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ENVIRONMENTAL POLICY IN A FEDERAL STATE
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Abstract

We discuss the environmental policy in a federal state (i.e. a central government with a number of autonomous jurisdictions). We start by explaining the rationale behind decentralization. Further, we develop three interactions caused by decentralized policy. First, pollution may show spillovers to other jurisdictions (i.e. transboundary pollution). If the jurisdictions do not manage to cooperate, they have not enough incentives to optimally solve the environmental problem.

Second, the jurisdictions use the environment to compete for capital, firms and investment. This competition may be detrimental for an efficient environmental policy, and lead to a “race-to-the-bottom”.

Finally, the environmental policy influences the tax bases of all government levels. Hence, environmental policy affects the budgets of all government levels. Environmental policy in a federal state causes vertical tax externalities.

Key Words: Environmental federalism, transboundary pollution, inter-jurisdictional competition, vertical externalities

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Introduction

Government levels increasingly share competences in environmental and fiscal policy. This phenomenon may originate both from decentralization (e.g. Spain and Belgium), as well as from voluntary cooperation between states (e.g. United States, Germany, or more recently, European Union). A federal state, typically, consists of a central government and a number of jurisdictions. These jurisdictions, autonomously, have a number of competences or instruments at their disposal.

The strongest economic argument to devolve (a part of) the competences for environmental policy to the regional levels, is the need to take into account the local circumstances¹. A basic shortcoming of a central government is its insensitivity to varying preferences for environmental quality among the residents of the different jurisdictions. Similarly, there may be a significant difference in marginal abatement costs. If all environmental policy is decided by a central government, one expects a tendency toward uniformity in environmental programs across all jurisdictions. This always involves a compromise between the jurisdictions. Some jurisdictions may prefer a high quality of environment, whereas others rather want a low level of environmental quality. If each jurisdiction had its own local government, the level of environmental quality may vary across the different localities. Hence, the optimal policy is not identical for all jurisdictions. For environmental problems with an important local component², there is at least a potential welfare gain in greater decentralization of the environmental decision-making. A decentralized form of government therefore offers the promise of increasing economic efficiency by providing a range of environmental quality that corresponds more closely to the local preferences and characteristics of the jurisdictions. A one-size-fits-all approach of the central government creates welfare losses compared to the case where all jurisdictions pursue their own optimal environmental policy.

Decentralized environmental policy, however, causes three types of distortions. Naturally, environmental federalism shows close similarities with fiscal federalism. First, pollution may show spillovers to other jurisdictions (i.e. transboundary pollution). If the jurisdictions do not manage to cooperate, they have not enough incentives to optimally deal with the environmental problem. Coordination on the federal level may solve this problem.

Second, the jurisdictions use the environmental policy to compete for capital, firms and investment. This competition is detrimental for an efficient environmental policy, and leads to a “race-to-the-bottom”. More recent economic literature, however, shows that this race-to-the-bottom does not necessarily happen.

1) Oates (1972) was among the first to raise this point for public goods. More recently, the model of Ulph (1999) contributes to this insight for environmental goods in the presence of asymmetric information.

2) Environmental problems showing an important local component include, among others, noise, local air pollution, root, build-on areas, water pollution, soil erosion, deforestation, eutrophication, etc. In contrast, CO₂ emissions hardly have any local effects.

Finally, we discuss the fiscal competition between government levels. Environmental policy has economy-wide consequences. The policy affects the level of the tax bases of all government levels (e.g. labor or capital). Hence, environmental policy has budgetary consequences for all government levels, and not only for the government level that is competent for environmental policy. We say that environmental policy in a federal state causes vertical tax externalities.

Transboundary Pollution

The first issue considers transboundary pollution. Transboundary pollution damages beyond the border of the jurisdiction with the power to control this pollution. Greenhouse gases are a classical example. A ton CO₂ emitted in Flanders contributes as much to the global climate change as a ton CO₂ emitted in Brussels, Wallonia, or elsewhere in the world, but there are hardly any local effects. A second example is the waste incinerator in Drogenbos, Flanders, with the wind blowing the smoke and dust towards Brussels. Similarly, the metallurgy in Liege contributes to the pollution of the drinking water of the Albert Canal in Flanders (and the Rhine River in the Netherlands).

When a jurisdiction determines whether it will or will not produce an additional unit of pollution, it considers only the damage to its own residents. Hence, the jurisdiction will allow for too much pollution, as it does not take into account the full damage of the unit of pollution.

The problem of transboundary pollution is not unique to federal states, and has been intensively studied in the context of international economics and trade³. In a federal state, however, the jurisdictions can not choose among the full range of instruments that a sovereign country has at its disposal. More particularly, economic literature emphasizes the role of import or export tariffs to correct for transboundary pollution. Obviously, in a federal state, jurisdictions can not impose those tariffs in their commercial transactions with the other jurisdictions; nor can the EU members use unilaterally these tariff instruments.

In an international context, a country may try to solve the transboundary pollution that damages all countries by joining an international agreement (e.g. Kyoto Protocol for climate change). These international agreements are voluntary as there is no powerful international authority. Countries have to be better off with than without the agreement. This limits severely the power of the agreement because non-signatories also benefit from the pollution reduction efforts (Barrett, 1994a). In a federal state, there is a central government that can impose binding regulations or action and even if this is not explicitly foreseen, regions in a federal state cooperate at regular intervals on many issues so that the repeated interaction gives more easily

3) For more on international trade and environmental policy see, among many others, e.g. Barrett (1994b) and Rauscher (1994). Silva and Caplan (1997) study transboundary pollution in a federal setting.

cooperative solutions. The central government will take into account the damage of a marginal unit of pollution to the residents of all the jurisdictions. One would therefore expect a central government to provide a better approximation to the efficient level of pollution than would a system of decentralized decision-making.

Inter-jurisdictional Competition

Governments of jurisdictions compete against one another for economic gain. Governments compete to attract firms and mobile capital, for the purposes of providing jobs, tax revenue and income. The primary tools available to governments are tax policy and regulatory policy including environmental regulation. One worry is that governments will use environmental regulation to attract business, to the detriment of the environment.

Jurisdictions need capital and investment to provide jobs which generate income. Local residents also desire environmental quality. Moreover, capital taxation may be necessary to raise money for running the jurisdictional government and providing local public goods, such as education, administration, culture, etc. Many authors have studied the level of tax rates, the provision of local public goods and the environmental quality in competing jurisdictions. This strand of literature is known as “business tax models”⁴.

Wilson (1986) and Zodrow and Mieszkowski (1986) have shown that it is optimal for the jurisdiction to set the mobile capital tax to zero and use a non-distorting lump-sum transfer from the jurisdiction’s residents to the local government. In the real world, however, legal and other constraints prevent the local government from doing so and, typically, we observe a positive tax rate on mobile capital.

Oates and Schwab (1988) show that when the regional governments dispose on alternative sources of tax revenue and when they can set the mobile capital tax rate at zero, the local jurisdictions provide the socially optimal level of environmental quality. When there is an exogenously imposed positive local tax on mobile capital a jurisdiction may loosen its environmental regulation relative to what it would pursue as a socially optimal solution.

Higher environmental quality reduces the output of the jurisdictional economy. This is the first cost of environmental policy. With a positive tax rate on mobile capital, however, there is also a second cost. The lower activity level of the economy reduces the attractiveness of the jurisdiction for mobile capital and investment. Hence, there is an outflow of capital to the other jurisdictions. The capital tax revenues of the local government drop due to this movement of capital, causing a second cost. Jurisdictions fear that environmental gains will be more than offset by the movement of capital to other jurisdictions with lower standards.

4) For an overview see Wilson (1999).

This result has an important interpretation. It represents the discrepancy between the social value of an additional unit of environmental quality and the social opportunity cost of this unit, measured from jurisdiction's viewpoint. For a single jurisdiction the cost of environmental policy is higher than from a social point of view. The jurisdiction considers the outflow of capital as a loss; whereas from a social point of view the outflow of mobile capital increases the tax base of other jurisdictions. As the private cost of a single jurisdiction is higher than the social cost, the jurisdiction will provide less environmental quality than the socially optimal level.

If each jurisdiction reasons the same way, all will adopt lower standards of environmental quality than they would prefer if there were some binding mechanism that enabled them simultaneously to enact higher standards. This competition is called the race-to-the-bottom.

Wellisch (1995) develops a theoretical exception to the race-to-the-top. Small jurisdictions are, in general, highly open economies. Firms are, typically, not fully owned by the jurisdiction's residents. Hence, a part of the benefits of pollution flow, as profit, to the non-resident owners of the firm. The residents bear the entire burden of the pollution, but gain only a part of the benefits (e.g. as wage or local taxes). Wellisch concludes that decentralized command-and-control regulation may lead to environmental overprotection (race-to-the-top). Kunce and Shogren (2005) reconcile Oates and Schwab (1988) with Wellisch (1995). They state that, even if the firms are foreign owned, there may be a race-to-the-bottom with a positive local capital tax rate.

Saveyn (2005) explains the occurrence of NIMBY (not-in-my-backyard) behavior through inter-jurisdictional competition. Recent examples of NIMBY behavior include the action groups against the airport of Zaventem (e.g. "de Noordrand") and the opposition against off-shore windpower near Knokke-Heist. The model considers a metropolitan area where residents are able to commute between the jurisdictions. The residents of these jurisdictions show NIMBY behavior as they try to preserve their living quality by pushing the polluting economic activity to the neighboring jurisdiction, while keeping their labor income as commuters. This induces a race-to-the-top among jurisdictions.

Empirical evidence for a race-to-the-bottom is weak at best, and some studies rather suggest a race-to-the-top (for an overview, see Jaffe *et al.*, 1995). Fredriksson and Millimet (2002) find evidence of strategic environmental policy making across U.S. states but are unable to conclude if the evidence supports a race-to-the-top or race-to-the-bottom. Fredriksson and Gaston (1999), examine the votes on environmental legislation in the U.S. in state legislatures as well as at the congressional level. They find no tendency for state politicians to vote against environmental measures. List and Gerking (2000) and Millimet (2003) analyze the decentralization of environmental policy under Reagan. List and Gerking (2000) conclude that a race-to-the-bottom in environmental quality did not materialize in the 1980's. Moreover, Millimet (2003) finds strong evidence that decentralized environmental policy contributed to a race-to-the-top in abatement expenditures. Fredriksson *et al.* (2004), however, point out that the previous literature considers strategic interaction in a uni-dimensional fra-

mework. Jurisdictions may respond to a more lenient environmental policy of their neighbors not only by lowering their environmental standards, but also by lowering state-level taxation or increasing infrastructure spending. Their result suggests that important own- and cross-policy interactions exist. They conclude that the literature with uni-dimensional frameworks present lower bound estimates of the degree of strategic interaction.

Within federations, such as the United States or the European Union, the federal government may restrict competition among jurisdictions, if it is determined that such competition leads to unwanted consequences. The desire to coordinate policies, avoiding that jurisdictions abuse the environmental policy to attract business motivates the federal or centralized control in the US and EU over environmental programs, despite the fact that marginal damage of pollution may vary considerably from one location to another.

Vertical Tax Competition

The transboundary pollution and competition between jurisdictions involve horizontal interactions between jurisdictions. There are, however, also vertical interactions between the local governments and the central government. The basic problem is that the environmental policy imposed by one government level diminishes or increases the tax bases and tax revenues of all other government levels. One government level does not take into account these spillover effects. These vertical interactions are complex to study and the results depend heavily on the relations between the government levels. The size of the vertical externalities depend, among others, on the initial tax rates of the central and local governments levels and the sensitivity of the tax bases for policy changes.

Up to now, vertical externalities have received relatively little attention from economists and are usually neglected in environmental policy⁵. Saveyn and Proost (2005) estimate these vertical externalities with a small numerical model. In their model, a single jurisdiction, unilaterally, increases its local pollution taxes. The jurisdiction uses the excess tax revenues to cut pre-existing local capital or labor taxes. This reform increases or diminishes the tax bases and tax revenues of the central government. In a Belgian context, the model can be used to assess the effects of regional environmental policy on the federal budget (e.g. excise duty revenues from fossil fuels⁶). Saveyn and Proost (2005) illustrate the theoretical results of their model with simulations for Belgium and the United States. In their simulations, one region or state raises its after-tax energy prices by 10%. The other regions or states do not change their policy.

5) For interesting theoretical contributions to vertical externalities in fiscal policy, see Keen and Boadway (1996), Hoyt and Jensen (1996) and Keen (1998). Smolders and Goeminne (2004) give an overview of empirical studies. They study the fiscal policy of municipalities in Flanders regarding local capital and labor taxes.

6) A recent example is the effort of some Belgian regions to reduce motorfuel consumption. This creates important excise tax revenue losses for the federal government that are not considered by the regions as a cost.

Belgium and the United States differ in two aspects. First, we assume that Belgium consists of two identical regions⁷, whereas the US has 50 identical states. We consider them all to be small open economies⁸. Second, in the United States, the lower government levels are responsible for about half of the total energy taxation. We estimate that the state's tax shares in the US are 20%, 20% and 50% for respectively capital tax, labor tax and energy tax. In Belgium, the local tax shares are 20% for capital and 10% for both labor and pollution.

The run for a Belgian region with a lower local labor taxes (first column Table 1) shows a positive effect for the environment in the reforming region with a decline of 6.47% in energy demand. Wage and employment decrease respectively with 0.02% and 0.01%, causing a negative effect on the non-environmental private welfare. There is no double dividend, but rather a trade-off between private and environmental welfare. Compared to labor, energy seems to be overtaxed from a non-environmental point of view. Moreover, regional environmental policy decreases the federal budget with 0.11%, causing a negative vertical tax externality. The overall welfare in the reforming region increases with 0.54%. This is a trade-off of the private welfare, the environmental dividend, and the vertical externality. The non-reforming region, however, suffers from a negative environmental tax externality and its welfare decreases by 0.04%.

In the case of lower local capital taxes in Belgium (second column in Table 1), pollution decreases by 5.76% and capital demand is 4.32% higher. Wage and employment increase by 0.08% and 0.02%, respectively. We observe a double dividend. This suggests that in most Western countries capital is overtaxed compared to energy. Moreover, the tax reform brings about a positive vertical tax externality as the federal budget increases by 0.28%. The overall welfare in the reforming region and non-reforming regions improve by 0.66% and 0.11%, respectively.

The results for the US in Table 1 are similar to those for Belgium. The environmental gain is similar. With a lower local labor taxes (third column in Table 1), the regional tax reform deteriorates private and federal public non-environmental welfare. Lower capital taxes boost private welfare and federal budget (fourth column in Table 1).

Differences between American and Belgian results are due to the higher local share in the overall energy tax and the higher number of regions in the US. First, a high initial local energy tax rate reinforces the costs of lost tax revenues on the regional level. With a labor tax cut, the wage and employment decrease more in

7) The two regions in the model are Flanders and Wallonia/Brussels. In reality, Belgium consists of three heterogeneous regions Flanders, Wallonia and Brussels Capital-Region, the last being a much smaller region.

8) Although the United States as a whole are definitely not a small open economy, it is a reasonable assumption to treat most states like small open economies. Only four states have more than 13 million people: California, Florida, New York and Texas.

the US than in Belgium. With a capital tax cut, the tax reform boosts the American wages and employment less than the Belgian. Second, as the number of regions is much higher in the US, the federal budget is less sensible to the policy of a single state. A regional environmental tax reform in the US imposes a relatively smaller vertical tax externality.

Curiously, the welfare improvement in the reforming region in the US is higher than in Belgium for lower labor taxes. This is due to the fact that the provision of federal local public goods decreases relatively less in the US. In the simulation, this effect outweighs the higher costs of lost local tax revenues. Similarly, for lower capital taxes the welfare increase in the reforming region is smaller in the US due to the lower positive vertical tax effect and the higher costs of lost local tax revenues.

With a negative tax externality, the reforming jurisdiction partially exports its costs for cleaner environment to the central government. The reforming jurisdiction tends to oversupply environmental quality. With a positive tax externality, the reforming jurisdiction exports a part of its non-environmental gains⁹ to the central government. The reforming jurisdiction is inclined to allow for too much pollution.

Conclusion

In this paper we discuss the welfare gains and losses of decentralized environmental policy. Decentralized decision-making in environmental matters can be defended when the autonomous jurisdictions have a high degree of heterogeneity. The very nature of decentralization, however, also leads to a couple of distortions and welfare losses, as distortions like transboundary pollution, inter-jurisdictional competition and vertical externalities may arise.

The question whether to decentralize environmental policy or not, is an ever-going process without an unambiguous answer. Policy makers need to take into account the gains, but also the possible welfare losses of the decentralization. The result highly depends on the characteristics of the jurisdictions, the type of pollution and the allocation of other competences in the federal setting. Clearly, all this complexity opens scope for further interesting research.

9) Thanks to the double dividend.

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Table 1: Increase in after-tax energy prices by 10% in Belgium and US

	Belgium		United States	
	Lower Tax	Labor Lower Tax	Lower Tax	Labor Lower Tax
Wage	-0.02	0.08	-0.06	0.05
Employment	-0.01	0.02	-0.03	0.01
Pollution	-6.47	-5.76	-6.48	-5.74
Capital	-0.77	4.32	-0.78	4.21
Output	-0.75	0.07	-0.76	0.04
Federal Budget	-0.11	0.28	-0.004	0.01
Consumption	-0.01	0.06	-0.04	0.03
Welfare in reforming region	0.539	0.658	0.567	0.543
Welfare in other regions	-0.042	0.107	-0.0015	0.004

