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EXPLAINING DIFFERENCES IN ENVIRONMENTAL GOVERNANCE PATTERNS BETWEEN CANADA, ITALY, AND THE UNITED STATES

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I. INTRODUCTION

Our objective is to formulate a hypothesis that can help explain the different *patterns* of environmental governance in three countries: Canada and the United States (both federal states) and Italy (a decentralized unitary state). To that effect, we will make use of what is a robust theory of the assignment of powers in federal and decentralized unitary states (see Breton and Scott, 1978; and Inman and Rubinfeld, 1997)[1], supplemented by more recent work by ourselves and others (Breton, 1996; Breton, 2006, Breton and Fraschini, 2003; Salmon, 2006; Scott, 2000; Scott, forthcoming) on the role of competition as a driving force in shaping these assignments. The differing patterns of environmental governance we wish to explain are that most environmental policies are enacted and implemented by the national government in the United States, by provincial governments in Canada, and by both national and regional governments in Italy.[2] We are aware that these statements are very much in the nature of "stylized facts" and therefore as with all stylized facts − and like all tendencies or trends − embody variable amounts of "noise" often difficult to identify and set apart.

The Breton-Scott (1978) model is built on assumptions regarding the behaviour of four organizational costs[3] − coordination and administration costs on the supply side, signalling and mobility costs on the demand side[4] − which, when minimized, generate an "optimal" assignment of powers and/or responsibilities. The application of the model has always been hampered by a lack of data on these costs and on how they behave. We

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[1] In the fifth (1980) and sixth (1987) editions of *The Public Finances. An Introductory Textbook*, Buchanan and Flowers, in their recommended "Supplementary Readings" at the end of the chapter on federalism, refer students to Breton and Scott (1978) as providing "a modern discussion of the economics of federalism", which we take as an authoritative endorsement of the robustness of the theory. Musgrave, Musgrave and Bird (1987, 506) make use of the Breton-Scott model to offer an interesting "positive theory" of intergovernmental grants which again we take as an endorsement our 1978 model.

[2] In Italy, the protection of the environment and ecosystem is an exclusive legislative power of the central government, but the regional governments have residual legislative power for all matters that are not listed in the exclusive power or that do not fall in the concurrent list. Recently, the Constitutional Court has declared that even if environmental protection is an exclusive power of the central government used to set uniform standards for all the regions, this does not exclude the possibility that regional laws (passed on concurrent or residual matters) can concern themselves with, among their objectives, environmental protection.

[3] These are in the nature of transaction costs. We call them organizational costs to make clear that they apply to the public sector only.

[4] Inman and Rubinfeld (1997, 96-97) call the Breton-Scott organizational costs transaction costs and label them: "decision costs", "monitoring costs", "revelation costs" and "moving costs", a change in nomenclature the authors do not defend.

attempt to remedy this problem by using other stylized facts that, we hope to show, are correlates of coordination and administration costs − the two organizational costs on which we focus. In that optic, the paper is in effect an extension of the Breton-Scott (1978) model applied to environmental powers.

We will be assuming that the demand for environmental policies is exogenous and therefore that signalling and mobility costs play no direct role in the assignment and reassignment of powers in federal and decentralized governmental states.[5] Consequently, we are able to assume that assignments and reassignments are determined by forces that are capable of producing coordination and administration at minimum cost. We will place much emphasis on vertical competition − competition among governments located at different jurisdictional tiers − as being the locus of the forces that, for a given volume of coordination and administration, makes the cost of producing these activities as small as possible or, stated in different words, for a given expenditure of resources makes the quantity of coordination and administration generated the largest possible.

II. THE MODEL

The model itself has four principal building-blocks pertaining to: 1) supply by governments of goods and services (including redistribution and regulation); 2) demand by citizens for these goods and services; 3) a hierarchical or pyramidal arrangement of governmental systems into tiers; and 4) vertical competition as a mechanism regulating some dimensions of the interrelationship of governments within such systems.

II.1. The organization of supply
The supply side of democratic systems is made up of compound governments, that is of institutions composed of a large number of autonomous or quasi-autonomous centres of power, some of which are elected and some of which are not.[6] All these centres of power are led to compete with each other because they all want the "support" of citizens. In that part of the literature that acknowledges that competition between centres of power exists, the analysis of competition is carried out with emphasis on "checks and balances".

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[5] A demand mechanism is, however, at work. We examine it in subsection *II.2*.
[6] For a detailed description of compound governments, see Breton, 1996, 71-74.

Typically this literature simplifies the complexity of the supply side by limiting the centres of power to those that have a legal or constitutional standing such as the *branches* of government − for example, the executive, the legislative, and the judicial branches. It omits centres of power like central banks, intelligence services, diplomatic corps, military establishments, police forces. For the purpose of this paper we carry the traditional simplification even further and, without loss of generality, assume that each government has only two centres of power. Given that we are concerned with democratic systems, these centres have to be political parties which we will identify as governing and opposition parties. Adding other centres of power to these two is a more or less mechanical exercise (see Breton, 1996, Chapter 3).

When working with the notion of compound governments, it is conventional to assume that elected centres of power maximize expected votes whereas non-elected centres maximize expected consent. In our framework which has only two centres of power − a governing (a) and an opposition party (b) − we must assume that the centres maximize expected votes which we may take to be proportional to expected consent. Let ϕ_i^j be the probability that citizen j will grant his or her vote (consent) to centre of power i, (where $i = a , b$), then expected vote is the sum over all js of the ϕ_i^js. This hypothesis is known as the "probabilistic voting" hypothesis or model. It possesses one all-important implication: if politicians and political parties maximize expected votes, they will supply goods and services to any constituency whatever its size as long as this increases expected votes (consent). Therefore, even if the number of citizens desirous to see particular environmental policies implemented is small, these citizens may see the implementation of their policies as long as the probability that environmentalist groups grant their vote to the governing party increases, and that the probability that other citizens grant their vote does not fall or falls by less than the increment granted by the environmentalist groups.

We note at this point that when the probability that j will grant his or her vote to party a increases, the probability that he or she will grant that vote to party b must necessarily fall. That by itself is an additional reason for believing that a and b will be induced to compete with each other.

II.2. A demand mechanism

In the analysis of the assignment of environmental powers that follows, the demand for environmental goods and services (policies) is assumed to be exogenous. In other words, the organizational costs − signalling and mobility costs − that operate on the demand side and help determine the assignment of powers in the general theory play no explicit role in the following analysis of assignment and reassignments. Demand, however, plays a role in the workings of horizontal and vertical competition and for that reason we provide a brief description of the mechanism through which demand manifests itself.

We begin by assuming that the decision on the part of citizens to grant their vote to a given centre of power is a function of the loss in utility (or well-being) inflicted on those citizens by the governing party. That loss of utility, in turn, is a function of the gap between the marginal value of a given good or service to citizens and what they have to pay for it. The formal derivation of this proposition need not concern us here.[7]

There are two possibilities: either the amount paid − the taxprice − per unit is *above* (is greater than) the marginal value to citizens of the quantity of the good or service supplied by the governing party, or it is *below* (is lower). In the first instance, it is intuitively obvious that there is a loss in utility to citizens. In the second case, when the taxprice is below the marginal value placed on the good or service, it becomes necessary to recognize that citizens (who are also consuming individuals or households) do not consume one good or service alone − they spend some of their income on other things besides the good or service provided by the governing party. The spending decisions of citizens are constrained by their budget, embedded in a budget equation which must remain unchanged during the whole of the exercise as there are no forces acting on it − in other words, incomes and prices are given. Consequently, if the taxprice is *lower* than the marginal value to the citizen of the amount of the good or service supplied by the governing party, satisfying the budget equation will require him or her to purchase *more* of some other good. Given that equilibrium requires that the marginal utility of both the publicly supplied good and the other good be declining − that the marginal rate of substitution (MRS) between the newly bought good or service and some numéraire be increasing − a low taxprice means that the citizen suffers a loss of utility or well-being.

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[7] Those interested in that derivation can consult Breton, 1996, 42-69.

For example, comparing a situation where the taxprice of sewage disposal is v to one where the price is $v - w$ (with $w < 0$), the utility loss to those who have to dispose of sewage will be larger in the second instance than in the first because the MRS and the new price ratio are no longer aligned. The expected votes granted the governing party by these people will therefore be smaller. Similarly, if we compare a tax rate on the per unit utilization of some natural resource of t with one where the tax rate is $t + \pi$ (with $\pi < 0$), the utility loss will be larger in the second instance − the marginal rate of transformation is no longer equal to the ratio of prices − and the expected votes granted the governing party will be less.

We note that the model does not require that the measures demanded by voters or those offered by centres of power be appropriate or ideal from an ethical and/or scientific point of view. Both citizens and suppliers could be misguided or "wrongly" motivated. The competitive forces that we will examine shortly could therefore generate a stable and even a permanent equilibrium in which the environmental policies chosen are preferred by a majority of citizens but are, from the point of view of moralists and/or scientists, inferior to those rejected. This is a quite general conclusion and applies to perfect or near perfect competitive markets as much as it applies to environmental policies.

II.3. Decentralization

So far, on the supply side the model possesses only one government with two centres of power. Since we are concerned with the assignment of environmental powers among governments each inhabiting a different jurisdictional level, it is time to consider a hierarchical or pyramidal decentralized governmental system.

At the top of the pyramid, one finds a single government which, in the interest of simplicity, we continue to assume has only two centres of power. That government is indifferently called the national or central government. At the level that is below that of the central government in the pyramid, one finds jurisdictional units that may be called provinces, regions, or states (also cantons, republics, etc.). The sizes of the areas and the populations of these can be large or small, the degree of skewness in their size distribution can be large or small, the inter-unit distribution of income and wealth can be wide or narrow, and so on.

In federations, the powers to legislate in certain domains that are assigned to the central government and to the provincial or state governments are owned by the governments at the respective levels − an ownership that is constitutionally entrenched.[8] In decentralized unitary states on the other hand, all powers are owned by the central government − an ownership that is also constitutionally entrenched. It is true that in a decentralized unitary state like Italy, all powers are owned by the centre but that centre has, as it were, institutionally tied its hands behind its back through institutions which make unilateral reassignments with respect to certain powers *de facto* impossible (see Breton and Fraschini, 2003).[9]

As already noted, in the remainder of the paper we assume that all governments are each made up of only two centres of power − a governing and an opposition party. In addition, we restrict the analysis to pyramidal governmental systems constituted of only two jurisdictional tiers. In the real world, governmental systems are generally made up of many tiers, among which municipal or local, *départemental*, and communal. One reason for limiting our analysis to two levels is that we do not have correlates of coordination and administration costs for more than two tiers. The reader should nonetheless keep in mind that governments "junior" to those at the provincial, regional, or state level do enact and implement many environmental policies, such as waste disposal, traffic control and hence the control of carbon dioxide emissions, and many others.

II. 4. Coordination

An unavoidable consequence of decentralization is the erection of jurisdictional boundary lines over a given territory − lines that define the frontiers of provinces, regions, or states. These are of significance for powers over all matters that are or could be assigned to provincial, regional or state governments, but they are particularly critical in regard to

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[8] The reader should be aware that, in these pages, the word *power* has two different meanings. In the expression "centres of power" (where the word is always in the singular), power refers to the capacity to make decisions and the ability to implement these decisions possessed by public bodies, institutions, and establishments that make up modern compound governments. In expressions such as "the assignment of powers" and "the division of powers" (where it is generally in the plural), the word refers to the authority (often constitutional or jurisprudential) possessed by a government to make statutes, laws, regulations, rules, bylaws, executive orders, codes, and protocols in certain areas or domains and therefore to supply particular goods and services.

[9] See footnote # 2.

powers over environmental matters. The reason for this is simple. The jurisdictional boundary lines which decentralization begets will inevitably split up − divide or parcel out − what could be called the "integrity" of the environment or of nature. To put it differently, the erection of jurisdictional boundary lines is superimposed on the continuing migration of birds, fish, wild animals, etc., on the flow of rivers and air currents and their pollutants, on the evolution of biodiversity, and so on.

One of the goals or objectives of environmental policy coordination is to *mitigate* the disruptive effects of jurisdictional boundary lines on the integrity of the natural environment while preserving the benefits that are the product of decentralization. We emphasize that this mitigation by coordination is never complete simply because coordination absorbs scarce resources. To economize, governments will tolerate some harmful effects of boundary lines.

To get a handle on these coordination costs, it is useful to distinguish between two dimensions of coordination. The first involves coming to an agreement on a particular matter, such as resolving how the flow of a cross-border stream is to be maintained or regulated. The resulting agreement will display some of the characteristics of a commercial contract. Like contracts, coordination agreements are always incomplete simply because it is not possible to incorporate all future contingencies in the agreements. In the case of private commercial contracts, one can appeal to contract law to deal with this problem (Trebilcock, 1993, 17). In the case of coordination agreements however a body of law does not exist. Instead, an agreement may specify that the parties will reconvene every three, five, or seven years to review the agreement and deal with the contingencies that had not been foreseen when the agreement was reached. Other procedures may be used. All will add to the cost of coordination (Scott, forthcoming).

The second dimension of coordination costs involves their implementation: the operation of the institutions and activities that are needed to do the coordinating. That too has costs which we illustrate below (Section III.2) in our discussion of the Tax Collection Agreements in Canada. If sometimes the costs of reaching and implementing agreements can be extended over time, the costs of coordinating end only when the coordination ends.

II.5 Vertical Competition

There is no better introduction to an understanding of vertical competition − the competition among governments located at different jurisdictional levels − than an understanding of horizontal competition − the competition among governments inhabiting a given tier as the first was developed with an eye on the second. Horizontal competition is a fairly well understood phenomenon which has generated a large literature following Charles Tiebout's (1956) and Pierre Salmon's (1987) seminal papers (see Salmon, 2006). The origin of that competition can be found in the mobility of citizens, capital, tax bases, etc., and also in what is labelled yardstick competition. The mobility rationale is simple. A provincial government (say) competes to attract some citizens, capital, tax bases, etc. and the other provincial governments react. Yardstick competition arises from the comparisons that the citizens of a given jurisdiction make of the performance of their own government with that of some other benchmark government or governments in respect of the loss in utility that their government's inferior performance inflicts on them.

Horizontal competition will *not* play an explicit role in what follows. We introduce it to emphasize that both the competition among governments and the coordination of activities by these same governments are not only possible, but also to point out that when coordination is required, it will take place in a framework of competitive inter-relationships. Indeed, a government may seek coordination in order to compete more effectively. This proposition is almost self-evident when competition is of the yardstick variety, but is generally true as can be ascertained by observing competitive behaviour in the marketplace.

In the three countries that are the object of our attention, there are many coordinating bodies − in Canada, there is the Canadian Council of Resource Ministers and the Canadian Council of Ministers of the Environment; in Italy, the *Conferenza delle Regioni e delle Province Autonome* (Conference of the Regions and Autonomous Provinces); and in the United States, the National Governors Association − that meet to discuss matters of common concern.

Environmental powers were not assigned in the Constitutions of Canada and the United States. Instead these powers have of necessity been largely assigned through

vertical competition.[10] They are assigned in the Italian Constitution, but there is enough interpretational leeway for vertical competition to exist. In all three countries that competition can take one of three forms:

a) the "invasion" of powers assigned to one government by governments located at other jurisdictional tiers. Invasion is a standard competitive instrument, as long as the power that is invaded has already been assigned *de jure* or *de facto*.[11]

b) the "occupation" of a power. Seizing a power pre-emptively is particularly likely when the initial constitutional document is silent as to which level of government has authority in that policy domain. Occupation is multi-faceted:

i) when governments legislate on matters such as preserving the habitat of a particular species of bird, they do not have to give their legislation an "environmental" label, nor even to make it the responsibility of an "environmental" ministry. When those who are engaged in the planning and building of a dam (say) decide to modify the initial plan for a reason that reflects their environmental consciousness or their desire to please certain environmentalist voters or interest groups, their decisions may be embodied in a minimized dam without the word "environment" ever being mentioned.

ii) occupation of environmental powers can be effected by using powers that are not directly related to the environment such as the "criminal powers" in Canada, the "dormant commerce clause" in the United States, the "national interest" clause in Italy (before the 2001 amendment of Article 117 of the Constitution which suppressed the clause), or the "taxation powers" everywhere.

iii) in most decentralized governmental systems, the treaty-making power is assigned to the central government. If a treaty pertains to environmental powers − the Kyoto Protocol is a recent example − it will, of necessity, bring the central government into the business of environmental governance, and perhaps give it an opportunity to use the treaty power to legislate on related environmental matters.

iv) sometimes the design and implementation of environmental policies require that the rights and interests of aboriginal peoples be recognized. Given Ottawa's

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[10] It is too early to say that assignments and reassignments are the product of vertical competition and of court rulings alone. It could even be that the latter is a component of the former.
[11] The word "encroachment" is sometimes used by lawyers.

responsibilities regarding Canada's First Nations, the federal government becomes involved with the provincial governments in certain environmental matters.

c) vacating or withdrawing from a power as discussed in Kathryn Harrison's (1996) *Passing the Buck*. Conceivably the governments at various jurisdictional levels could compete with each other to avoid legislating and implementing a distasteful and/or unpopular policy.

We must keep in mind that as these are all instruments of vertical competition, their use may be resented and disputed. The government using them may be challenged in the courts; and the litigation may result in the instruments being modified, curtailed or abandoned altogether.

III. CORRELATES OF COORDINATION AND ADMINISTRATION COSTS

We use the word correlates to refer to quantifiable and measurable variables which on *a priori* grounds appear to be statistically correlated − functionally related − to organizational costs. As already noted, we restrict our analysis of organizational costs to coordination and administration costs. We single out two correlates for coordination costs and one for administration costs: jurisdictional boundary lines and the size distribution of units for the first, and public ownership of land and natural resources for the second.

III.1. Jurisdictional boundary lines

What are jurisdictional boundary lines and how are their characteristics correlated with coordination costs? Jurisdictional boundary lines are the agreed-upon legal boundaries or frontiers that define provinces, regions, states, and other political units.[12] To see why and how these boundary lines are correlates of coordination costs, consider one particular industry, say agriculture. Assume that the people in agriculture (farmers) make use of the political power they possess − voting and lobbying − to oppose political parties that are pro-environment and to prevent the implementation of environmental policies. The people in agriculture do this because their opponents' policies are deemed to constrain

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[12] In his "Essay on Fiscal Federalism", Oates (1999, 1130-31) uses the same definition of "jurisdictional boundaries" as we do. He also recognizes that these boundaries create 'neighbourhood effects' of all sorts. He discusses the possibility of "associations" of units as a way of reducing the negative impact of these effects. He does not, however, think of these boundaries as correlates of coordination costs and therefore as essential ingredients in the assignment of powers.

unduly their freedom of decision-making and are likely to place on them expensive restrictions such as those placed by policies that: a) ban certain herbicides; b) disallow uncontrolled varietal genetic changes; c) force farmers to tolerate wildlife on their farms; d) regulate their water supply and their waste disposal; and e) other restrictive stipulations.

If a national economy is divided into smaller units such as provinces then, except by accident, the percentage share of agriculture in the national labour force (or in GDP), will be larger than this national average in some units and smaller in the others The smaller the size of the units, the more numerous (absolutely) will be the units in which agriculture is a specialty. The units in which the percentage share of agriculture in GDP is smaller than the national average will also be more numerous in absolute terms.

To illustrate, divide Canada into ten provinces. After the division, there could be five provinces that would be predominantly agricultural. The other five, being below the national average in agriculture, will be above the national average in some other industry or industries: manufacturing, mining, or whatever else. The mere fact of the division into ten or more political units creates additional governments in which politicians must cater to agricultural interests and so oppose environmental policies. If the country was divided into forty-eight states, there would perhaps be twenty-four of them in which the dominant politicians would be pro-agriculture and therefore anti-environment.[13]

It might be objected that because the procedure of doubling the number of units does not change the percentage or proportion or location of farmers or of units that are pro-agriculture, it would also not change the balance between their politicians nor the balance in the competition between the levels of government for powers over the environment. This is to neglect inter-unit environmental spillovers. As the number of units increases they become smaller, and as they become smaller they acquire more neighbours, and as they acquire more neighbours they acquire, on average, more neighbours where the political majority and the responding government policy are agricultural. For example, when a country is divided into very few units, it is possible that most citizens will live in units that do not adjoin agricultural units. But when it is divided into many units, almost

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[13] In Canada the addition of Nunavut to the list of jurisdictional units has created an active government that stands for pro-First-Nation policies when previously none did.

every citizen will live in a unit that is agricultural or that adjoins and shares part of its boundary with at least one agricultural unit. That is, they will live in a province or region or state which adjoins at least one province or region or state that, having a permissive and anti-environmental policy, produces and tolerates many kinds of air and water pollution, diverts streams, and destroys wildlife. The mere fact of increasing the number of units means that while there is not necessarily any change in the number of farmers who are subjected to environmental policies there is an increased number of non-farmers who, living across a border from a unit where such farmers operate, are exposed to spillovers of environmental bads.

To minimize the burden on their citizens of these pollution spillovers and water diversions, the governments of the pro-environmental provinces or regions or states can attempt to compete − through invasion and/or occupation − but they will probably be obliged to enter into agreements and contracts aimed at gaining common pro-environmental laws and at finding the ways and means for their implementation. Doing this may have some success, but the success will be at the expense of increases in the compensation and inspection components of total coordination costs. In brief, an increase in the number of units will lead to an increase in coordination costs.

A very similar prediction about coordination costs can be formulated in more conventional terms. Let us assume that the spatial distribution of economic activity and population is given and fixed. That distribution is determined by the location of the country's physical endowments: natural resources, rivers, lakes, mountains, soil, *et cetera*. We can now compare two cases: at one limit the country is divided into only two units and at the other it is divided into ten. Bearing in mind that the spatial distribution of economic activity is defined by the fixed location of physical endowments, we now change the country's degree of centralization. Instead of living in one of two units, people now find themselves living in one of ten units; they will discover that there has been a reduction in the average distance of their homes and productive establishments from the border of their unit. More of their trade, payments and travel must now cross one or more borders. Exchanges of all sorts will henceforth encounter more interferences necessitated by differences in their laws, standards, regulations, inspection systems, taxes, *et cetera*.

Furthermore, it will be found that the action of dividing the country into an increasing number of units increases the total length of border that all the governments, together, must demarcate and maintain. That is, it increases the *administration* component of organizational costs. For example, in the simple case where the action of increasing the number of units is achieved by dividing the rectangular area of a country into ever-smaller rectangles, the total length of border steadily increases. (Similarly if the country is circular and is then divided into ever-smaller circles).

To minimize the costs to their people of the increased interference of borders with their trade and mobility, the governments of these units will attempt to coordinate their laws, standards, *et cetera*. That is, they will attempt, through coordination, to reduce the significance of borders. Because there must now be coordination among ten units rather than among two, the country's total coordination costs arising from decentralization will be increased from a sum in the neighbourhood of zero to some significantly large amount. Alternatively, the governments may decide not to coordinate their laws and policies. They will then be faced with spillovers and the full costs of maintenance of, and inspection at, the borders that coordination would have mitigated.

Let us now bring environmental problems and policies into this discussion. If there are only two units, the population of these units will live at a maximum distance from each other's environments. They will be protected by distance from the pollution of the air and the watercourses originating in other units. Their own environmental actions, such as protecting their wildlife and landscape, will not be prevented or interfered with by actions permitted in other units. They will have minimal need to incur coordination costs to enjoy sustainable development of the environment − compared to a situation in which the country is divided into a larger number of units.

If there are many units, the people are vulnerable to environmental abuses originating in other units and to actions in other units that nullify their own domestic environmental policies. To reduce these ill effects they must incur coordination costs − that is, every one of the increased number of governmental units must incur coordination costs. As well, they must maintain their (lengthened) boundaries. They can avoid these abuses and the related coordination costs by assigning environmental problems and policies to the centre rather than to the units.

It follows that if the members of the constituent assembly – "the fathers of the federation" or "*i padri costituenti*" – decided on small average areas for the country's provinces, regions, or states, they would have taken into account the burden of policy interferences and environmental spillovers and its alternative − the burden of coordination costs that the units they are creating would have to incur.

They would have two alternatives. One of these is largely theoretical: to reduce the problems associated with environmental abuse and environmental policies, they could increase the sizes of individual provincial, regional, and state units. This remedy is mostly theoretical because in the case of Canada, Italy, and the United States, the sizes, areas and boundaries of the units and the location of their populations and industries already exist. However, as Wallace Oates (1999, 1131) has noted, associations or groupings of jurisdictional units are possible, even if these are costly to set up and maintain.

The alternative remedy is to assign powers over the environment between the two − the provincial, regional, or state and the central − levels of government in such a way as to minimize total coordination costs. This argument makes it possible to predict that if there are large units and few remote borders of a relatively short total length, the preoccupation of "the fathers" with coordination costs will lead them to assign environmental powers to the provinces, regions or states. If the units are numerous and small, with populations living close to the borders that are relatively long, "the fathers" will assign the environment to the central government.

If for some historical reason the country must be divided into many small units with small areas, the environmental costs of border control will be higher than if the country could be divided into a few large units. Such a country − like the United States − could avoid these costs and thus experience a large gain by simply "eliminating the border" altogether − that is, by unifying environmental responsibilities by assigning them to the central government.

III 2. The size distribution of provincial and state populations

Some inter-provincial or inter-state coordination agreements may require the involvement of all the provinces or states of the country, others may be achieved with the participation

of only a fraction of the provinces or states. We may call the first *integral* coordination agreements and the second *fragmentary* agreements.[14]

To illustrate the relationship between agreements and coordination costs and appreciate why fragmentary agreements may emerge, consider the assignment of tax collection powers that vertical competition begot in Canada. First, under the Canadian Tax Collection Agreements the federal government collects its own as well as the provinces' personal and corporate income taxes and remits the proceeds to the provincial governments. Quebec does not participate in the collection agreements for either the personal or the corporate income taxes; excluded from the collection agreements for the corporate income taxes are also Alberta and Ontario. Second, Ottawa also collects the GST (the goods and services tax) for New Brunswick, Nova Scotia, and for Newfoundland and Labrador, but not for other provincial governments. Indeed, in a switch, Quebec collects the GST for Ottawa in that province. Third, in the United States, there are no such tax collection agreements. Each state collects its own taxes.[15]

It is well-known that there are important economies of scale in tax collection. If an agreement is proposed, it is almost impossible, *ceteris paribus*, for smaller provinces (where size should ideally be measured by the number of taxpayers but must, for practical reasons, be measured by population) not to be part of the agreement, while the larger provinces can, if they decide to use tax collection to pursue one or more particular objectives of their own, decide not to participate in the agreement. Such a decision will

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[14] Fragmentary agreements may also be between units of different countries. For example, the regions of Northern Italy and the Swiss canton of Ticino recently signed an agreement to deal with the problem of air pollution.

[15] In Italy, one particularly important regional tax is the IRAP (*Imposta regionale sulle attività produttive* − regional tax on productive activities). The tax itself and the rate at which it can be levied are set by the central government in Rome. Moreover, the Revenue Agency − a department of that government's Ministry of Finance − collects the tax unless a regional government passes a law reserving for itself the power to collect the tax. So far, only the government of Campania has retained for itself the tax collection power, while ten other regions and the autonomous province of Bolzano that also passed regional laws chose to sign agreements with the Revenue Agency for the administration of IRAP, including tax collection. Those agreements may require things such as the training of personnel for tax collection and the delivery of other services. All of these plus the collection itself are paid for by the regions. At present, the Revenue Agency therefore collects the IRAP for all regional governments but one. However, the regions can pass regional laws "tailoring" the tax rate to achieve specific regional objectives. For example, if the rate set by the central government is 4.25 percent, the regions can increase or reduce that rate by up to 1 percentage point for certain sectors or particular enterprises. In view of differences of all sorts among regional laws, whether there are significant economies of scale in the collection of IRAP is an open question.

be costly; that cost should be recognized as the price of pursuing the provinces' particular objective or objectives.

We may venture a general explanation of why a province takes advantage of the federal services provided under the Canadian collection agreement. A province with a small population (indicating also a small number of taxpayers) cannot capture economies of scale in tax collection and will therefore tend to sign on to the federal collection agreement. These economies of scale are available to the large provinces of Ontario and Quebec so that their losses, if they do not sign on, will be small. Indeed if the governments and their electorates obtain some benefit from collecting their own taxes, they will refuse the agreement. The point is that because they are large provinces they relieve the federal government of the cost of collecting their taxes for them. These analytical remarks about the willingness of the large provinces to pay a "premium" as it were to retain their tax-collecting activities may be confronted with data about the size distribution of populations as proxy for the number of taxpayers among Canadian and American units.

We start with the population in Quebec – about 7.6 million in 2006 − that is willing to forego the economies of the tax collection agreement in order to "purchase" other benefits. We may assume that similar benefits, great enough to justify carrying on their own tax collection, would be available to any other unit of the same size − such as an American state with a population of about 7.6 million or larger. This turns out to be the case of the state of Virginia, the twelfth state by size. Its population plus that of the eleven larger states amounts to 60 percent of the total population of all 50 states. That Virginia has the same population as Quebec suggests that Virginia and the eleven larger states, if confronted with an opportunity like that offered by the Canadian Tax Collection Agreement, would react as Quebec has: they would refuse to sign it. In order to receive the particular benefits that go with having their own tax policy they would engage in the forms of competition discussed above until as a general matter tax collection had become a state power.[16]

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[16] This can be confirmed at another level by considering middle-sized and smaller provinces and states. Alberta has a taxpayer population about equal to Connecticut's. Like Ontario and Quebec, its collects its own corporation income taxes. If it can afford to do this (allowing it to obtain certain benefits of an

The argument in brief: if at the outset the federal government had a tax-collecting power, the economies of scale in tax collection would enable the states larger than Quebec/Virginia to compete successfully with the federal government for this power and so to enjoy particular benefits arising from having the tax-collection power. That leaves uninvestigated the decisions of the smaller, more dependent states. In Canada they have signed on to the Tax Collection Agreement. If we count such provinces we find that almost 70 percent of the provinces and territories are of the size of Manitoba or smaller. Having essentially no economies of scale in tax collection they follow the Harrison (1996) route and do not compete to obtain the tax-collection power from the federal government.

In the United States only 16 percent of the states are as small as Manitoba. The states in this group would benefit from having the federal government collect their taxes, But their elected representatives in Washington are out-manoeuvred both by the large number of taxpayers and by the number of states in the group of larger states. So, in the US, no coordination agreement has been necessary to ease the states out of competing to collect their own taxes.

What the foregoing suggests is that if power-sharing agreements do promise the exploitation of significant economies of scale, the gains from these economies may induce the units and the central government to come to service-providing and/or revenue-collection agreements. However, the gains from these fragmentary agreements must exceed the costs of generating them. In fact, the gains to be derived from the exploitation of economies of scale are probably small because the number of provincial units that could make these gains positive and sufficiently large to be attractive is too small to overtake the costs of coordination which, it is well to recall, are made up of two components: the costs of devising agreements and the costs of implementing them. Then, obviously, there will be no fragmentary agreements of any sort. But the costs of implementing the terms of an agreement include the costs of executing the policy. It would not be surprising, under these circumstances, to observe provincial governments vacating the power or powers − to be, in the language of Harrison (1996), "passing the

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independent tax-levying and tax-collection regime) so could most American states as large as or larger than Connecticut.

buck". The foregoing helps us understand more clearly what the "passing the buck" phenomenon is about.

For environmental policies for which fragmentary coordination agreements are not efficient, the costs of executing the policy or policies may be such as to lead to efforts to withdraw from the power or powers. If that is the case, the central government would also withdraw − "pass the buck". The power would remain decentralized but unused. That could characterize Canada. In the United States, the states would try to "pass the buck" in vain, as Washington would find it efficient to appropriate − invade and/or occupy − the power or powers, and devise and implement national policies.

III 3. The ownership of land

The amount of land owned and exploited is a measure of, or a proxy for, the volume of accumulated general and specific human capital: experience, skills, and knowledge. The larger the area a landowner holds, the more machinery and equipment, the more buildings, and the more capable employees he will have. So it is with governments as landowners. The more land over which they have authority (own and exploit), the more physical infrastructure in place they will have to administer that land and the resources on it; and the more personnel they will have with accumulated human capital in the form of knowledge and experience of resource management and protection.

Environmental protection is complementary to the natural-resource protection that was the responsibility of specialized governmental departments in the days before the question of assigning the making and implementation of environmental policies arose. Past government physical and human capital investments in the inputs that enabled the public sector to manage, preserve and profit from its lands can today be adapted to look after the environmental health not only of forests and waterways but also of wildlife and indeed of whole ecosystems. In short, a governmental unit that is a landholder can assume environmental policy implementation with greater skill and at lower costs than a similar government that has not had and does not have land-holding rights and powers Such a government, because it is endowed with more general and specific human capital will have lower *administration* costs. Furthermore, its past experience with land and resources that stretch across inter-unit boundaries and spread out to similar resources in

adjoining units will enable it to come to fragmentary agreements with its neighbours and incur coordination costs that are lower than a governmental unit that has no previous concern for public land and resources.

IV. Some Stylized facts and their meaning

In regard to the problem under analysis, the first difference between Canada, Italy, and the United States is that the effect of jurisdictional boundary lines − measured in what follows by the number of units (provinces, regions, and states) − are smaller in Canada than in Italy and the United States, and smaller in Italy than in the United States. There are, indeed, 10 provinces and 3 territories in Canada, 20 regions in Italy, and 50 states in the United States.[17] A second difference is that the number of relatively small provinces (measured by population) in Canada significantly exceeds the number of small states in the United States, with Italy falling somewhere between the two. The Canadian province whose size is immediately below Alberta (the smallest province to forgo some of the benefits of the Tax Collection Agreements) is Manitoba with a population, in 2005, of 1,180,004. There are 8 provinces and territories out of a total of 13, or 62 percent that are smaller than Manitoba which we identify as "small". The American state whose population approximates that of Manitoba is Rhode Island with a population, in 2005, of 1,067,610. A total of 7 states out of 50 or 14 percent are "small" − that is, smaller than Rhode Island. The Italian region whose population is closest to those of Manitoba and Rhode Island is Friuli-Venezia Giulia with a population, in 2005, of 1,208,278. There are 5 out of 20 regions, or 25 percent, that are smaller than Friuli-Venezia Giulia.

The first of these two stylized facts − the number of units − explains: a) why in the United States the federal government owns more environmental powers; b) why in Canada it is the provinces that own more of these powers; and c) why in Italy, because of constitutional concurrency in regards to environmental powers,[18] the division of these powers is one that grants authority to the national and the regional governments more equally than is the case in Canada and the United States. How do these stylized facts

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[17] The United States is defined to exclude Guam, the United States Virgin Islands, the Northern Mariana Islands, and American Samoa.

[18] Following the reform of 2001, there are two lists of powers in the Italian Constitution: a list of the powers assigned to the central government, and a list of concurrent powers. All the powers that are not enumerated are assigned to the regions.

explain the above propositions? More jurisdictional boundary lines − more governmental units − implies that coordination costs will be higher which, in turn, implies that taxes will have to be higher and/or there will be less of everything else governments supply. This reduces the competitive advantage of a province, region, or state. Powers become centralized to economize on coordination costs. The assignment of environmental powers in Canada, Italy and the United States is a consequence of the effects that jurisdictional boundaries have on the workings of vertical competition in economizing coordination costs.

The second stylized fact − the number of "small" units − tells us that because the number of "small" provinces in Canada is relatively large, gains from fragmentary agreements among some provinces to deal with environmental matters may exceed the costs of coordination and lead to decentralization of policy making and implementation. The obverse would reflect the situation in the United States.

A third stylized fact about differences among Canada, Italy, and the United States pertains to the ownership of public lands and natural resources. The matter of public lands poses an exceedingly difficult measurement problem. Firstly, comparable data are difficult to find for the three countries, and secondly, ownership *per se* is a biased index of what is needed. Why? As we saw earlier (Section III. 3), ownership of land can serve as a proxy for the volume of resources invested in human capital whose yield is, to a degree, a reduction in administration costs. To appreciate the difficulty, consider Canada. The federal government owns a large number of hectares of land, but much of this land is in the Yukon and the Northwest Territories. Let us look at the Yukon. All of the Yukon outside the boundary of First Nations settlement lands, outside municipal boundaries, and outside National Parks, or 85 percent of the total, is owned but not exploited and hardly regulated by the federal government. We therefore suggest that lands in the Yukon and the Northwest Territories owned by Ottawa not be counted as federal lands as an index of investment in human capital.

If this is accepted, a third difference between Canada and the United States is that in the latter the federal government owns more land and natural resources than do the states, whereas in Canada it is the provinces that own more land and natural resources. In Italy, after the recent transfer to the regions of forests, quarries, roads, and other properties (like

demanio armentizio and *demanio lacustre*) previously owned by the central government, the regions own more land and natural resources than the central government.

That leads us to conclude that because the abundance of highly qualified human capital employed in the management of federal lands makes for low administration costs, the national government in the United States can extend its activities and so occupy more environmental powers than the federal government in Canada which is poor in that sort of capital. The same rationale helps us understand the more equal division of environmental powers between Rome and the regions in Italy

V. CONCLUSION

Making use of a robust and credible theory of the assignment of powers in decentralized governmental systems, we have attempted to explain the "stylized facts" that powers over the environment are decentralized in Canada, somewhat equally divided in Italy, and centralized in the United States. The theory assumes that vertical competition − competition among governments located at different jurisdictional tiers − operates in such a way as to make the costs of assignments and re-assignments as small as possible. These cost are, on the demand side, signalling and mobility costs, and, on the supply side, coordination and administration costs.

To proceed with the analysis, we assumed that demand is exogenous; assignments are therefore a function of coordination and administration costs alone. In order to form an idea of the magnitude of these costs, we assumed that coordination costs are related to the number of provinces, regions, and states in a given territory in such a way that the larger the number the higher the coordination costs. The reason for this is that the larger the number of units the more coordination will be needed to deal with neighbourhood effects, externalities, and other such phenomena. That by itself can explain why environmental powers are decentralized in Canada, centralized in the United States, with Italy falling in between. But there is more. We argue that because the ownership of land and natural resources requires qualified personnel − specific and general human capital − for efficient management and exploitation, environmental powers will be centralized in Washington which owns huge tracts of land in the United States, but will be decentralized to the

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provinces in Canada as it is provincial governments that own more public land in that country, with again Italy falling in between and possibly being closer to Canada.

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