow’s expected rents are higher in the rich province, $E_\theta r_c^r(\theta) > E_\theta r_c^p(\theta), and the latter is higher because today’s potential rents are higher, $r_c^r(1) > r_c^p(1)$.

---

28I also use today when referring to period 1 and tomorrow when referring to period 2.

29Note that $r_c^i(a) = r_c^i(1) - \frac{(1-a)\tau(y_p + y_r)}{2}$.

30Eliminating the expectation and substituting for the rent terms, the inequality constraint may be written as $\delta R \leq (1-\delta)(1-\tau)y_r + [(1-a)(1-\delta(1-q)) - \delta q] \frac{\tau(y_p + y_r)}{2}$. Analogous to the environment without transfers, conditional on certain reelection, the benefit of mimicking is given by tomorrow’s discounted prestige-value of holding office; the cost of mimicking now has two components due to provincial government revenues from two sources.

31$r_c^r(1) = (1-\tau)y_r + \frac{\tau(y_p + y_r)}{2} > (1-\tau)y_p + \frac{\tau(y_p + y_r)}{2} = r_c^p(1)$
When the state is \( \theta = a \), we have type \( c \) politicians separating if

\[
\frac{R + \delta[R + E_{\theta}r_{i}^{c}(\theta)]}{ \text{Payoff from mimicking and certain reelection} } \leq \frac{R + r_{i}^{c}(a)}{ \text{Payoff from separating today} }
\]

\[
\delta[R + E_{\theta}r_{i}^{c}(\theta)] \leq r_{i}^{c}(a) \tag{9}
\]

In contrast to mimicking when the state is \( \theta = 1 \), mimicking when the state is \( \theta = a \) requires the incumbent to refrain from any diversion of resources today. The payoff from separating today is also lower than in state \( \theta = 1 \) because there are less resources available for misappropriation, \( r_{i}^{c}(a) < r_{i}^{c}(1) \). Inequalities (9) and (8) are identical.

It therefore follows, conditional on certain reelection, that corrupt politicians prefer separating policies \((t_{i}^{c}, 0, r_{i}^{c}(1))\) to mimicking policies \((t_{i}^{a}, g_{i}^{a}, \frac{(1-a)\tau(y_{p}+y_{r})}{2})\) when the state is \( \theta = 1 \) if, and only if they prefer separating policies \((t_{i}^{c}, 0, r_{i}^{c}(a))\) to mimicking policies \((t_{i}^{a}, g_{i}^{a}, 0)\) when the state is \( \theta = a \). We summarize: if inequality (8) is satisfied, we have a separating equilibrium. In case of equality we could have a separating or a pooling equilibrium. If inequality (8) is not satisfied, we have a pooling equilibrium.

Assume, then, that inequality (8) is not satisfied such that a corrupt politician has incentives to mimic, and suppose a corrupt politician chooses policies \((t_{i}^{a}, g_{i}^{a}, r_{i}(\theta))\), where \( r_{i}(1) = \frac{(1-a)\tau(y_{p}+y_{r})}{2} \) and \( r_{i}(a) = 0 \). In that case voter \( i \)'s updated beliefs\(^{32} \hat{p} \) regarding the politician’s type when observing policies \((t_{i}^{a}, g_{i}^{a})\) are given by

\[
P(j = v | (t_{i}^{a}, g_{i}^{a})) = \hat{p} = \frac{p(1 - q)}{p(1 - q) + (1 - p)q + (1 - p)(1 - q)}.
\]

For voter \( i \) to reelect the incumbent, we require \( \hat{p} \geq p \) which implies \( (1 - q) \geq 1 \); a contradiction because \( q \in (0, 1) \). Therefore, we cannot have a pooling equilibrium in which a corrupt politician chooses observable policies \((t_{i}^{a}, g_{i}^{a})\) with probability 1 independent of the state \( \theta \).

Suppose a corrupt politician chooses today’s policies in the same manner as a virtuous politician, i.e., he chooses policies \((t_{i}^{\theta}, g_{i}^{\theta}, 0) \). Clearly, we must have

\[
\frac{R + \delta[R + E_{\theta}r_{i}^{\theta}(\theta)]}{ \text{Payoff from mimicking and certain reelection} } > \frac{R + r_{i}^{\theta}(1)}{ \text{Payoff from separating today} }
\]

\(^{32}\)Beliefs are updated according to Bayes’ rule. \( p(1 - q) \) is the probability of the incumbent being virtuous times the probability of the state being \( \theta = a \), in which case a virtuous incumbent chooses policies \((t_{i}^{a}, g_{i}^{a})\) with probability 1. The denominator is equal to the sum over the probabilities of the events generating an observation of policies \((t_{i}^{a}, g_{i}^{a})\).
which can be rewritten as
\[ \delta[R + E_\theta r_c^i(\theta)] > r_c^i(1); \]  
otherwise, a corrupt politician would not be willing to mimic choosing policies \((t_1^i, g_1^i)\) in state \(\theta = 1\). Comparing (10) and (8), it is clear that satisfaction of (10) implies non-satisfaction of (8) and (9). Assume, then, that (10) is satisfied such that we have \(\hat{p} = p\), if a corrupt politician chooses today’s policies identical to those of a virtuous politician. Hence, voter \(i\)’s continuation payoff \(\hat{p}E_\theta u_i(\theta)\) from reelecting the first period incumbent is
\[ \hat{p}E_\theta u_i(\theta) = pE_\theta u_i(\theta) \equiv p[qu_i(1) + (1 - q)u_i(a)], \]  
and therefore equal to his payoff from replacing the incumbent.

Now, if \(\rho_i^0\) denotes the probability of reelection that leaves a corrupt politician in province \(i\) indifferent between separating and mimicking\(^{33}\) when the state is \(\theta\), then
\[ \rho_i^0 = \frac{r_c^i(\theta)}{\delta[R + E_\theta r_c^i(\theta)]}. \]
Observe that a corrupt politician is only willing to choose policies \((t_1^0, g_1^0)\) if the voter reelects with probability at least \(\rho_i(t_1^0, g_1^0) \geq \rho_i^0\). Moreover, for a corrupt politician not to deviate to policies \((t_1^a, g_1^a, (1-a)r(y_p + y_c))\) when the state is \(\theta = 1\), the voter’s probability of reelection when observing policies \((t_1^a, g_1^a)\) must not be too high; more precisely, we require \(\rho_i(t_1^a, g_1^a) \leq \hat{\rho}_i(\rho_i(t_1^i, g_1^i))\), where for \(\rho(t_1^i, g_1^i) = 1\), \(\hat{\rho}_i(1)\) is defined\(^{34}\) by
\[ \hat{\rho}_i(1) = 1 - \frac{(1-a)r(y_p + y_c)}{\delta[R + E_\theta r_c^i(\theta)]}, \]
and \(\hat{\rho}_i(1) > \rho_i^0\). If the voter reelects the incumbent with probability 1 after an observation of policies \((t_1^i, g_1^i)\), then, for a corrupt incumbent to choose policies \((t_1^i, g_1^i)\) in state \(\theta = 1\), the probability of reelection \(\rho_i(t_1^a, g_1^a)\) must not be larger than \(\hat{\rho}_i(1)\). Note that \(\hat{\rho}_i(\rho_i^1) = \rho_i^2\); that is, for a corrupt politician not to deviate to policies \((t_1^a, g_1^a)\) in state \(\theta = 1\), the voter’s maximum probability of reelection \(\hat{\rho}_i(.)\) after an observation of policies \((t_1^a, g_1^a)\), when reelecting with the minimum discipline instilling probability of reelection \(\rho_i^1\) after an observation of policies \((t_1^i, g_1^i)\), is given by the

\(^{33}\)Since \(\rho_i^0\) equalizes the payoffs from mimicking and separating, we have \(R + \rho_i^0\delta[R + E_\theta r_c^i(\theta)] = R + r_c^i(\theta)\) and \(R + \rho_i^0\delta[R + E_\theta r_c^i(\theta)] = R + r_c^i(1)\). Clearly, in the latter case inequality (10) must hold; in the former case non-satisfaction of (8) is sufficient.

\(^{34}\)\(\hat{\rho}_i(1)\) is derived from \(R + \frac{(1-a)r(y_p + y_c)}{2} + \hat{\rho}_i\delta[R + E_\theta r_c^i(\theta)] \equiv R + \rho_i(t_1^i, g_1^i)\delta[R + E_\theta r_c^i(\theta)],\) where \(\rho(t_1^i, g_1^i) = 1\).
minimum discipline instilling probability of reelection $\rho_i^a$. The larger the probability of reelection after an observation of good policies by the voter, $\rho_i(t_1^i, g_1^i)$, the larger may be the probability of reelection after an observation of bad policies by the voter, $\rho_i(t_1^a, g_1^a)$. Correspondingly, $\hat{\rho}_i(\rho_i(t_1^i, g_1^i))$ increases on $[\rho_1^i, 1]$.

Assuming that inequality (10) is satisfied, consider the following policy-dependent reelection strategies $\rho_i(t_i, g_i)$, $i \in \{p, r\}$ by voters,

$$
\rho_i(t_i, g_i) = \begin{cases} 
\rho_i(t_1^i, g_1^i) \in [\rho_1^i, 1], & \text{if } (t_i, g_i) = (t_1^i, g_1^i) \\
\rho_i(t_i, g_i) \in [\rho_2^i, \hat{\rho}_i(\rho(t_1^i, g_1^i))], & \text{if } (t_i, g_i) = (t_1^a, g_1^a) \\
0, & \text{otherwise}
\end{cases}
$$

and the following state-dependent, first-period policies $P_i(\theta) = (t_i(\theta), g_i(\theta), r_i(\theta))$, $i \in \{p, r\}$ by corrupt politicians:

$$
P_i(\theta) = \begin{cases} 
(t_1^i, g_1^i, 0) & \text{if } \theta = 1 \\
(t_1^a, g_1^a, 0) & \text{if } \theta = a
\end{cases}
$$

Finally and in accordance with politicians’ first-period policy choices, let voters’ updated beliefs on the eve of the second period be given by

$$
\hat{p} = \begin{cases} 
p, & \text{if } (t_i, g_i) \in \{(t_1^a, g_1^a), (t_1^1, g_1^1)\} \\
0, & \text{otherwise}
\end{cases}
$$

Corrupt incumbent’s first-period policies in (13), voters’ reelection rules in (12), and voters’ beliefs as specified in (14) are sufficient for the characterization of a perfect Bayesian equilibrium. As is evident from (12), there is a set of PBEs differing in reelection rates. Due to triviality, virtuous politicians’ first-period policy choices and second period play are not specified.

For inequality (10) to be satisfied, the prestige-value $R$ that politicians attach to holding office must be large enough, and politicians must not discount future payoffs too much ($\delta$ must be large enough). If the value of holding office or the discount rate are too low, a corrupt politician is not willing to choose policies $(t_1^i, g_1^i, 0)$ when the state is $\theta = 1$; he may, however, be willing to choose policies $(t_1^a, g_1^a, \frac{(1-a)r(y_p+y_r)}{2})$ when the state is $\theta = 1$, assuming (8) is not satisfied. For non-satisfaction of (8), the value of holding office and the discount rate need not be as high as for satisfaction of (10) because a corrupt politician gets in addition to the value he attaches to holding office some rents from the misappropriation of resources, $\frac{(1-a)r(y_p+y_r)}{2}$. Note that in this parameter range, (10) and (8) not satisfied, the voter recognizes an honest
politician upon observing policies \((t^1_i, g^1_i)\) because a corrupt politician never chooses such policies.

Assuming neither (8) nor (10) are satisfied, consider the following policy dependent reelection strategies \(\rho_i(t_i, g_i), i \in \{p, r\}\) by voters,

\[
\rho_i(t_i, g_i) = \begin{cases} 
1, & \text{if } (t_i, g_i) = (t^1_i, g^1_i) \\
\rho^0_i, & \text{if } (t_i, g_i) = (t^a_i, g^a_i) \\
0, & \text{otherwise}
\end{cases}
\] (15)

and consider the following state dependent policies \(P_i(\theta) = (t_i(\theta), g_i(\theta), r_i(\theta))\) by a corrupt politician in province \(i\)

\[
P_i(\theta) = \begin{cases} 
(t^a_i, g^a_i, \frac{(1-a)x(g_p+y_r)}{2}), & \text{w/ prob. } \xi \text{ if } \theta = 1 \\
(t^c, 0, r^c_{i}(1)), & \text{w/ prob. } 1 - \xi \text{ if } \theta = 1 \\
(t^c, 0, r^c_{i}(a)), & \text{w/ prob. } 1 - \nu \text{ if } \theta = a \\
(t^a_i, g^a_i, 0), & \text{w/ prob. } \nu \text{ if } \theta = a
\end{cases}
\] (16)

According to these policies, a corrupt politician mixes between separating and mimicking in both states. In either state the voter observes policies \((t^a_i, g^a_i)\) if mimicking policies are chosen. Upon observing policies \((t^a_i, g^a_i)\), voter \(i\) is only willing to reelect with probability \(\rho^a_i \in (0, 1)\) if \(\hat{p} = p\); in other words, if his updated beliefs are identical to his prior. Hence, \(\nu\) and \(\xi\) must be implicitly determined by

\[
p = P(j = v|(t^a_i, g^a_i)) = \frac{p(1-q)}{p(1-q) + (1-p)(1-q)\nu + (1-p)q\xi}.
\] (17)

Intuitively, then, the larger \(\nu\) is the smaller \(\xi\) has to be; that is, the more weight a corrupt politician puts on mimicking policies in state \(\theta = a\), the less weight he must put on mimicking policies in state \(\theta = 1\); otherwise his reputation \(\hat{p}\) falls below the threshold level \(p\), and the voter replaces the incumbent. Let the voter’s beliefs on the eve of the second period be given by

\[
\hat{p} = \begin{cases} 
1, & \text{if } (t_i, g_i) = (t^1_i, g^1_i) \\
p, & \text{if } (t_i, g_i) = (t^a_i, g^a_i) \\
0, & \text{otherwise}
\end{cases}
\] (18)

Abstracting again from second period play and a virtuous incumbent’s first-period policy choice, the voters’ reelection rules in (15), a corrupt incumbent’s first-period policies in (16) where \(\xi\) and \(\nu\) in (16) are determined by (17), and voters’ beliefs as
specified in (18) are sufficient for the characterization of a set of PBEs. Since $\xi$ and $\nu$ in (17) are not uniquely determined, a continuum of different mixtures among the suggested state contingent policy-choices in (16) are consistent with voters’ beliefs being unchanged.

Summarizing the discussion, we found the following equilibria depending on parametric conditions: equilibria may be separating or pooling. In a separating equilibrium the incumbents’ first period policy choices allow the voter to identify their types. Voters reelect virtuous and replace corrupt incumbents. Apart from the separating equilibrium there are two types of pooling equilibria. The first type is characterized by pure mimicking such that the voter’s prior with respect to the incumbent’s type is unchanged after observing first period policies; in these equilibria a corrupt incumbent mimics a virtuous incumbent in both states of the world $\theta \in \{a, 1\}$. Depending on the policies observed, the voter reelects with probabilities at least equal to $\rho^\theta_i > 0$. Note that the pure pooling equilibrium requires that politicians be patient enough and attach a sufficiently high prestige-value to holding office\textsuperscript{35}. The second type of pooling equilibrium is partially pooling – a corrupt incumbent mixes between separating and mimicking policies in both states of the world – and, conditional on politicians being patient enough\textsuperscript{36}, may also arise with no office motivation, that is $R = 0$. In these latter equilibria a virtuous type is recognized after an observation of good policies and reelected. A corrupt politician, unless he separates, chooses policies indicating that the bad state of the world prevails. As a consequence of a corrupt politician’s mixing between separating and mimicking policies, his type may be revealed in either the good or the bad state. We summarize the set of equilibria in the following proposition:

**Proposition 2** (federal transfers, $\tau > 0$). An equilibrium exists for all parameter values. There are two types of equilibria: (1) separating equilibrium, (2) pooling equilibria.

1. If

$$\delta[R + E_\theta r^c_i(\theta)] \leq r^c_i(a),$$

then corrupt politician $i \in \{p, r\}$ chooses separating policies regardless of the state $\theta \in \{a, 1\}$.

2. If

$$\delta[R + E_\theta r^c_i(\theta)] > r^c_i(a),$$

\textsuperscript{35}See inequality (10).

\textsuperscript{36}See inequality (8).
then the equilibrium is pooling. There are two types of pooling equilibria: (a) purely mimicking, (b) partially mimicking. In either case, there is a set of equilibria.

(a) If

\[ \delta [R + E_\theta r^c_i(\theta)] > r^c_i(1), \]

then voter \( i \)'s reelection rule is

\[
\rho_i(t_i, g_i) = \begin{cases} 
\rho_i(t^1_i, g^1_i) \in [\rho^1_i, 1], & \text{if } (t_i, g_i) = (t^1_i, g^1_i) \\
\rho_i(t_i, g_i) \in [\hat{\rho}_i(\rho_i(t^1_i, g^1_i)), \rho_i(t^a_i, g^a_i)], & \text{if } (t_i, g_i) = (t^a_i, g^a_i) \\
0, & \text{otherwise}
\end{cases}
\]

where the \( \rho^a_i \) are defined by

\[
\rho^a_i \equiv \frac{r^c_i(a)}{\delta [R + E_\theta r^c_i(\theta)]}, \\
\rho^1_i \equiv \frac{r^c_i(1)}{\delta [R + E_\theta r^c_i(\theta)]}.
\]

\( \hat{\rho}_i(\rho_i(t^1_i, g^1_i)) \) is defined by

\[
R + \frac{(1 - a)\tau(y_p + y_r)}{2} + \hat{\rho}_i \delta [R + E_\theta r^c_i(\theta)] \\
\equiv R + \rho_i(t^1_i, g^1_i)\delta [R + E_\theta r^c_i(\theta)],
\]

a corrupt incumbent’s first-period policies are

\[
P_i(\theta) = \begin{cases} 
(t^1_i, g^1_i, 0) & \text{if } \theta = 1 \\
(t^a_i, g^a_i, 0) & \text{if } \theta = a
\end{cases}
\]

and voter \( i \)'s beliefs on the eve of period 2 are

\[
\hat{p} = \begin{cases} 
p, & \text{if } (t_i, g_i) \in \{(t^a_i, g^a_i), (t^1_i, g^1_i)\} \\
0, & \text{otherwise}
\end{cases}
\]

(b) If

\[ \delta [R + E_\theta r^c_i(\theta)] \leq r^c_i(1), \]
then voter $i$’s reelection rule is

$$
\rho_i(t_i, g_i) = \begin{cases} 
1, & \text{if } (t_i, g_i) = (t_{i1}, g_{i1}) \\
\rho_{i1}, & \text{if } (t_i, g_i) = (t_{i1}, g_{i1}) \\
0, & \text{otherwise} 
\end{cases}
$$

A corrupt incumbent’s first-period policies are

$$
P_i(\theta) = \begin{cases} 
\left( t_{i1}, g_{i1}, \frac{(1-u)(y_p+y_r)}{2} \right), & \text{w/ prob. } \xi, \text{ if } \theta = 1 \\
(t^c, 0, r_{i1}^c(1)), & \text{w/ prob. } 1 - \xi, \text{ if } \theta = a \\
(t^c, 0, r_{i1}^c(a)), & \text{w/ prob. } 1 - \nu, \text{ if } \theta = a \\
(t_{i1}^a, g_{i1}^a, 0), & \text{w/ prob. } \nu, \text{ if } \theta = a 
\end{cases}
$$

where $\nu$ and $\xi$ are implicitly determined by

$$
p = P(j = v|(t_i^a, g_i^a)) = \frac{p(1-q)}{p(1-q) + (1-p)(1-q)\nu + (1-p)q\xi}.
$$

and voter $i$’s beliefs on the eve of period 2 are

$$
\hat{\rho} = \begin{cases} 
1, & \text{if } (t_i, g_i) = (t_{i1}, g_{i1}) \\
p, & \text{if } (t_i, g_i) = (t_{i1}^p, g_{i1}^p) \\
0, & \text{otherwise} 
\end{cases}
$$

The structure of the set of equilibria for the game with transfers, though richer, parallels the structure of the set of equilibria of the game without transfers. Also, in analogy to the game without transfers, the set of equilibria characterized here has implications for reelection rates across provinces and across states of the world. The following corollary summarizes.

**Corollary 2.** In case of a pooling equilibrium, (2a) and (2b) in proposition (2), we have

$$
\rho_{i1} > \rho_{i1}, \quad i \in \{p, r\},
$$

$$
\rho_{i1} > \rho_{i1}, \quad \theta \in \{a, 1\},
$$

and

$$
\hat{\rho}_i(\rho_i(t_i^1, g_i^1)) \in [\rho_i^1, \hat{\rho}_i(1)], \text{ where } \hat{\rho}_r(1) > \hat{\rho}_p(1).
$$

Analogous to the model without interregional transfers reelection rates tend to be
higher in the rich than in the poor province. The intuition from the model without transfers carries over to the model with transfers. The opportunity cost of mimicking a virtuous politician is higher for a corrupt politician in the rich province than in the poor province. Hence, he can only be disciplined if the voter reelects at a higher rate. In doing so, the voter provides a corrupt politician with a larger expected payoff tomorrow. The intuition for higher rates of reelection after an observation of good policies than after an observation of bad policies is similar. If the voter observes bad policies, a corrupt politician either mimics a virtuous politician in the good state or the state is bad. In the first case a corrupt politician’s cost of restraining himself is reduced because he exploits the voter’s imperfect information with regard to the state of the world. In the second case a corrupt politician’s opportunity cost of mimicking is lower because provincial revenues are lower in the bad state leaving no room for the embezzlement of funds.

In comparison to the model without interregional transfers, reelection rates after an observation of bad policies are lower in the rich province. This follows not only because redistribution from the rich to the poor province reduces provincial resources in the rich province today and tomorrow but also because today’s opportunity cost of mimicking, given bad policies are observed, are relatively low and the state of the world tomorrow may be good. After an observation of good policies reelection rates may be higher or lower than in the model without transfers. The minimum reelection rate may be higher because, given good policies are observed today, the opportunity cost of discipline is relatively large today and the state of the world tomorrow may be bad. In comparison to the model without transfers, the effects on reelection rates in the poor province are exactly opposite. The minimum reelection rate after an observation of good policies is higher, and reelection rates after an observation of bad policies may be lower or higher than in the model without transfers.

3.2 Comparative Statics

In this section, the effects of changes in three of the model’s parameters - the federal tax rate $\tau$, the scope-for-graft parameter $a$, and a new parameter $\mu$ that captures the amount of redistribution implied by the federal transfer scheme - are derived. Changes in the federal policy parameters $\tau$, representing uniform taxes on income and

37 Note that in case of the pure mimicking equilibrium a higher probability of reelection after an observation of bad policies than after an observation of good policies is possible. This may occur if $\hat{p}_1(1) > \rho_1$, which requires $R$ to be relatively large; see appendix A.

38 Note that we have $y_r > r_c^r(1) > E_{\theta} r_c^r(\theta) > r_c^p(a)$.

39 Note that we have $r_c^p(1) > E_{\theta} r_c^p(\theta) > r_c^p(a)$. Depending on the numerical values of $a$, $q$ and $\tau$, we may have $y_p > E_{\theta} r_c^p(\theta)$ or $y_p < r_c^p(a)$. 

20
consumption as well as being a measure of the vertical fiscal gap, and \( \mu \), measuring the degree to which the federal government redistributes income from rich to poor provinces, would be expected to be important determinants of electoral behaviour in federal elections. In the model presented here, however, these policies affect electoral behaviour in provincial elections.

Considering changes in the federal policy parameter \( \tau \) first, note that an increase in \( \tau \) raises federal revenues and increases the vertical fiscal gap; \( \tau (y_p + y_r) \) being a measure of both. As a consequence, federal transfers (4) increase in \( \tau \),

\[
D_\tau T^\theta = \left( \frac{(y_p + y_r) \theta}{2(y_p + y_r)^2} \right) > 0, \ \theta \in \{a, 1\}, \ a \in (0, 1).
\]

Also, interregional redistribution \( IR^\theta \) increases in \( \tau \) regardless of the state \( \theta \) if incomes across provinces differ sufficiently,

\[
IR^\theta = \frac{\theta y_r - (2 - \theta) y_p}{2} > 0, \ \text{for} \ \theta \in \{a, 1\} \ \text{if} \ \frac{y_r}{y_p} > \frac{2 - a}{a}.
\]

Electoral behaviour is affected through the policy change’s impact on inequalities (8) and (10) which carve up the parameter space into separating and pooling equilibria. In particular, the trade-off that corrupt politicians face between mimicking and separating policies is affected. As a consequence the minimum discipline instilling probabilities of reelection, the \( \rho_i^\theta \), change across provinces. We summarize in the following proposition.

**Proposition 3.** An increase in the federal tax rate \( \tau \), which increases the vertical fiscal gap and federal transfers, implies

\[
0 > \frac{\partial \rho^a_r}{\partial \tau}, \quad \frac{\partial \rho^a_p}{\partial \tau} > \frac{\partial \rho^a_r}{\partial \tau}, \quad \text{and}
\]

\[
0 > \frac{\partial \rho^1_p}{\partial \tau}, \quad \text{if} \quad \frac{y_r}{y_p} < \frac{2 - a}{a}
\]

upon observation of bad policies \((t_i^a, g_i^a)\), and

\[
\frac{\partial \rho^1_p}{\partial \tau} > 0, \quad \frac{\partial \rho^1_p}{\partial \tau} > \frac{\partial \rho^1_r}{\partial \tau}
\]

upon observation of good policies \((t_i^1, g_i^1)\) by voters.

The effect on the reelection rates operates via the misappropriation terms, \( r_i^\theta(\theta) \) and \( E_\theta r_i^\theta(\theta) \). Consider, for instance, the decrease in the probability of reelection after
an observation of bad policies in the rich province, \( \rho_r \).  

\[
r_r^a(a) = (1 - \tau)y_r + a\frac{\tau(y_p + y_r)}{2} 
\]
decreases in \( \tau \); an additional $ taxed by the federal government reduces the maximum amount that can be misappropriated by a corrupt politician today.  

\[
E_\theta r_r^a(\theta) = (1 - \tau)y_r + q\frac{\tau(y_p + y_r)}{2} + (1 - q)a\frac{\tau(y_p + y_r)}{2}, 
\]
decreases in \( \tau \) as well; however it does so by a lesser amount because tomorrow’s state of the world may be good and tomorrow’s payoffs are discounted. Overall, therefore, mimicking policies generating observable policies \((t^a_i, g^a_i)\) become more attractive. As a consequence the voter need not reelect at as high a rate to instill discipline, or, put differently, keeping a corrupt politician indifferent between mimicking and separating policies requires a lower rate of reelection.

Two further observations are in order. First, a decrease in \( \rho_r \) implies that marginal separating equilibria are turned into pooling equilibria. This follows from mimicking policies becoming relatively more appealing. Second, note that if income differences across provinces are not too small, that is \( \frac{y_r}{y_p} > \frac{2-a}{a} \), and politicians attach a sufficiently high value to holding office, \( R \) large enough, then reelection rates \( \rho_i^\theta \) are predicted to move in opposite directions across provinces when the federal policy parameter \( \tau \) changes.

We next turn to the effect of changes in the scope-for-graft parameter \( a \). The degree by which \( a \) differs from 1 determines the amount of leakage of funds at the federal level. This leakage may be due to the federal government facing higher or lower costs in conducting its business\(^{40}\); possibly due to mismanagement\(^{41}\), or even misappropriations\(^{42}\) at the federal level.

An increase in \( a \) – recall that \( a \in (0, 1) \) determines the scope for graft \( \frac{(1-a)\tau(y_p + y_r)}{2} \) that a corrupt first period incumbent has in the partially mimicking equilibrium – increases transfers in the bad state, that is

\[
D_a T^a = \left( \frac{\tau(y_p + y_r)}{\tau(y_p + y_r)} \right) > 0. 
\]

In doing so, it reduces the difference in transfers between the good and the bad state such that less resources are available for misappropriation by a mimicking corrupt politician who pretends the state is bad when it is good.

---

\(^{40}\)One may think of emergencies such as wars, weather catastrophes, and epidemics.

\(^{41}\)In the Canadian context, two examples are: the recent introduction of the federally sponsored gun registry and associated costs (2004), and the spending scandal related to the Jane Stewart led human resources development Canada ministry (2000).

\(^{42}\)A recent Canadian example is provided by the sponsorship scandal surrounding the (Québec wing) of the Liberal party (2004).
Proposition 4. An increase in \( a \), increasing transfers in the bad state, implies

\[
\frac{\partial \rho^a}{\partial a} > \frac{\partial \nu^a}{\partial a} > 0
\]

upon observation of bad policies \((t^a_i, g^a_i)\), and

\[
0 > \frac{\partial \rho^1_p}{\partial a} > \frac{\partial \nu^1_r}{\partial a}
\]

upon observation of good policies \((t^1_i, g^1_i)\) by voters.

Reelection rates after an observation of bad policies have to rise because the increase in \( a \) implies that the amount of funds that may be embezzled by corrupt provincial politicians increases, and this increase is stronger today. A reduction in the scope for graft therefore tends to increase reelection rates across provinces while a decrease tends to reduce reelection rates. An alternative way to think of the difference of \( a \) from unity is to think of it as measuring the amount of discretionary, as opposed to, rules based spending in the federal budget.

By introducing an additional parameter into the transfer function in (4), we can vary the degree to which the federal government redistributes income from the rich to the poor province and explore the effects on equilibrium behaviour by politicians and voters. Let the transfer function be given by

\[
T^\theta(\tau, \mu, y_p, y_r) = (\tau(y_p + y_r)\theta\mu, \tau(y_p + y_r)\theta(1 - \mu)) = (T^\theta_p, T^\theta_r),
\]

where \( \mu \in (0, 1) \) determines the share of federal revenue that is transferred to the poor province\(^{43}\). Corresponding to equation (4\(^*\)), there are starred (poor province) and double-starred (rich province) inequalities\(^{44}\) (8), (9), and (10) which are inclusive of the newly introduced parameter \( \mu \), and continue to carve up the parameter space into separating and pooling equilibria.

Proposition 5. An increase in \( \mu \), increasing the share of revenue being transferred to the poor province, implies

\[
\frac{\partial \rho^1_p}{\partial \mu} > 0 > \frac{\partial \nu^1_r}{\partial \mu}.
\]

after an observation of good policies \((t^1_i, g^1_i)\) by voters. In contrast, after an observa-

\(^{43}\)In (4), \( \mu = 1/2 \).

\(^{44}\)See appendix A
tion of bad policies \((t_i^a, q_i^a)\), we have

\[
\frac{\partial \rho_p^a}{\partial \mu} > 0 \quad \text{iff} \quad a > \rho_p^a \delta [q + (1 - q)a],
\]

and

\[
\frac{\partial \rho_r^a}{\partial \mu} < 0, \quad \text{iff} \quad a > \rho_r^a \delta [q + (1 - q)a].
\]

Changes in the federal policy parameter \(\mu\) move minimum rates of reelection in opposite directions. Reelection rates move in opposite directions because changes in \(\mu\) redistribute resources across provinces. As the amount of resources available for misappropriation to a corrupt provincial politician increase or decrease, discipline instilling rates of reelection rise or fall. Assuming that the leakage of funds parameter \(a\) is reasonably close to 1, reelection rates increase in the poor province and decrease in the rich province regardless of the policies observed by the voter.

Summarizing, observe that changes in the federal policy parameters \(\tau\) and \(\mu\) affect the provincial voting mechanism. In particular, assuming that income differences across provinces are not too small and politicians attach a sufficiently high value to holding office, minimum provincial reelection rates \(\rho_i^\theta\) are predicted to move in opposite directions when federal policies \(\tau\) and \(\mu\) change. Federal policy changes affect voter behaviour in provincial elections through their impact on the amount of resources accessible for misappropriation by corrupt politicians. Disciplining these politicians prompts voters to adjust minimum rates of reelection. Reelection rates move in opposite directions because both changes in \(\mu\) and \(\tau\) redistribute resources across provinces.

In corollary 2 it was not only established that rates of reelection across provinces are higher after an observation of policies indicating the good state of the world than after an observation of policies indicating the bad state, but it was also established that reelection rates tend to be higher in the rich province than in the poor province. Federal policy changes that increase the degree of redistribution from the rich to the poor province - for instance, an increase in the federal tax rate \(\tau\) or an increase in the fraction \(\mu\) of federal revenue that is transferred to the poor province - tend to reduce this difference in reelection rates by increasing minimum rates of reelection in the poor and decreasing minimum rates of reelection in the rich province. To the extent that the provinces’ relative standing in the federation reflects the policies of provincial governments, this movement in reelection rates may be unhealthy in the sense of reducing reelection chances of putatively successful provincial governments in rich
provinces and augmenting reelection chances of putatively unsuccessful governments in poor provinces. In other words, successful politicians who should be rewarded with reelection may be less likely to get reelected, while less successful politicians who should not be reelected may be more likely to get reelected. Federal policies may thus be said to contribute - through their impact on provincial electoral behaviour - to the perpetuation of provinces relative standings within the federation.

The scope-for-graft parameter $a$, while symmetrically affecting reelection rates across provinces, has a stronger effect on voter behaviour in the rich province than in the poor province. Minimum reelection rates rise after an observation of policies indicating the bad state and fall after an observation of policies indicating the good state. An increase in $a$ renders federal transfers in the bad state not quite as bad. For voters this implies, assuming the bad state prevails, corrupt politicians can only be disciplined if minimum rates of reelection rise. If, on the other hand, the good state prevails minimum rates of reelection decrease.

In contrast to the parameters $\tau$ and $\mu$, the parameter $a$, is not strictly a federal policy parameter. The degree by which $a$ differs from 1 determines the amount of leakage of funds at the federal level. This leakage may be due to emergencies, mismanagement, or even misappropriations. In either case, it matters for electoral behaviour in provincial elections because of the existence of a vertical fiscal gap. Without a vertical fiscal gap and indirect federal financing of the provincial provision of publicly provided goods, there would be no distortion of minimum rates of reelection at the provincial level due to changes in $a$. Moreover, an equilibrium in which a corrupt provincial politician misappropriates resources $\frac{(1-a)\tau(y_p+y_r)}{2}$ in his first term in office and gets reelected could not exist. For a corrupt politician misappropriating resources would mean to give his type away.

Consider then an alternative transfer mechanism that eliminates the vertical fiscal gap and the broken lines of accountability. The federal government could provide the public goods itself. In that case the transfer mechanism in (4) maps federal revenues $\tau(y_p+y_r)$ directly into province specific publicly provided goods $g_f^i(\theta)$, where $\theta \in \{a, 1\}$, $i \in \{p, r\}$, and the superscript $f$ refers to the federal government. With $\mu = \frac{1}{2}$, the transfer mechanism can be written as

$$T^\theta(\tau, y_p, y_r) = \left(\tau \frac{(y_p + y_r)\theta}{2}, \tau \frac{(y_p + y_r)\theta}{2}\right) = (g_{f}^p(\theta), g_{f}^r(\theta)).$$

(19)

In that case provincial politicians decide whether to top up the federally provided level $g_f^i(\theta)$, where topping up requires raising additional revenue in the province. The conditions carving up the parameter space in separating and pooling equilibria
change. There is again, analogous to the introductory environment with independent provinces, a single provincial separation constraint. Assuming the payoff from mimicking policies conditional on certain reelection is larger than the payoff from separating, we must have

\[
\begin{align*}
R + \delta[R + (1 - \tau)y_i] &> R + (1 - \tau)y_i, \\
\text{Payoff from mimicking and} & \quad \text{Payoff from separating} \\
\text{certain reelection} & \quad \text{today}
\end{align*}
\]

\[ \delta R > (1 - \delta)(1 - \tau)y, \quad i \in \{p, r\}. \tag{20} \]

Note that the reduction of the separation constraints from two to one is due to the elimination of the uncertainty the voter faces about provincial funding in an environment with monetary transfers. Assuming the inequalities in (20) hold, minimum rates of reelection that are consistent with corrupt politicians choosing mimicking policies are defined by

\[
\rho_f^i = \frac{(1 - \tau)y_i}{\delta[R + (1 - \tau)y_i]} \tag{21}
\]

Relative to the equilibria with monetary transfers minimum rates of reelection are lower because the relative importance of ego-rents in a corrupt politician’s payoff function increases. Since the importance of ego-rents in politicians’ payoff function becomes relatively more important, it is easier to discipline corrupt politicians; reelection probabilities need not be as large. The increased relative importance of ego-rents also implies that the subset of the parameter space in which pooling equilibria are played is larger than in the environment with monetary transfers. Finally, note that reelecting a corrupt provincial politician is not as expensive in the environment with federal in-kind transfers as in the environment with monetary transfers. Overall, therefore, voters may be better off with a government engaging in provincial public good delivery than with a federal government writing cheques to provincial governments.

This paper studies a two-period, two-province political agency model of asymmetric information to explore accountability in provincial public good provision in a federation with interregional transfers. In an environment in which the federal government takes the form of an exogenous transfer mechanism, a rich set of equilibria with empirically testable implications is found. Across states of the world, provincial revenues may be high or low, reelection rates are predicted to be higher in the rich than in the poor province. Across provinces, reelection rates are higher after an observation of good policies by the voter, where good policies indicate that provincial
revenues are high, than after an observation of bad policies.

Comparative statics indicate that changes in federal policy parameters, such as the federal tax rate and the degree to which income is redistributed from the rich to the poor province, affect electoral behaviour in provincial elections. Relative to an environment in which provinces are independent, there is no redistribution of income between provinces, monetary transfers from the rich to the poor province increase minimum rates of reelection in the poor province and decrease minimum rates of reelection in the rich province. The intuition is simply that monetary transfers across provinces change the amount of resources accessible to provincial politicians. Since these politicians are potentially corrupt, reelection rates that are discipline-instilling have to rise.

Note that in the basic set-up of this model a vertical fiscal gap is a by product of a federal government that engages in interregional transfers. Allowing the federal government to effect interregional transfers in-kind instead of in monetary terms may improve voter welfare. The set of equilibria collapses. In eliminating the uncertainty with respect to the amount of provincial revenues from the voter’s consideration, an equilibrium in which a stealing incumbent is reelected is eliminated. Moreover, since federal transfers in-kind reduce the amount of resources accessible to potentially corrupt provincial politicians, minimum discipline-instilling rates of reelection decrease. The relative importance of ego-rents for corrupt politicians increases. Therefore, effecting interregional transfers in-kind may increase accountability.

With regard to the potential superiority of a federal government engaging in provincial public good delivery instead of writing cheques to provincial governments, the following limitations should be observed. Assuming the federal government effects interregional transfers through the provision of provincial public goods, provincial politicians – virtuous types and mimicking corrupt types – top up the federal provision level to the optimal level. In contrast to Joanis (2007), provincial voters in this model are assumed capable of differentiating between federally provided goods and provincially provided goods. If this were not the case such that there is uncertainty with respect to how much the federal government contributes to provincially provided public goods, then the set of equilibria would be described by a proposition analogous to proposition 2. The case for increased voter welfare under federal in-kind transfers would be weakened. Any attentive traveller in federal countries is

\footnote{Assuming provincial voters can only observe the total amount of the public good essentially reintroduces the uncertainty, which we eliminated from the revenue side, on the expenditure side of the provincial budget constraint.}

\footnote{For instance, Canada, Germany, or the European Union (where the latter is not really a federation).}
aware that federal governments like to point out their contributions to provincially provided public goods on big billboards; this, however, may not be enough to rule out uncertainty on the part of voters with respect to the federal government’s share in the total provision level. A different matter of concern is that federal provision of some goods and services is sometimes not intended by the constitution\(^{47}\). Constitutional assignments of responsibilities to different levels of governments, however, can be changed. In the case of Canada, Bird and Tarasov (2002) observe that both unemployment insurance and old age security were once provincial responsibilities which were taken over by the federal government in the course of the last century.

On a different note, the model presented here also neglects aspects of federal systems that speak in favour of decentralized provision. Besley and Coate (2003), studying a citizen-candidate model in the tradition of Osborne and Slivinski (1996), argue in favour of decentralized provision. Centralized provision can imply excessive spending in their model. The intuition for their result is similar to that in the model of Chari, Jones, and Marimon (1997). With sharing of local costs, there is an incentive to export local costs to the rest of the federation in electing local representatives with high demands for public spending.

Instead of allowing for cross-jurisdictional spillovers, the given model would rather benefit from integrating the federal government as a player. While modelling the federal government as an exogenous transfer mechanism seems an admissible starting point, integrating the federal government as a strategic player would be interesting in light of the suggested accountability bonus from effecting interregional transfers in-kind rather than in coins. Showing that this implication continues to hold in an environment with an active federal government would add weight to the result.

\(^{47}\)For instance, matters of education are exclusively assigned to the provinces in the Canadian constitution (See Pilette (1993)). Essentially the same observation holds for Germany.
References


Panel on Equalization and Territorial Formula Financing, Department of Finance, Ottawa.


A Proofs

Claim: $\rho_a > \rho_p$

Proof.

$$\rho_r^a = \frac{r_c^c(a)}{\delta[R + E_{\theta r_c^c}(\theta)]} > \frac{r_p^c(a)}{\delta[R + E_{\theta r_p^c}(\theta)]} = \rho_p^a,$$

$$\frac{R + E_{\theta r_p^c}(\theta)}{R + E_{\theta r_c^c}(\theta)} > \frac{r_p^c(a)}{r_c^c(a)},$$

$$y_r[R + q(T^1_p - T^a)] > y_p[R + q(T^1_r - T^a)],$$

where the last line follows, since $y_r > y_p$ and $T^\alpha_r = T^\alpha_p$.

Is $\hat{\rho}_i(1) > \rho^1_i$ possible?

$$1 - \frac{(1 - a)\tau(y_p + y_r)}{2\delta[R + E_{\theta r_i^c}(\theta)]} > \frac{r_i^c(1)}{\delta[R + E_{\theta r_i^c}(\theta)]}$$

By inequality (10) we have

$$\delta[R + E_{\theta r_i^c}(\theta)] > r_i^c(1),$$

which implies

$$R > \frac{r_i^c(1) - \delta E_{\theta r_i^c}(\theta)}{\delta}.$$ 

For $\hat{\rho}_i(1) > \rho^1_i$, we require

$$R > \frac{r_i^c(1) + \frac{(1 - a)\tau(y_p + y_r)}{2} - \delta E_{\theta r_i^c}(\theta)}{\delta},$$

which is satisfied for large enough $R$. 

\[31\]
Proposition 3

Proof.

\[
\frac{\partial \rho_i^2}{\partial \tau} = \frac{\partial}{\partial \tau} \frac{r_i^2(a)}{\delta[R + E_\theta r_p^c(\theta)]},
\]

\[
= \frac{R[-y_i + a \frac{y_p + y_r}{2}] - q(1 - a) \frac{y_p + y_r}{2} y_i}{\delta[R + E_\theta r_p^c(\theta)]^2},
\]

which is clearly negative for \(i = r\). For \(i = p\), the derivative may be positive or negative. Furthermore, we have

\[
\frac{\partial \rho_i^1}{\partial \tau} = \frac{\partial}{\partial \tau} \frac{r_i^1(1)}{\delta[R + E_\theta r_p^c(\theta)]},
\]

\[
= \frac{R[-y_i + \frac{y_p + y_r}{2}] + (1 - q)(1 - a) \frac{y_p + y_r}{2} y_i}{\delta[R + E_\theta r_p^c(\theta)]^2},
\]

which is clearly positive for \(i = p\). For \(i = r\), the derivative maybe positive or negative.

\(\Box\)

Proposition 4

Proof.

\[
\frac{\partial \rho_i^a}{\partial a} = \frac{\partial}{\partial a} \frac{r_i^a(a)}{\delta[R + E_\theta r_p^c(\theta)]}
\]

\[
= \frac{R^a(y_p + y_r) + q \frac{r(y_p + y_r)}{2} (1 - \tau) y_i + q^2 \frac{(y_p + y_r)^2}{4}}{\delta[R + E_\theta r_p^c(\theta)]^2} > 0
\]

We also have

\[
\frac{\partial \rho_i^1}{\partial a} = \frac{\partial}{\partial a} \frac{r_i^1(1)}{\delta[R + E_\theta r_p^c(\theta)]}
\]

\[
= \frac{-r_i^1(1 - q) \frac{r(y_p + y_r)}{2}}{\delta[R + E_\theta r_p^c(\theta)]^2} < 0
\]

\(\Box\)

Proposition 5

\[
R + (1 - a) \mu \tau(y_p + y_r) + \delta[R + E_\theta r_p^c(\theta)] \leq R + r_p^c(1)
\]

32
\[
\delta[R + E_\theta r_p^c(\theta)] - r_p^c(a) \leq 0 \quad (8^*)
\]
\[
R + (1 - a)(1 - \mu)\tau(y_p + y_r) + \delta[R + E_\theta r_p^c(\theta)] \leq R + r_p^c(1)
\]
\[
\delta[R + E_\theta r_r^c(\theta)] - r_r^c(a) \leq 0 \quad (8^{**})
\]
Inequalities (9*), and (9**) are identical to (8*) and (8**).
\[
R + \delta[R + E_\theta r_p^c(\theta)] > R + r_p^c(1)
\]
\[
\delta[R + E_\theta r_p^c(\theta)] - r_p^c(1) > 0 \quad (10^*)
\]
\[
R + \delta[R + E_\theta r_r^c(\theta)] > R + r_r^c(1)
\]
\[
\delta[R + E_\theta r_r^c(\theta)] - r_r^c(1) > 0 \quad (10^{**})
\]

\[
r_p^c(a) = \mu \tau a(y_p + y_r) \quad \text{and} \quad r_r^c(a) = (1 - \mu)\tau a(y_p + y_r) + (1 - \tau)y_r
\]

\[
r_p^c(1) = \mu \tau(y_p + y_r) + (1 - \tau)y_p \quad \text{and} \quad r_r^c(1) = (1 - \mu)\tau(y_p + y_r) + (1 - \tau)y_r
\]

\[
\frac{\partial \rho^i_p}{\partial \mu} = \left[ \frac{\delta[R + E_\theta r_p^c(\theta)] \cdot 1 - r_p^c(1)\delta[q + (1 - q)a]}{\delta^2[R + E_\theta r_p^c(\theta)]^2} \right] \tau(y_p + y_r) > 0
\]
\[
= \frac{[1 - \rho^1_p\delta[q + (1 - q)a]] \tau(y_p + y_r)}{\delta[R + E_\theta r_p^c(\theta)]} > 0,
\]
\[
\frac{\partial \rho^i_r}{\partial \mu} = \left[ \frac{- \delta[R + E_\theta r_r^c(\theta)] \cdot 1 - r_r^c(1)\delta[q + (1 - q)a]}{\delta^2[R + E_\theta r_r^c(\theta)]^2} \right] \tau(y_p + y_r) < 0,
\]
\[
= \frac{- [1 - \rho^1_r\delta[q + (1 - q)a]] \tau(y_p + y_r)}{\delta[R + E_\theta r_r^c(\theta)]} < 0,
\]
by \(1 > \rho^i\delta[q + (1 - q)a], \ i \in \{p, r\}\).
\[
\frac{\partial \rho_p^p}{\partial \mu} = \frac{[a - \rho_p^p \delta q + (1 - q)a]}{\delta[R + E_\theta r^c_p(\theta)]} \tau(y_p + y_r),
\]
\[
\frac{\partial \rho_r^p}{\partial \mu} = -\frac{[a - \rho_r^p \delta q + (1 - q)a]}{\delta[R + E_\theta r^c_r(\theta)]} \tau(y_p + y_r),
\]
which implies
\[
\frac{\partial \rho_p^a}{\partial \mu} < 0 \iff \frac{\rho_p^a \delta q}{1 - \rho_p^a \delta(1 - q)} \geq a.
\]
Since \(\rho_r^a > \rho_p^a\),
\[
\frac{\partial \rho_p^c}{\partial \mu} < 0 \Rightarrow \frac{\partial \rho_r^c}{\partial \mu} > 0.
\]
B Tables & Figures

Table 1: Equalization Payments in Million $ – 2006/07

<table>
<thead>
<tr>
<th></th>
<th>NL</th>
<th>PE</th>
<th>NS</th>
<th>NB</th>
<th>QC</th>
<th>MB</th>
<th>SK</th>
<th>BC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular</td>
<td>632</td>
<td>291</td>
<td>1,386</td>
<td>1,451</td>
<td>5,539</td>
<td>1,709</td>
<td>13</td>
<td>260</td>
<td>11,282</td>
</tr>
<tr>
<td>Adjust.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>199</td>
</tr>
<tr>
<td>Total</td>
<td>687</td>
<td>291</td>
<td>1,386</td>
<td>1,451</td>
<td>5,539</td>
<td>1,709</td>
<td>13</td>
<td>459</td>
<td>11,535</td>
</tr>
<tr>
<td>$ per Cap</td>
<td>1,030</td>
<td>208</td>
<td>1,182</td>
<td>1,019</td>
<td>4,169</td>
<td>1,126</td>
<td>224</td>
<td>0</td>
<td>8,959</td>
</tr>
</tbody>
</table>

Canada, Federal Government, Equalization Payments by Province, 2006/07; Source: Department of Finance, Canada. NL - Newfoundland, PE - Prince Edward Island, NS - Nova Scotia, NB - New Brunswick, QC - Québec, MB - Manitoba, SK - Saskatchewan, BC - British Columbia. Totals may not add up due to rounding.

Figure 1: Equalization Payments as a Percentage of Own Source Revenue

Canada: Maritimes: Equalization Payments as a Percentage of Own-Source Revenue, 1993 - 2004; Sources: Statistics Canada and Department of Finance.
Table 2: Equalization Entitlements in Million $ – 1993/94 to 2006/07

<table>
<thead>
<tr>
<th>Year</th>
<th>NL</th>
<th>PE</th>
<th>NS</th>
<th>NB</th>
<th>QC</th>
<th>MB</th>
<th>SK</th>
<th>BC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993/94</td>
<td>900</td>
<td>175</td>
<td>889</td>
<td>835</td>
<td>3,878</td>
<td>901</td>
<td>486</td>
<td>0</td>
<td>8,063</td>
</tr>
<tr>
<td>1994/95</td>
<td>958</td>
<td>192</td>
<td>1,065</td>
<td>927</td>
<td>3,965</td>
<td>1,085</td>
<td>413</td>
<td>0</td>
<td>8,607</td>
</tr>
<tr>
<td>1995/96</td>
<td>932</td>
<td>192</td>
<td>1,137</td>
<td>876</td>
<td>4,307</td>
<td>1,051</td>
<td>264</td>
<td>0</td>
<td>8,759</td>
</tr>
<tr>
<td>1996/97</td>
<td>1,030</td>
<td>208</td>
<td>1,182</td>
<td>1,019</td>
<td>4,169</td>
<td>1,126</td>
<td>224</td>
<td>0</td>
<td>8,959</td>
</tr>
<tr>
<td>1997/98</td>
<td>1,093</td>
<td>238</td>
<td>1,302</td>
<td>1,112</td>
<td>4,745</td>
<td>1,053</td>
<td>196</td>
<td>0</td>
<td>9,738</td>
</tr>
<tr>
<td>1998/99</td>
<td>1,068</td>
<td>238</td>
<td>1,221</td>
<td>1,112</td>
<td>4,394</td>
<td>1,092</td>
<td>477</td>
<td>0</td>
<td>9,602</td>
</tr>
<tr>
<td>1999/00</td>
<td>1,169</td>
<td>255</td>
<td>1,290</td>
<td>1,183</td>
<td>5,280</td>
<td>1,219</td>
<td>379</td>
<td>125</td>
<td>10,900</td>
</tr>
<tr>
<td>2000/01</td>
<td>1,112</td>
<td>269</td>
<td>1,404</td>
<td>1,260</td>
<td>5,380</td>
<td>1,314</td>
<td>208</td>
<td>0</td>
<td>10,948</td>
</tr>
<tr>
<td>2001/02</td>
<td>1,055</td>
<td>256</td>
<td>1,315</td>
<td>1,202</td>
<td>4,679</td>
<td>1,362</td>
<td>200</td>
<td>240</td>
<td>10,310</td>
</tr>
<tr>
<td>2002/03</td>
<td>875</td>
<td>235</td>
<td>1,122</td>
<td>1,143</td>
<td>4,004</td>
<td>1,303</td>
<td>106</td>
<td>71</td>
<td>8,859</td>
</tr>
<tr>
<td>2003/04</td>
<td>766</td>
<td>232</td>
<td>1,130</td>
<td>1,142</td>
<td>3,764</td>
<td>1,336</td>
<td>0</td>
<td>320</td>
<td>8,690</td>
</tr>
<tr>
<td>2004/05</td>
<td>762</td>
<td>277</td>
<td>1,313</td>
<td>1,326</td>
<td>4,155</td>
<td>1,607</td>
<td>652</td>
<td>682</td>
<td>10,774</td>
</tr>
<tr>
<td>2005/06</td>
<td>861</td>
<td>277</td>
<td>1,344</td>
<td>1,348</td>
<td>4,798</td>
<td>1,601</td>
<td>82</td>
<td>590</td>
<td>10,900</td>
</tr>
<tr>
<td>2006/07</td>
<td>687</td>
<td>291</td>
<td>1,386</td>
<td>1,451</td>
<td>5,539</td>
<td>1,709</td>
<td>13</td>
<td>459</td>
<td>11,535</td>
</tr>
</tbody>
</table>

Canada, Federal Government, Equalization Entitlements by Province, 1993/94 to 2006/07; Source: Department of Finance, Canada. 1. Figures for 2004/05 exclude the additional $150 million in Equalization announced in Budget 2004. 2. Figures for 2006/07 are as proposed in Budget 2006 and include one-time adjustments. Totals may not add up due to rounding.

Figure 2: Federal Transfers as a Percentage of Own Source Revenue

Canada: Maritimes: Federal General- and Specific Purpose Transfers as a Percentage of Own Source Revenue; 1989 - 2004; Source: Statistics Canada, Table 3850001.