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THE IMPACT OF ECONOMIC OPENNESS
ON THE VERTICAL STRUCTURE
OF THE PUBLIC SECTOR

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The impact of economic openness on the vertical structure of the public sector (§)

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Abstract

The aim of this paper is to investigate the impact of economic openness on the vertical structure of the public sector within a country. To tackle this issue we set up a simple theoretical model of fiscal federalism, where both central and local public spending enter the objective functions of both a central government and an aggregate local public sector, accommodating a wide range of behaviours. The degree of economic openness is assumed to erode central tax revenues and through this channel to affect the size of central spending, the size of grants paid to local governments and the optimal amount of local public spending. Consequences on the degree of decentralization are investigated. The main findings are that for a large subset of parameters an increase in economic openness leads to: a) a lower level of central government expenditures; b) a lower level of general government expenditures; c) a higher level of local taxation; d) a higher degree of public sector decentralization.

Keywords: openness, decentralization, fiscal federalism, public sector, government size.
JEL Classification: H77, H50, H11.

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1. Introduction

The theory of fiscal federalism provides a number of explanations of why governments should be articulated on different levels. The most popular theories focus on heterogeneous preferences across localities (Oates, 1972), on the need to enforce competition in the use of public resources (Brennan and Buchanan, 1980; Breton, 1987; Salmon, 1987), on the purpose of preserving the functioning of markets (Weingast, 1995; Qian and Weingast, 1997) or on the necessity to assure a "fiscal correspondence" between political and economic jurisdictions (Casella and Frey, 1992; Frey and Eichenberger, 1996).

Even though those theories differ with respect to the objective function of the public sector, they share some common features that may help interpreting the motivation and the results of our paper.

A first common feature of all theories is that a decentralised structure – under certain conditions – may be more effective than a unique central government, an outcome that is mostly determined by greater mobility of economic resources at local level in response to undesirable public policies (an effect that is rooted in the "voting by feet" argument by Tiebout, 1956). Such a mobility, in the standard theory, would assure homogeneous preferences within local governments; while it would reduce tax exploitation opportunities by part of "monopolistic" central governments in the theories of competitive federalism.

A second common feature concerns the institutional role of local governments, called to 'remedy' some imperfections in the functioning of the central authority. In the standard theory, local governments solve for the central government imperfect knowledge of local preferences. In competitive federalism, local governments serve the purpose of limiting the exploitative nature of the central government.

A third common feature is that any group of theories – either implicitly or explicitly – subsumes a vertical structure of the public sector. Yet, this structure may differ according to the objective function of the public sector. In a Tiebout-type world, local expenditures and benefit-type taxation must meet differentiated preferences, and local governments should be sufficiently small to guarantee an adequate sorting process, while wide differences between taxes paid and benefits received are removed by mobility. The vertical structure of the public sector is therefore built upon the existence of 'local public goods' and by consumers' willingness to pay for them. Within the theories of competitive federalism, instead, those expenditures and taxes that promote horizontal and vertical competition should be decentralised. This might imply that local governments should manage elastic tax bases, as taxes on immovable factors may simply replace central tax exploitation with local ones.

A fourth feature, most important for our paper, is that all theories fail to embody the possibility that the degree of economic integration may affect the vertical structure of the public sector.[1] Either benevolent or self-interested, the central government of many fiscal federalism theories rules over a mainly 'domestic' economy, regardless of the pressures that may arise from the international context. In other words, the theories of fiscal federalism do not properly take into account that, *ceteris paribus*, more open economies may end up with a vertical structure of the public sector that does not necessarily coincide with that of a relatively more closed economy.

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[1] See, for example, Brennan and Buchanan (1980), the empirical evidence provided by Oates (1985) for the Leviathan hypothesis, the recent empirical evidence provided by Stein (1999) and the survey of the literature in Rodden (2003).

On the other hand, while the theories of fiscal federalism are rather "closed" in nature, the studies on the impact of economic openness on government size are rather "unitary", focusing mostly on the effects of the public sector as a whole without modelling any intergovernmental relations (e.g. Cameron, 1978; Rodrik, 1998 to quote two popular contributions on the relationships between government size and economic openness).[2]

The interest in merging fiscal federalism theories and the impact of economic integration on public finance variables finds its foundations in the theory of international tax competition and on the future of 'Nation State' (Schulze and Ursprung, 1999). The main message from both strands of literature is that public sectors may be somewhat constrained in the use of both taxes and public expenditures when there is a high degree of mobility of tax bases and the consequent erosion of tax revenues. Tax revenues may decrease (or increase slowly), the tax burden may reallocate from more mobile to less mobile tax bases, large redistributive programs are less easily implemented and large welfare states are increasingly difficult to maintain. It is therefore highly unlikely that these "big" changes that economic integration is alleged to generate may leave the vertical structure of public sectors unaffected.

This paper addresses this issue by using economic integration and its alleged impact on tax revenue as a way to "open" fiscal federalism theories to external constraints. This may contribute to understand that the vertical structure of public expenditures, the size of aggregate spending and the degree of decentralization in any given country may well depend on how economic integration "erodes" national resources. It is worth stressing that this issue has been so far overlooked by existing theories of fiscal federalism, and that this paper makes a step in the direction of highlighting that external constraints matter for both central and local government behaviours.[3]

In order to tackle this issue, we set up a simple theoretical model that embodies a variety of both central and local governments attitudes towards local and central public spending, respectively. In this sense, our framework is general enough to encompass, as special cases, both self-interested own-budget maximizer (Niskanen-type) and welfare-maximizer governments.[4]

In our model, the Central Government (CG) decides the level of central public expenditures and the level of transfers to LGs subject to a revenue constraint that becomes tighter the higher the degree of economic openness, assumed to erode central tax revenues. On the other hand, Local Governments (LGs) set the level of autonomous public spending, financing it by central grants and local lump-sum taxes.

The main findings – for a significant subset of parameters – are that an increase in economic openness leads to a lower level of general government expenditures, a higher level of local taxation, a lower level of central government spending and a higher degree of public sector decentralization.

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[2] For an extensive review, see Schulze and Ursprung (1999). See, among many, Garrett (1996, 1998a, 1998b and 1999), Quinn (1997), Rodrik (1997), Swank (1998), Hallerberg and Basinger (1998), Iversen and Cusack (2000), Grubert (2001), Bretschger and Hettich (2002), Swank (2002), Sanz and Velázquez (2003), Dreher (2003), Slemrod (2004), Garen and Trask (2005), Liberati (2007).

[3] As stated in a comment to Buchanan (1995), in the presence of an open environment "national governments find themselves in the approximate position of a province or a state or a canton vis-à-vis the national economy in a federal state. The Tiebout mechanism comes into play…because the national government loses its traditional power to rule over society and regulate the economy".

[4] Given the purpose of the paper, the federalist structure of the public sector is taken as given, without pursuing its microfoundation .

A review of the literature is addressed in Section 2, while the model is discussed in section 3. Comparative statics and interpretation of results are the content of Section 4.

2. The relation between openness and government size

Even though the relationship between economic openness and decentralisation is relatively unexplored in the prevailing literature, there are some useful insights that can be learned from different strands of theoretical and empirical studies that have investigated those topics either jointly or in isolation. In what follows, we propose both a classification of these studies and their implications for the vertical structure of public sectors.

2.1. The extension of the compensation hypothesis

A possible nexus between openness and fiscal federalism straightforwardly arises from the extension of the hypothesis suggested by Rodrik (1998) to local governments. He argued that increasing external economy's exposure may lead to more demand for public expenditures to compensate for increasing external risk (macroeconomic volatility, asymmetric shocks), a process that has become popular as the *compensation hypothesis* (e.g., Swank, 2002).[5] Since this kind of insurance function is thought to be best served by centralised fiscal arrangements (e.g. Oates, 1972), the consequential outcome is that globalisation should increase the size of central governments and reduce that of local ones, especially if regions are specialised in production.[6] On the other hand, economic integration may increase the cost of stabilisation policies – i.e. the cost associated to counter-cyclical policies – as part of the intended effects can be vanished by factor mobility, a feature that would further push towards centralised policies.

2.2. The emphasis on the costs of secession

The second explanation stems from a strand of research suggesting that economic integration may reduce the cost of secession by part of small regions and provide for less benefits to larger countries (e.g. Alesina and Spolaore, 1997; Alesina and Wacziarg, 1998). According to this view, "political separatism should be associated with increasing economic integration" (Alesina and Spolaore, 1997, p.1041). In other terms, exit threats might become more credible (and cheaper) in an integrated world than in an autarchic world.

Now, if fiscal decentralisation is interpreted as a backstop to secession (for example to avoid inefficiency costs associated to secession as in Bolton and Roland, 1997) more economic integration should lead to more decentralised countries. The reason is that central governments will be willing to "pay" more to local governments to avoid secession – for example, by increasing transfers or by devolving expenditure and taxation power to them. However, as Garrett and Rodden (2003) pointed out, central governments may try to "buy" loyalty of voters – especially in would-be breakaway regions – by direct

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[5] The role of asymmetric shocks in increasing regional demand for insurance was already pointed out in Persson and Tabellini (1996a) and (1996b).
[6] See also Garrett and Rodden (2003).

spending rather than by transfers, by this way recovering the possibility that economic integration would increase (more) the size of central governments.

The authors, however, seem to disregard the possibility that "local voters" might be more effectively bought by increasing either the size of – possibly unconditional – transfers or the amount of taxes devolved to local territories (at least if one assumes that local citizens are better informed about what happens at local rather than at central level or that less rents are dissipated at local level).[7]

A notable contribution on this issue is by Stegarescu (2004), who argues that economic integration may have triggered the recent process of fiscal decentralisation in OECD and EU countries. The theoretical model contains several interesting points, the most relevant for our analysis being the dependence of both preferences for national public goods and per capita regional output on the degree of economic integration. He shows that complementarities between local and national public goods leads to an increase of the total supply of public goods (central + local) when economic integration increases. At the same time, the theoretical effect on the optimal degree of decentralisation would be ambiguous, yet a positive relationship between openness and decentralisation finds some support on the empirical side.[8]

2.3. Openness as a fiscal discipline device

A third explanation tend to highlight the role of globalisation as a fiscal discipline device. In particular, as suggested by de Mello (2005), globalisation can impose harder budget constraints on decentralised governments. By this way, it would reduce the "deficit bias" empirically observed in more decentralised countries – originated by either implicit or explicit bail-out guarantees from the central governments[9] – and favour the implementation of a market-preserving federalism (e.g. ; Qian and Weingast, 1997; Qian and Roland, 1998).

There are two debatable points in this interpretation. The first is intrinsic to the model by de Mello (2005), in which globalisation has a direct impact on local budgets, but only a mediate effect on the budget of the central government, a feature which remains rather unexplained. The second is that some theories of fiscal federalism suggest that decentralisation may be a discipline device by itself, through an increase of both horizontal and vertical competition among government levels.[10] Arguing that more decentralised countries tend to have a "deficit bias" – and that economic integration may remedy it – is a direct challenge to the benefits of decentralisation highlighted by the theories of competitive federalism.

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[7] On this latter point, see Ferejohn (1999).

[8] See also Verdier and Breen (2001) and van Houten (2003), the first showing that fiscal centralisation is positively related to financial openness; the second showing that economic integration has not a clear effect on decentralisation.

[9] See, for example, Alesina and Perotti (1998).

[10] In particular those theories evoking some kind of competitive federalism. See, for all, Buchanan and Brennan (1980) and Salmon (1987). But see Oates (1985) and Ferejohn (1999) pointing to the fact that local voters may ask for more spending rather than less, to the extent that they perceive that less public money is dissipated in rents by local governments. More recently, Wilson and Janeba (2005) show how local governments may play a role in reducing the harmful effects of externalities in a tax competition setting.

Furthermore, it has been recently shown by Besfamille and Lockwood (2004) that hard budget constraints for sub-national governments may not be desirable, as under some circumstances socially efficient projects may not be undertaken. In other words, fiscal discipline may not be socially optimal.

Other contributions (e.g. Jin and Zou, 2002) suggest that vertical imbalances may lead to higher subnational, national and aggregate governments, presumably because central governments pay transfers to localities.[11] In this context, however, there is no analysis of whether economic integration may discipline this inefficiency.

But perhaps the most compelling case for this point of view indirectly arises from a comment to Buchanan (1995). While describing the main features of competitive federalism, it is argued that "the monopoly power of unitary governments, as well as the common pool problem of federalist politics, can be alleviated to the extent that free movements of resources allows resource owners to move away from excessive taxes and regulations". It is indeed a common point of all theories of competitive federalism, that the institution of "federalism" may facilitate the exit option by part of individuals and firms dissatisfied with tax and expenditure policies, compared with the monolithic central government. In the same vein, increased economic integration may play the same role at a supranational level, strengthening fiscal discipline.

2.4. The role of opportunistic behaviour

A fourth explanation is based on the existence of opportunistic behaviour by part of either of the government levels involved in the process. In particular, the existing literature has focused on the case where central governments may offload some fraction of total public expenditures to local governments.

Economic integration, for example, may increase the marginal efficiency cost for central governments of pursuing redistributive aims (through an increased elasticity of tax bases). To some extent, the reason is the same as that predicted by the Tiebout (1956) model when perfect mobility is assumed. In this latter case, redistribution is a hardly tenable function for local governments and unstable equilibria may originate.[12]

In the same vein, in more open countries, central governments are likely to face high mobile tax bases and additional distortions in taxing less mobile tax factors. This would point to redistributive expenditures (but also to redistributive taxes) as the most at risk at high levels of economic integration.[13]

However, since cutting redistributive expenditures is a politically costly activity for central governments, one possible strategy would be to decentralise. Economic integration may therefore push towards more decentralisation on a political ground,

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[11] See Rodden (2003) who argue that when local expenditures are financed with local own taxes the size of welfare spending is lower. Hicks and Swank (1992), Schmidt (1996), Castles (1998) and Swank (2002) also provide empirical evidence of a negative relation between fiscal federalism and the size of welfare spending.

[12] See also Stigler (1957).

[13] Note that this argument may be interpreted as the counterpart of the compensation hypothesis. This latter predicts that there is a larger demand of public expenditures, but this does not necessarily entail that this demand can be satisfied by a larger supply if there are constraints on the use of public finance variables.

something that can be referred to here as the *shifting hypothesis*.[14] Sáez (2001) has indeed pointed out that central governments may try to offload public expenditures to local governments without a commensurate increase in tax revenue (i.e. central governments shift budget deficits), which is likely to lead to smaller aggregate government size.

Garrett and Rodden (2000) argue that strategic behaviour may be followed by central governments facing increasing pressures to maintain fiscal balance, by attempting to cut expenditures by offloading expenditures and deficits to local governments.

Two things are worth noting. First, the previous arguments by de Mello (2005) seem to be turned on their head. In this latter case, openness could remedy the fact that more decentralised countries have higher budget deficits. In Garrett and Rodden (2000), openness may induce central governments to shift budget deficits to local governments.

Second, if one is ready to assume that the most powerful pressure to maintain fiscal balance comes from capital markets[15], the argument by Garrett and Rodden (2000) that fiscal balance pressures give incentives to central governments to offload public expenditures to local governments ends up to be the argument advanced in this paper that more economic integration (at least some types of economic integration) may lead to larger local governments.[16]

3. The model

> "There are local expenditures that, if particularly useful to the members of a community, give benefits also to the central government; and there are central expenditures that are particularly useful for some local communities" (English translation from Nitti F. (1912), Scienza delle Finanze, p.950, IV edition).

The following model will set up a simple theoretical framework to show one basic point and some by-products. The basic point is that higher economic openness, assumed to erode central tax revenue, may lead in most cases to larger decentralisation. The by-product is that this may occur combining various behavioural opportunities of both central and local governments, i.e. various ways in which central and local spending may be deemed useful to other government levels.

In what follows, we will discuss first the behaviour of local governments, then the corresponding behaviour of central government and the optimal outcomes.

3.1. *The Local Government decision problem*

Consider a simplified structure of territorial organization in which there are a Central Government (CG) and an aggregate local public sector. The central government spends an amount g for overall purposes, while the local sector spends an amount g_L for local purposes.

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[14] The relevance of this *shifting hypothesis* is not new in the economic literature. Its origin can be traced back to the literature on regulation authorities. See, for example, Mitnick (1980).

[15] This hypothesis is known as the *domestic balance* hypothesis. See Swank (2002).

[16] Note that the reduction of welfare spending, for example, may also be the outcome of a process in which expenditures are first delegated without corresponding tax powers and then reduced if central governments are not available to fully finance them with grants and local governments have insufficient resources to afford them.

The local aggregate government maximizes the following objective function with respect to local public expenditures:

$$W_L = \alpha \ln(g_L + \beta g) + (1 - \alpha)\ln(Y - T - t_L) \tag{1}$$

subject to the budget constraint $g_L = t_L + b$, where t_L is a local lump-sum tax, b is a lump-sum grant from the central government and Y is total income.[17] Population in each region is fixed and no migration is allowed between the regions. Debt issue is also not allowed to local governments.

Of particular interest, in (1), $0 \leq \beta \leq 1$ is a parameter measuring the attitude of the local politician towards central public spending. Varying the level of β makes this approach consistent with a wide spectrum of local politicians' behaviour. The extreme $\beta = 0$, for example, would be consistent with both own-budget maximizer local governments (Niskanen-type) or with an 'informed' median voter model who considers central and local spending two separate outcomes attached to different levels of political responsibilities.[18] 'Information' would imply that local voters would better assess the performance of local politicians for what they directly spend and not for what is spent by central governments on their account.[19]

Alternatively, $\beta > 0$ would be again consistent with the median voter framework or with a welfare-maximising perspective, where politician's objective function reflects either citizens or median voter's preferences on central and local expenditures, characterised by some degree of substitution in producing benefits, whose extreme is represented by $\beta = 1$, i.e. by the case in which one euro of central public spending gives the same utility as one euro of local public spending.

Finally, α is a parameter of preference; $\alpha = 0$ means that local governments do not assign any weight to public expenditures; at the same time private income Y, net of the central revenue T and of the local tax burden t_L, is all that matters. The opposite holds true when $\alpha = 1$.

In this framework grants b are taken as given by local governments, which means that the decisional process on the appropriate amount of grants is concentrated in the hands of the central government.[20] It follows that local taxation must fill the gap between local spending and grants, i.e. $t_L = g_L - b$.

The decision problem (1) is therefore equivalent to maximize the following:

$$\max_{g_L} \quad W_L = \alpha \ln(g_L + \beta g) + (1 - \alpha)\ln(Y - T + b - g_L) \tag{1a}$$

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[17] In this version, grants from the central government are assumed uniform among regions. A natural extension would be to assume a regionally differentiated transfer, such as an equalisation transfer to compensate differences of potential tax revenues.

[18] This would be consistent, for example, with the observed practice of disjoint voting in national and local elections by part of the same voter.

[19] This argument is consistent with Brennan and Buchanan (1980), once their statement on the tax policy perspective is transposed to one of public spending policy.

[20] In practice, the amount of transfers paid by the central government might be the outcome of a bargaining process. However, the central government power on this setting process is usually stronger, not least because in many legislative framework, the rules governing grants may be changed unilaterally by the central government. See, for example, the discussion about the vertical competition by Salmon (1987) and the need for constitutional rules discussed by Breton (1996).

3.2. *The Central Government decision problem*

Consider now the problem faced by the Central Government. It has two choice variables, central public expenditures *g* and grants *b* to local governments. The objective function is assumed to mirror that of local governments:

$$\max_{g,\,b} \; W = \gamma \ln\!\left(g + \theta g_L\right) + \left(1 - \gamma\right)\ln\!\left(Y - T - t_L\right) \tag{2}$$

γ is a parameter describing central government's preferences, playing the same role as α in the local government's objective function. Also, analogously to the previous case, θ has, for the central government, the same meaning as β in the case of local government. Various values of θ accommodate for different central government attitudes towards local government expenditures. Again, with $\theta = 0$, the central government maximises own public spending (i.e. the central government is self-interested), while with $\theta = 1$ central and local spending gives to national politicians the same utility (i.e. the central government is welfare maximiser).

The central government has the following budget constraint:

$$g + b = T - \omega \tag{3}$$

where *T* is the central government exogenous tax revenue. The peculiarity of the budget constraint (3) is that the central tax revenue, for a *given level of tax rates*, is *assumed to be negatively affected* by ω, measuring the impact of economic openness on tax revenue. For the sake of simplicity, define this term as the 'openness impact'.

The meaning of this parameter is simple. A given level of tax rates is assumed to yield more tax revenue in a closed economy than in an open one. If the economy is closed, tax revenue is *T*. If it is open, it is $T - \omega$. By assumption, however, $\omega \ll T$, i.e. economic openness does not make the tax revenue to disappear and its impact is significantly below the total amount of tax revenue.

It is worth noting that ω is here introduced in a very general way as a factor of *erosion* of central government tax revenue that is not under control of central political authorities. On the one hand, this is a simplified way of dealing with economic openness, one that does not require to model economic interrelations between countries, as it focus on the internal consequences of the action of external factors.[21] On the other hand, this modelling can accommodate the action of every "eroding factor", of which openness is thought to be one of the most prominent examples in recent times.

There are a number of arguments supporting the hypothesis maintained in the budget constraint (3). Just to focus on relatively recent contributions, the possibility that increasing economic openness may shrink tax bases (and tax revenues for the same level of tax rates) has been put forward by Tanzi (1995 and 2002) and by the literature on international tax competition. One of the predicted consequences is a relatively more

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[21] To some extent, it amounts to assume that every country is *openness-taker*, i.e. it is too small to affect the degree of economic integration by acting in isolation.

heavy taxation of less mobile tax bases. On the empirical side, however, measuring the impact of either trade openness or capital openness (or both) on the level and composition of tax revenues does not give clear-cut results, but the erosion of tax revenue is an event often supported by data.[22]

In our context, the simplest interpretation is that total tax revenue in an open economy is likely to be lower than it would be with the same tax rates were the economy perfectly closed, which is in fact a mild assumption. By analogy, the openness of the economy is here assumed to affect total tax revenue in the same way as the openness of the economy affects the level of national income by allowing some consumption to "fly away" towards imported goods in the standard Keynesian multiplier. For the sake of clarity, therefore, we will not discuss *whether* the openness of the economy causes a reduction of total tax revenue in general terms; we simply assume that – for a *given level of tax rates* – the openness of the economy will tend to reduce the amount of resources available to central government.[23] This also provides some justification to our assumption that central tax revenue is left exogenous, as the main focus of our model is to investigate what happens *by assuming* that tax revenue is eroded and not to investigate *whether* tax revenue is actually eroded.

Note further that the central government makes decision about the level of public expenditures by considering the aggregate disposable income (net of central and local taxes) in each local government. This latter factor introduces in (2) a simplified way of how the central government "care" for local governments' well-being. Indeed, even in the self-interested scenario ($\theta = 0$), net incomes of citizens represents an implicit limit to the expansion of the central public sector, in the sense that the 'implicit cost' of higher g and lower b would be a lower disposable income. Nevertheless, when $\gamma = 1$, the central government maximises the objective function by considering only central variables.

3.3. *Federalist equilibrium*

3.3.1. *The optimum solutions for local governments*

Local and central governments maximize their own objective function with respect to their own policy instruments, taking as given the decisions of the other government level.

Consider first the *local government*. The optimal level of local public expenditures can be determined by solving $\dfrac{\partial W_L}{\partial g_L} = 0$, from which:

$$\hat{g}_L = \alpha[Y - T + b] - (1 - \alpha)\beta g \tag{4}$$

$$\hat{t}_L = \hat{g}_L - b = \alpha[Y - T] - (1 - \alpha)(\beta g + b) \tag{5}$$

Equation (4) gives the optimal level of local public expenditures for given levels of grants and central spending. Note that the presence of central spending reduces the optimum level of local ones. This is the main effect of introducing both expenditure levels (central and local) in both objective functions.

The attitude towards central and local public spending shown by the corresponding government levels becomes therefore crucial. For a given level of grants, the optimum level of local spending would be higher when $\beta = 0$, i.e. when the local government is own-spending maximiser. For $\beta > 0$, instead, optimal local spending may be lower, as in this case central government spending "serve" also local government purposes that are "recognised" by the objective function of local politicians.[24]

Equation (5) gives the optimal level of local taxes. In this case, the interpretation is straightforward: local taxes fund the fraction of public expenditures that is not financed by central grants.

3.3.2. *The optimum solutions for central government*

Consider now the *central government*. The optimal level of central public expenditures can be obtained by the Lagrangian function of the maximization problem:

$$L(\lambda, g, b) = W + \lambda(T - \omega - g - b)$$

The first order conditions (FOCs) of the problem are given by:

$$\frac{\partial L}{\partial g} = 0 \Leftrightarrow \frac{\gamma}{g + \theta g_L} = \lambda$$

$$\frac{\partial L}{\partial b} = 0 \Leftrightarrow \frac{(1-\gamma)}{y - g_L - T + b} = \lambda$$

$$\frac{\partial L}{\partial \lambda} = 0 \Leftrightarrow g + b = T - \omega$$

Taking the ratio between the first two FOCs and solving for *g* yields:

$$g = \frac{\gamma}{1-\gamma}(Y - T - g_L + b) - \theta g_L \tag{8}$$

Substituting equation (8) into the central government budget constraint (3) and solving for *b* yields the optimal level of grants:

$$\hat{b} = T + [\gamma + (1-\gamma)\theta]g_L - \gamma Y - (1-\gamma)\omega \tag{9}$$

Finally, substituting (9) into (8) gives the optimal level of central public expenditures:

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[24] For example, optimum local spending on health may be lower if the central government provides basic health infrastructures. However, if the local government aims at maximizing local spending, it might well duplicate central government spending, ending up with a higher level of local spending.

$$\hat{g} = \gamma(Y - \omega) - [\gamma + (1 - \gamma)\theta]g_L \tag{10}$$

Note that the openness impact plays a direct role in shaping both the optimal levels of central expenditures and grants. Also, both depends on the optimal level of local public expenditures g_L. Equation (9) and (10) can therefore be interpreted as reaction functions of central government to local government decisions. In the same vein, equation (4) can be interpreted as the reaction function of local government to central government decisions. Therefore, solving the system of equations (4), (9) and (10), gives the equilibrium of the model for grants, central and local government expenditures:

$$g^* = \frac{\gamma - \alpha\Gamma}{1 - A\Gamma}(Y - \omega) \tag{11a}$$

$$b^* = T + \left\{\frac{\gamma - \alpha\Gamma}{1 - A\Gamma}\right\}Y + \left\{\frac{(1 - \alpha)\Gamma\beta - (1 - \gamma)}{1 - A\Gamma}\right\}\omega \tag{11b}$$

$$g_L^* = \left\{\alpha + \frac{[\alpha - (1 - \alpha)\Gamma\beta](\gamma - \alpha\Gamma)}{1 - A\Gamma}\right\}Y + \left\{\frac{(1 - \alpha)\gamma\beta - \alpha(1 - \gamma)}{1 - A\Gamma}\right\}\omega \tag{11c}$$

where $\Gamma = \gamma + (1 - \gamma)\theta$ and $A = \alpha + (1 - \alpha)\beta$. Note that $\theta = 0 \Rightarrow \Gamma = \gamma$ and $\beta = 0 \Rightarrow A = \alpha$. It is worth noting that in order to have $g^* > 0$ in equilibrium, it is required that $\frac{\gamma}{1 - \gamma} > \frac{\alpha}{1 - \alpha}\theta$, for which a sufficient (not necessary) condition is $\gamma \geq \alpha$. We will assume this condition throughout the paper. The equilibrium level of transfers b^* and local spending g_L^* - given the assumption $Y \gg \omega$ - are also positive.[25]

4. Comparative statics

Comparative statics may help disentangle the impact of economic openness on public finance variables and on their distribution among government levels, which is the main focus of the paper. The set of general relations defining these impacts is as follows:

$$\frac{\partial g^*}{\partial \omega} = -\frac{(\gamma - \alpha\Gamma)}{1 - A\Gamma} \tag{12}$$

$$\frac{\partial b^*}{\partial \omega} = \frac{(1 - \alpha)\beta\Gamma - (1 - \gamma)}{1 - A\Gamma} \tag{13}$$

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[25] What is required is the following sufficient condition on the numerators $(\gamma - \alpha\Gamma) > (1 - \alpha)\Gamma\beta - (1 - \gamma)$, which implies $\Gamma A < 1$ that is always verified.

$$\frac{\partial g_L^*}{\partial \omega} = \frac{(1-\alpha)\beta\gamma - \alpha(1-\gamma)}{1-A\Gamma} \tag{14}$$

It is also worth defining the difference between the change of local government spending and the change of grants paid by the central government:

$$\frac{\partial g_L^*}{\partial \omega} - \frac{\partial b^*}{\partial \omega} = \frac{(1-\alpha)(1-\gamma)(1-\beta\theta)}{1-A\Gamma} \tag{15}$$

Also, define $D^* = \dfrac{g_L^*}{G^*}$ as the degree of decentralization given by the ratio between local spending and total spending $\left(G^* = g^* + g_L^*\right)$ Then:

$$\frac{\partial D^*}{\partial \omega} = \frac{1}{G^2}\left(\frac{\partial g_L^*}{\partial \omega}G^* - \frac{\partial G^*}{\partial \omega}g_L^*\right) \tag{16}$$

In order to discuss the main implications of the model, it is worth distinguishing among sub-cases, according to the behavioural attitudes of both central and local governments. Before proceeding any further it is worth stating two general conclusions of the model:

Proposition 1

Following an increase of the openness impact, central government spending always decreases, i.e. $\dfrac{\partial g^*}{\partial \omega} < 0$.

Proof: Using the assumption $\gamma \geq \alpha$, the result follows directly from (12).

Proposition 2

Following an increase of the openness impact, local taxation always increases, i.e. $\dfrac{\partial t_L^*}{\partial \omega} > 0$.

Proof: From (15), $\dfrac{\partial g_L^*}{\partial \omega} - \dfrac{\partial b^*}{\partial \omega} > 0$ always holds. The increase of local taxation follows from the budget constraint.

Proposition 1 is a general outcome of the model. Whenever central tax revenue is eroded, the best response of the central government is to reduce public spending, regardless of the attitude of both central and local politicians towards public spending realised by the other government level. β and θ, indeed, may affect the size of the response, but not its direction, which is unequivocally negative. This is a first challenge to the compensation

hypothesis discussed in paragraph 2.1. The size of the central government decreases in absolute terms, denying the compensation hypothesis general validity.

4.1. *The case* $\beta = 0$

Consider now some results specific to the assumptions made on both β and θ. Consider first the case in which central government spending does not play any role in the objective function of the local public sector. In other words, central spending gives no utility to local politicians. The following Proposition holds:

Proposition 3

In the case $\beta = 0$ and for any $0 < \theta < 1$:

a) local public spending decreases;
b) total public spending decreases;
c) grants from central government decrease;
d) the degree of decentralization increases.

Proof: Replacing $\beta = 0$ into (13), (14) and (16) and using the definition of A, one can get:

$$\frac{\partial g_L^*}{\partial \omega} = -\frac{\alpha(1-\gamma)}{1-\alpha\Gamma} < 0, \text{ for part a);}$$

Since central government spending always decreases (Proposition 1) and local government spending decreases, the total size of the public sector G also decreases $\left(\frac{\partial G^*}{\partial \omega} = \frac{\partial g^*}{\partial \omega} + \frac{\partial g_L^*}{\partial \omega} \right)$, which proves part b).

$$\frac{\partial b^*}{\partial \omega} = -\frac{(1-\gamma)}{1-\alpha\Gamma} < 0, \text{ for part c);}$$

$$\frac{\partial D^*}{\partial \omega} = \frac{1}{G^2} \left(\frac{2\alpha(\gamma - \alpha\Gamma)^2}{(1-\alpha\Gamma)^2} \right) > 0, \text{ for part d), using the assumption } \gamma \geq \alpha.$$

Remark 1

Proposition 1 holds irrespective of the value of θ. Note that even when the central government is completely selfish ($\theta = 0$), the degree of decentralization increases. This occurs because grants from central to local government decrease less than what would cause a reduction of local spending larger than that of central spending. A reduction of grants, indeed, would imply an increase of local taxation, which in turn reduces disposable income. Since this latter variable enter the central government's objective function, this explains why even a selfish central

government may prefer not to cut grants significantly. This may explain, for example, why grants from central to local governments are a persistent feature of apparently wide different models of fiscal federalism. Besides complementing a structural insufficiency of tax sources at local level, grants may serve the scope of better 'satisfying' central government's preferences for local disposable incomes.

The case of selfish local governments, therefore, gives full account of the common opinion that one possible impact of economic openness might be a shrink of the general government size (part c)). Our model, in this case, makes a step further. It explains that when the central tax revenue is eroded, the final outcome of that shrink is to increase the share of local government expenditures on total spending (i.e. the degree of decentralisation), a point that has been so far overlooked by the specialised economic literature.

4.2. *The case* $\beta > 0$

For the purpose of simplifying the discussion of this case, it is worth distinguishing two further sub-cases, $\theta = 0$ and $\theta > 0$.

4.2.1. *A central government with* $\theta = 0$

In order to discuss this case, use will be made of the following threshold:

$$\alpha_\gamma = 1 - \frac{1}{\beta}\left(\frac{1-\gamma}{\gamma}\right) \qquad (17)$$

Consider first how economic openness impacts on the relevant variables, using the following Propositions:

Proposition 4

When grants increase (following an increase of the openness impact), local public spending will increase and will increase more than grants. When grants decrease, local public spending may either increase or decrease.

Proof: It is convenient to start from what happens to grants. Replacing $\theta = 0$ into (13) one gets $\frac{\partial b^*}{\partial \omega} = \frac{(1-\alpha)\beta\gamma - (1-\gamma)}{1 - A\gamma}$. The sign of this expression depends on the numerator. In particular, using (17), $\alpha < \alpha_\gamma \Rightarrow \frac{\partial b^*}{\partial \omega} > 0$, while $\alpha > \alpha_\gamma \Rightarrow \frac{\partial b^*}{\partial \omega} < 0$. Now, consider the following relation, obtained by replacing optimal solutions in (4) and taking the derivative with respect to ω:

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$$\frac{\partial g_L^*}{\partial \omega} = \alpha \frac{\partial b^*}{\partial \omega} - (1-\alpha)\beta \frac{\partial g^*}{\partial \omega} \tag{18}$$

We know from Proposition 1 that $\frac{\partial g^*}{\partial \omega} < 0$, therefore the second term is always positive.[26] We now also know that $\alpha < \alpha_\gamma \Rightarrow \frac{\partial b^*}{\partial \omega} > 0 \Rightarrow \frac{\partial g_L^*}{\partial \omega} > 0$. Since, in this case, $\frac{\partial g_L^*}{\partial \omega} = \frac{(1-\alpha)\beta\gamma - \alpha(1-\gamma)}{1-A\gamma}$, it is straightforward to show that $\frac{\partial g_L^*}{\partial \omega} - \frac{\partial b^*}{\partial \omega} = \frac{(1-\gamma)(1-\alpha)}{1-A\gamma} > 0$, i.e. local spending increases more than grants (see Proposition 2). Conversely, $\alpha > \alpha_\gamma \Rightarrow \frac{\partial b^*}{\partial \omega} < 0$ is consistent with both $\frac{\partial g_L^*}{\partial \omega} > 0$ and $\frac{\partial g_L^*}{\partial \omega} < 0$.

Proposition 5

Following an increase of the openness impact, the aggregate size of the public sector decreases, i.e. $\frac{\partial G^*}{\partial \omega} < 0$.

Proof: The proof follows from the definition of the aggregate public sector, from which:

$$\frac{\partial G^*}{\partial \omega} = \frac{\partial g^*}{\partial \omega} + \frac{\partial g_L^*}{\partial \omega} = -\frac{\left[(1-\alpha)\gamma(1-\beta) + \alpha(1-\gamma)\right]}{1-A\gamma} < 0$$

Proposition 6

Following an increase of the impact of economic openness, the degree of decentralisation always increases, i.e. $\frac{\partial D^*}{\partial \omega} > 0$.

Proof: From (16), $\frac{\partial D^*}{\partial \omega} = \frac{1}{G^{*2}}\left(\frac{\partial g_L^*}{\partial \omega} G^* - \frac{\partial G^*}{\partial \omega} g_L^*\right)$. From Proposition 5, the second term in round brackets is always positive. Therefore, the conclusion follows for the case $\frac{\partial g_L^*}{\partial \omega} > 0$. When $\frac{\partial g_L^*}{\partial \omega} < 0$, one has to replace the equilibrium values of total and

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[26] Note that in the case $\theta = 0$, $\frac{\partial g^*}{\partial \omega} < 0$ does not require $\gamma \geq \alpha$.

local public spending into the general form (16). With $\theta = 0$, after manipulation,

one can obtain $\dfrac{\partial D^*}{\partial \omega} = \dfrac{1}{\left(G^*\right)^2}\left\{\dfrac{\gamma(1-\alpha)}{\left(1-A\gamma\right)^2}\alpha\gamma\left[\left(1-A\right)+\left(1-\alpha^2\right)+\left(1-\alpha\right)\beta\right]Y\right\}$. It is easy to

show that all terms in round brackets are positive, therefore $\dfrac{\partial D^*}{\partial \omega} > 0$ always holds.

Proposition 4 highlights a number of issues. First, a selfish central government may either increase or decrease grants to local governments. Even a selfish government, indeed, gets some utility from disposable income (net of local taxes). Reducing grants, given the local budget constraint, would mean to increase local taxation and to reduce local disposable income, which has a negative feedback on the central government objective function. Therefore, even though local public spending has no 'value' for the central government, it may prefer to pay grants rather than to cause an increase of local taxation.

Second, when grants decrease, local public spending is more likely to increase when β is larger, i.e. when there is a large positive attitude towards central government spending. This would appear counterintuitive, but it is not if one thinks that a reduction of central government spending, with larger β's, would cause a larger loss in local 'welfare'. This loss needs to be increasingly compensated by local spending, which also compensates the 'welfare' loss due to the increase of local taxation caused by the reduction of grants (see *Proposition* 2). Technically, there is no shifting of resources from central to local governments (grants decrease), yet the increase of local spending is still an admissible outcome, implying that the vertical structure of the public sector would change.

Third, local spending increases more than grants – when both increase – which gives account of the observed 'bandwagon effect'. Combining this result with that in Proposition 1, leads to the conclusion that more economic integration may reshape the vertical structure of the public sector, with the central government spending less and local governments spending more also using more grants. Put in other words, the vertical structure of the public sector would change and this occurs through a shifting of expenditures from central to local governments. This finding, for example, may explain why a large number of empirical studies on the relation between economic openness and the size of the public sector show apparently contradictory results (either a positive or a negative relationship), mostly depending on which definition of public sector is used (central, local or general governments).

Proposition 5 gives interesting insights on the consequences of economic openness on the aggregate size of the public sector. When both central and local public spending decrease, the result is obvious. There are cases, however, in which a decrease of central public spending is associated to an increase of local public spending. The negative sign on the total size of the public sector, however, would imply that local public spending increases by less than the size of the reduction of central public spending. In other words, and in absolute terms, the shrink in the central public sector always outperforms the enlargement of the local public sectors. As it stands, our model gives no analytical support to the compensation hypothesis in the case of a selfish central government, regardless of the attitude of the local public sector towards central spending.

Proposition 6 is also insightful. Given the definition of *D*, in those cases where a shrink of the aggregate size of the public sector is associated to an increase of local public spending, the degree of decentralization unambiguously increases. This would imply that the most likely reaction to the erosion of the central tax revenue flows through a reduction

of central public spending, a shrink of the aggregate size of the public sector and an enlargement of local public spending, causing an increase of the share of total public spending managed by local governments. This result would support the hypothesis that economic openness, by reducing the ability of central governments to raise sufficient tax revenue to finance large amount of expenditures, would both cut expenditures under its own responsibility and then delegates local governments to take responsibility of additional public spending with additional local taxes. Grants, in this case, play the role of mitigating heavy increases of local taxation in the case in which central governments 'care' for disposable incomes.

Local spending, however, may decrease in response to an increase of the impact of economic openness, but recall that this is less likely if local governments have a larger positive attitude towards central spending, clarifying once again that the impact of economic openness strongly depends on the behavioural context in which central and local governments operate. Nevertheless, the degree of decentralisation still increases.

We think that this is an important result, as it may add to theories of fiscal federalism those cases in which decentralisation is the optimal response to exogenous shocks of either macroeconomic or institutional framework. Our hypothesis is that once perturbed by an exogenous factor (i.e. economic openness), the vertical structure of the public sector might change in favour of decentralisation.

4.2.2. A central government with $\theta > 0$

In this paragraph, it will be discussed the most general case in which both $\beta > 0$ and $\theta > 0$, in order to investigate how a positive attitude of the central government towards local public spending may affect the outcome discussed in the previous paragraphs.

Use will be made of the following Propositions:

Proposition 4bis

Conclusions from Proposition 4 still holds. However, larger θs makes an increase in grants more likely as well as an increase in local public spending.

Proof: When $\theta > 0$, the threshold (17) becomes $\alpha_\Gamma = 1 - \frac{1}{\beta}\left(\frac{1-\Gamma}{\Gamma}\right)$. By definition, we know that $\Gamma > \gamma \Rightarrow \frac{1-\Gamma}{\Gamma} < \frac{1-\gamma}{\gamma} \Rightarrow \alpha_\Gamma > \alpha_\gamma$. Compared with $\theta = 0$ and for a given β, this makes more likely $\alpha < \alpha_\Gamma \Rightarrow \frac{\partial b^*}{\partial \omega} > 0$. From the relation $\frac{\partial g_L^*}{\partial \omega} = \alpha \frac{\partial b^*}{\partial \omega} - (1-\alpha)\beta \frac{\partial g^*}{\partial \omega}$, it is more likely that $\frac{\partial g_L^*}{\partial \omega} > 0$.

Proposition 5bis

Following an increase of the openness impact, the aggregate size of the public sector decreases, i.e. $\frac{\partial G^*}{\partial \omega} < 0$.

Proof: The proof follows from Proposition 5, noting that in this case the condition is:

$$\frac{\partial G^*}{\partial \omega} = \frac{\partial g^*}{\partial \omega} + \frac{\partial g_L^*}{\partial \omega} = -\frac{\left[(1-\alpha)\gamma(1-\beta) + \alpha(1-\gamma)(1-\theta)\right]}{1-A\Gamma} < 0$$

Proposition 6bis

Following an increase of the openness impact, the degree of decentralisation increases.

Proof: In this case, the general formulation for the impact of economic openness on the degree of decentralisation can be written as:

$$\frac{\partial D^*}{\partial \omega} = \frac{1}{\left(G^*\right)^2} \left\{ \frac{(\gamma - \alpha\Gamma)}{\left(1-A\Gamma\right)^2} \alpha \left[(\gamma - A\Gamma) + \gamma + \left((1-\alpha)\beta - \alpha^2\right)\Gamma\right]\gamma \right\}$$

The sign of the previous expression depends on the sign of the expression inside the square brackets. Using $\left((1-\alpha)\beta - \alpha^2\right)\Gamma = \left(A - \alpha - \alpha^2\right)\Gamma$, after manipulation, one can get $\left[2\gamma - (1+\alpha)\alpha\Gamma\right]$. By assumption $\gamma > \alpha\Gamma$ and $2 > (1+\alpha)$, therefore the square bracket is always positive, which implies $\frac{\partial D^*}{\partial \omega} > 0$.

Proposition 4bis has a straightforward intuition. When local spending has a direct impact on the objective function of the central government, it is more likely that local spending compensates for the reduction of central spending dictated by an increase of the openness impact. Note that the compensating function of local spending is an increasing function of θ, as shown by the fact that when $\frac{\partial g_L^*}{\partial \omega} > 0$, $\frac{\partial \left(g_L^*\right)^2}{\partial \omega \partial \theta} > 0$. This process, in our model, would also be stimulated by the increase of grants paid by the central government, whose aim, as before, is to avoid large increases of local taxation to finance local spending.

Proposition 5bis reveals that the contraction of the aggregate public sector is still the unique outcome following an increase of the impact of economic openness. However, this is associated to an increase of the degree of decentralisation. To this purpose, it is worth considering the following Proposition:

Proposition 7

The marginal effect of increasing economic openness on the degree of public expenditure decentralisation is decreasing in θ and increasing in β, i.e. $\dfrac{\partial^2 D^*}{\partial \omega \partial \theta} < 0$ and $\dfrac{\partial^2 D^*}{\partial \omega \partial \beta} > 0$.

Proposition 7 points to the fact that as θ increases, the central government preferences for public expenditures adjusted for the attitude towards local spending (i.e. Γ) increases. This implies that, albeit negative, the marginal impact of economic openness on total public spending will be lower. Furthermore, the magnitude of the reduction of the marginal impact on aggregate spending will be higher than the one (positive) of the marginal impact on local spending. Analytically, $\left| \dfrac{\partial^2 g_L^*}{\partial \omega \partial \theta} \right| < \left| \dfrac{\partial^2 G^*}{\partial \omega \partial \theta} \right|$. Therefore, decentralisation increases at smaller rates when θ increases. The opposite holds true with reference to β, i.e. decentralisation increases at faster rates when β increases.

Once again, this gives account of the fact that the degree of fiscal federalism will be driven by the existing international and behavioural framework in which central and local governments operate. It is indeed a property of the model the fact that conclusions depend on behavioural assumptions and are not uniquely determined. We think that this may paves the way to further exploring economic integration as an external constraint to the distribution of taxes and expenditures across government levels.

5. Conclusions

It is now worth summarising the main insights of the paper. Some "almost general" findings occur:

a) the degree of decentralisation D increases in most cases. The "almost" general conclusion of our paper is therefore that an increase of economic openness leads to a change of the vertical structure of the public sector in favour of more decentralisation;

b) the total amount of public expenditures G (central + local) always decreases. This would rationalise the common opinion, often empirically founded but not theoretically shown, that economic openness may affect the absolute size of the public sector. Note that this outcome would go opposite to the 'compensation hypothesis', according to which more exposure to international markets would lead to more public expenditures to compensate for additional risks;

c) the level of local taxation also always increases. This also supports the common observation that the role of local taxation has increased over time in many advanced and also less-advanced countries and that local governments have increasingly relied (or are called to rely) on their own resources to provide local public goods and services;

d) central public expenditures always decrease. This point is rather important if assessed in view of the on-going debate on the effects of globalisation on public finance. In particular, this finding would further weak the relevance of the "compensation hypothesis" (see point b);

e) quite interestingly, these "almost general conclusions" stem from a more variable behaviour of both local expenditures and grants. When they both increase, a result of our paper is that local expenditures increase more than grants (the *bandwagon* effect). When they both decrease, local public expenditures decrease less than grants (which may be thought of as a bandwagon effect on the opposite side). This result gives account of the common idea that more grants may facilitate the growth of local public expenditures, while less grants do no act in a symmetric way, in the sense that local public expenditures reduce to a less extent;

f) furthermore, our model shows that a number of results are robust to different behavioural attitudes by part of both central and local governments. But it makes explicit one often overlooked issue that may explain the significant ambiguity of the empirical literature on this topic, i.e. that the size and the direction of the response to an increase of economic openness may broadly depend on the institutional context. This paper exactly captures this variety of responses by modelling central and local attitudes towards local and central spending, respectively, and shows that different attitudes may differently shape the vertical structure of the public sector.

We think that these results pave the way to further investigation of how economic integration may impact on the vertical structure of public sectors as a whole, rather than considering either the tax side or the expenditure side in isolation, and provide useful insights to rationalise the big controversy arisen in the empirical literature with regard to the impact of economic openness on the size and the structure of the public sector.

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