ECONOMICS DEPARTMENT

WORKING PAPER

2013

Department of Economics
Tufts University
Medford, MA 02155
(617) 627-3560
http://ase.tufts.edu/econ

Large versus Small States in The Eurozone, The Democratic Deficit, and Future Architecture [1]

Yannis M. Ioannides

Department of Economics

Tufts University

Medford, MA 02155

USA

yannis.ioannides@tufts.edu `sites.tufts.edu/yioannides/`

December 16, 2013

[1]Paper presented at the Conference, "Cyprus: Five Years in the Eurozone," Tassos Papadopoulos Foundation, Nicosia, May 17–18, 2013. The author is Max and Herta Neubauer Chair and Professor of Economics, Department of Economics, Tufts University.

1 Introduction

The Eurozone (EZ) is at a crossroads. The global financial crisis revealed the importance of the dearth of macro policy tools available to members of the European monetary union. This is in stark contrast to US. A critical issue, taken up by this paper is the limits to monetary policy tools in the absence of a fiscal union. This is the case for the Eurozone, in sharp contrast to the US fiscal union. The paper reviews the differences in various macro policy parameters between the US and the Eurozone. It then develops a stylized model of a fiscal union within a monetary union and examines broad policy options and advantages that adding a fiscal union confers on a monetary union.

One of the most important considerations that confronts students of the design of European integration is heterogeneity of the constituent parts. Heterogeneity is expressed in many dimensions, such as political, cultural, economic and of course magnitudes in terms of the population and economic size. Climatic geographic diversity is an advantage, provided that it does impose serious transportation costs for goods and people. As it stands, the Eurozone spans from the Arctic to the Mediterranean, thus offering a great variety of climates and thus the possibility of traditional comparative advantage for different activities to different nations. Newer theories of comparative advantage, such as those associated with product differentiation that new trade theory and new economic geography have utilized, have emphasized that due to the advantages of agglomerations and path dependence advancing economic integration may make constituent states even more heterogeneous. As a consequence, suboptimalities in the currency area they make up may thus be further exacerbated.

This paper is interested in notions of democratic deficit in the governance of the European Union and thus emphasizes the importance of differences in population sizes. Population size directly affects real economic outcomes. It also underlies perceptions of relative importance in international economic governance and thus state actions. Therefore, it affects notions of democratic legitimacy both within and across countries. In the EU, size is critically enshrined in numerous decision making structures, such as qualified majority rules. At the same time,

EU member states are equally represented in the European Commission, which is made up of a single national from each member state. This is very similar to the US parliamentary structure, where states are equally represented in the US Senate but in proportion to the populations in the US House of Representatives.

EU economic affairs are ruled primarily by the European Commission, the European Council, and the European Central Bank. Whereas the Council is the ultimate authority on matters of discretionary economic policy, standing rules and procedures of the European Commission often shape the agenda. The ECB, on the other hand, is designed to be independent of political authorities of member countries, a status that is zealously protected.

The ECB's (ESCB's) "primary objective shall be to maintain price stability. ... Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Community with a view to contributing to the achievement of the objectives of the Community as laid down in Article 2." (Treaty article 105.1) And, the objectives of the Union (Article 2 of the Treaty on European Union) are a high level of employment and sustainable and non-inflationary growth [http://www.ecb.int/ecb/orga/tasks/html/index.en.html]. These objectives are well understood and have been tested in practice during the operation of the ECB since the inception of the euro as electronic currency on January 1, 1999. The ECB is run by its Governing Council, which consists of the six members of the Executive Board, plus the governors of the national central banks of the 17 euro area countries. At present, the Executive Board consists of the ECB's president, who is Italian, its vice president who is Portuguese, and the remainder of its six members are from Belgium, France, Germany and Luxembourg.

On March 19, 2009 the Governing Council decided on the implementation of the rotation scheme for voting rights in the Governing Council in anticipation of enlargement. The new scheme will take effect when the number of Eurozone countries increases to 18. According to the new scheme, the members of the Executive board continue to have a vote each, but the governors of the central banks of the member states are grouped into groups, which will be three when the EZ members become 27 [ECB (2009). In particular, the first group consisting of five governors will rotate over four votes, the second group consisting of fourteen

governors will have eight votes, and the third group consisting of eight governors will have three votes. The grouping will be based on the ranking according to a composite indicator, which is defined in terms of two parameters: (i) the share of a country in aggregate GDP at market prices, which has a weighting of five-sixths; and (ii) the countrys share in the total aggregated balance sheet of monetary and financial institutions (MFIs), which has a weighting of one-sixth. The rotation is monthly.

In contrast, voting in the Federal Open Market Committee (FOMC) of the US Federal Reserve System reflects historical realities rather than current economic magnitudes. The twelve presidents of the US regional federal reserve banks rotate as voting members of the FOMC, with only the president of the NY Fed always having a vote, along with the seven members of the Board. The other regional reserve bank presidents serve one-year terms on a annual rotating basis. The rotating seats are filled from the following four groups of banks, one bank president from each group: Boston, Philadelphia, and Richmond; Cleveland and Chicago; Atlanta, St. Louis, and Dallas; and Minneapolis, Kansas City, and San Francisco.

Whereas in both the EZ and the US, decision making pertaining to monetary policy is centralized and fairly well understood, that pertaining to fiscal policy is decentralized and the role of the excessive deficit procedure plays in reining in different states' "fiscal transgressions" is not well understood. The *European Fiscal Compact*, a new treaty, formally known as *Treaty on Stability, Coordination and Governance in the Economic and Monetary Union*[2] was signed on March 2, 2012 by all Eurozone members and all other EU members except for the United Kingdom and the Czech Republic and took effect on January 1, 2013. The new treaty strengthens the Stability and Growth Pact[3] and centers on a number of rules which provide for coordination and oversight over the members' fiscal policies. It defines a *balanced budget rule* and stipulates that the annual structural deficit must not exceed 0.5% of GDP, unless a country's debt as a share of GDP is below 60%, in which

[2]http://european-council.europa.eu/media/639235/st00tscg26_en12.pdf. A brief critical analysis of the treaty is here: http://www.project-syndicate.org/commentary/will-europe-s-fiscal-compact-work-by-jeffrey-frankel.

[3]http://www.eurozone.europa.eu/euro-area/topics/stability-and-growth-pact/.
http://ec.europa.eu/economy_finance/economic_governance/sgp/index_en.htm

case the structural deficit may be at most 1%. It defines a *debt brake rule*, whereby member states whose government debt-to-GDP ratio exceeds the 60% reference level, shall reduce it at an average rate of at least one twentieth (5%) annually of the exceeded percentage points, where the calculated average period shall be either the 3-year period covering the last fiscal year and forecasts for the current and next year' or the last three fiscal years. For example, if the debt-to-GDP ratio is 80% in the year preceding the last year, then it should for the period covering the last year and the subsequent two years decline with at least: 1/20 * 20% = 1.0 percentage point per year, resulting in a ratio below 77.0% three years later. Automatic correction mechanism: If it becomes clear that the fiscal reality does not comply with the balanced budget rule or debt brake rule, an automatic correction mechanism should be triggered. The exact implementation of this mechanism will be defined individually by each Member State, but it has to comply with a specific European Commission's directive of June 2012. This directive also refers to principles and institutions, including a Fiscal Advisory Council, responsible at national level for monitoring the observance of the rules.[4] It also provides for debt issuance coordination, whereby the signatories are required to report their plans for borrowing on the capital market to the European Council and the European Commission for "better coordination and planning," and to notify the other members and the European Commission of their policies for improving competitiveness, employment and financial stability.

Clearly, the European Fiscal Compact requires major consultations among its member states with respect to fiscal policy and thus naturally it interacts with monetary policy in producing outcomes for the different economies. Therefore, this paper takes the position that it would be interesting to explore these interactions by means of a formal model. The formal model recognizes a key essential characteristic of each country, its size, and uses a model that appropriately makes size a critical parameter. The paper emphasizes the role of size as a determinant of fiscal and monetary policy in the context of international equilibrium. When countries open up to trade, their national policies become interdependent and thus generate cross-country spillovers. International policy coordination may improve welfare

[4]See Calmfors and Wren-Lewis (2011) and IMF (2013) for analyses of fiscal advisory councils.

by recognizing spillovers. Still, whether or not a coordinated outcome is superior to an uncoordinated one for any of the parties depends upon the nature of interactions and the weights assigned to the different parties to the agreement. The model builds on Casella (1992), who observes that in any voluntary cooperative agreement, the potential gain from deviation should determine the minimum influence required over coordinated (common) decision-making. Casella shows that that a highly asymmetrical distribution of weights, "power", between two partners over exercise of policy is not sustainable if the choice variables are strategic substitutes. Casella studies a simple general-equilibrium model of a monetary union and shows that a small economy will not take part in the agreement unless it can secure influence that is more than proportional to its size and a transfer of seigniorage revenues in its favor.

This paper borrows Casella (1992)'s framework and examines a number of scenaria above and beyond hers. In particular, it allows for coexistence of fiscal policy, national as well as union-wide, along with monetary policy. The paper also allows for inefficiencies in tax collection that serves as another difference across countries. It allows for the possibility that tax and spending policy in the union are decided by means of different procedures. This is intended to express the contrast between monetary policy outcomes determinant by deliberations and voting in the ECB, given the fiscal policy stance, and national fiscal policy stance, given monetary policy. What options does this logic confer on smaller versus larger members of a currency union? How a small country's fundamentals affects its bargaining power, especially over a full range of fiscal policy, like taxes on different aspects of activity is an important question.

2 International Equilibrium ala Casella (1992)

Casella (1992) assumes that individuals value a composite good, which is produced by means of intermediate varieties, and a public good, which is financed publicly by means of seignorage. The indirect utility functions depend on the country's size and real money growth in each country. A non-cooperative game among governments yields that if the elasticity of

substitution among intermediates exceeds 1, uncoordinated policies give inefficient allocations. That is, each government provides more of the public good than globally socially optimal, because it ignores the negative effects on the foreign country of withdrawing resources from private production. The smaller country always allocates a larger proportion of its endowment to the public good. With a monetary union, the exchange rate between two countries' currencies is set equal to 1 and inflation rates are equalized. Then, individual private consumption is equalized across the two countries. There is no international financial equilibrium to be cleared, and the monetary regime does not impose discipline in each country's policy.

Specifically, utility functions are defined as the sum of the logs of Dixit-Stiglitz aggregate of consumption intermediates, c_{ij}^{θ}, and of the public good, Γ_j,

$$U_j = (1-g)\ln\left(\sum_{i=1}^{n} c_{ij}^{\theta}\right)^{1/\theta} + g\ln\Gamma_j, \quad , j = A, B,\ 0 < \theta < 1, \tag{1}$$

where n is the total number of intermediate varieties of the private good and Γ_j is the public good, and $j = A, B$ denotes the two countries. The elasticity of substitution among varieties is given by $\frac{1}{1-\theta}$. If it approaches 1, the two economies that are otherwise identical except for size enjoy no advantage from trade. There are no spillovers across countries and no scope for international cooperation.

Individuals live for two periods: working when young, consuming when old, saving only in the form of money holdings. New money issued finances the public good. Money of the old plus new money equals money held by the young.

Intermediates produced with IRS using labor:

$$\ell_i = \alpha + \beta x_i,\ i = 1, \ldots, n, \tag{2}$$

where ℓ_i is the labor required to produce x_i units of variety i. The industry organizes as monopolistic competition, each variety is produced by one producer, entry is free and at the equilibrium each firm earns zero profits. The advantage of the Dixit–Stiglitz model is that the size of a country translates immediately into the number of goods produced domestically, with no counterbalancing effect on the terms of trade. If a change in the countries' relative

endowments affects the terms of trade, national income depends on the overall solution of the general-equilibrium problem and is therefore much more difficult to analyze [Casella, *op. cit.*, p. 851]. At the free entry equilibrium, each variety is produced at the same quantity:

$$x_{ij} = \frac{\alpha\theta}{\beta(1-\theta)}. \tag{3}$$

The monopolistic competition price is given by $p_j = \frac{\beta}{\theta} w_j$, and is a markup on the marginal costs in the usual fashion. The corresponding labor requirement is $\frac{\alpha}{1-\theta}$. The public good is produced using labor $\ell_{\Gamma j}$ with CRS,

$$\Gamma_j = \ell_{\Gamma j},\ j = A, B.$$

The government pays for the public good by new money printing, M_j, tax revenue, or a combination of both. If country A's size is $2 - \sigma$, then the number of varieties produced is given by

$$n_A = (2 - \sigma - \Gamma_A)\frac{1-\theta}{\alpha}. \tag{4}$$

2.1 Autarky

Under autarky, each individual consumes $c_{aut,A} = \frac{1}{2-\sigma}\frac{\alpha\theta}{\beta(1-\theta)}$ of each variety. The public good is financed by money creation:

$$\Gamma_A = \ell_{\Gamma_A} = m_A.$$

The range of varieties produced is given by:

$$n_A = (2 - \sigma - m_A)\frac{1-\theta}{\alpha}.$$

The corresponding value of the utility function is:

$$U_A = (1-g)\ln\left((2 - \sigma - \Gamma_A)\frac{1-\theta}{\alpha}\left[\frac{1}{2-\sigma}\frac{\alpha\theta}{\beta(1-\theta)}\right]^{\theta}\right)^{1/\theta} + g\ln\Gamma_j. \tag{5}$$

Optimal policy is characterized by the optimal provision of the public good. The autarky solution is easy to obtain and given by:

$$\Gamma_{aut,A} = \frac{\theta g}{\theta g + 1 - g}(2 - \sigma) = m_A.$$

The inflation rate follows from equilibrium in the money market. That is, from each individual's budget constraint, we have:

$$n_A c_{aut,A} \frac{\beta}{\theta} w_A = w_{A,-1}.$$

And from money market equilibrium, we have:

$$(2-\sigma) w_A = (2-\sigma) w_{A,-1} + M_A.$$

It is trivial to show that these two conditions are consistent, which confirms Walras' law.

2.2 International Equilibrium with National Currencies

Under international equilibrium with national currencies, each variety is still produced at the same quantity at equilibrium, but traded in both countries. Each individual spends the same amount on each variety. The imported quantity is purchased with the currency of the country where it is produced. Thus the exchange rate, in units of A currency per unit of B currency, satisfies:

$$e p_B x_{iB} = p_A x_{iA}. \tag{6}$$

Therefore,

$$e w_B = w_A,\ e p_B = p_A.$$

The number of varieties produced are:

$$n_A = (2 - \sigma - \Gamma_A)\frac{1-\theta}{\alpha},\ n_B = (\sigma - \Gamma_B)\frac{1-\theta}{\alpha}. \tag{7}$$

Individuals work when young, receive their wages, $w_{A,-1}, w_{B,-1}$ in the form of money and consume when old. Thus, each variety in each country is consumed at:

$$c_A = \frac{w_{A,-1}}{p_A}\frac{1}{n_A + n_B}\ , c_B = \frac{w_{B,-1}}{p_B}\frac{1}{n_A + n_B}.$$

The market for each variety is at equilibrium if:

$$\frac{\alpha\theta}{\beta(1-\theta)} = (2-\sigma)c_A + \sigma c_B.$$

Equilibrium in the foreign exchange market requires that total expenditure on A products by B must be equal to total expenditure on B products by A:

$$\sigma p_A n_A c_B = e(2-\sigma) p_B n_B c_A.$$

This condition determines the exchange rate, if it is flexible, or constrains the countries' monetary policies, if it is fixed.

In each country, total money demanded by the young must equal total money supplied by the old plus newly created money. That is:

$$(2-\sigma)w_A = (2-\sigma)w_{A,-1} + M_A; \;\; \sigma w_B = \sigma w_{B,-1} + M_B.$$

Dividing through by w_A, w_B, respectively, expressing real money growth by m_A, m_B, and using the pricing condition and solving we have:

$$\frac{w_A}{w_{A,-1}} = \frac{2-\sigma}{2-\sigma-m_A}, \; \frac{w_B}{w_{B,-1}} = \frac{2-\sigma}{\sigma - m_B}. \tag{8}$$

If public good provision is financed by money creation only, we have: $\Gamma_A = m_A, \; \Gamma_B = m_B$. Solving for the consumption per person of each variety, we have:

$$c_A = \frac{\alpha\theta}{\beta(1-\theta)} \frac{2-\sigma-\Gamma_A}{(2-\sigma)(2-\Gamma_A-\Gamma_B)}); \;\; c_B = \frac{\alpha\theta}{\beta(1-\theta)} \frac{\sigma-\Gamma_B}{\sigma(2-\Gamma_A-\Gamma_B}. \tag{9}$$

The resulting indirect utility functions are:

$$U_A = K_A + \frac{(1-g)(1-\theta)}{\theta} \ln(2-m_A-m_B) + (1-g)\ln(2-\sigma-m_A) + g \ln m_A, \tag{10}$$

$$U_B = K_B + \frac{(1-g)(1-\theta)}{\theta} \ln(2-m_A-m_B) + (1-g)\ln(\sigma-m_B) + g \ln m_B, \tag{11}$$

where K_A, K_B are functions of parameters (which notably include country sizes, $2-\sigma, \sigma$):

$$K_A = \frac{(1-g)(1-\theta)}{\theta} \ln\left[\frac{1-\theta}{\alpha}\right] + (1-g)\ln\left[\frac{\theta}{\beta(2-\sigma)}\right];$$

$$K_B = \frac{(1-g)(1-\theta)}{\theta} \ln\left[\frac{1-\theta}{\alpha}\right] + (1-g)\ln\left[\frac{\theta}{\beta\sigma}\right].$$

The spillovers associated with international equilibrium are clear. Money growth in A appears in country B's utility and vice versa. Higher money growth in A finances a greater

quantity of the public good, benefitting A residents, but hurts B residents by withdrawing resources from the production of varieties. The equations expressing the first order conditions for country A's government with respect to m_A, taking m_B as given, and for country B's government with respect to m_B, taking m_A as given, the *reaction functions* for the two governments, are as follows:

$$\frac{(1-g)(1-\theta)}{\theta(2-m_A-m_B)} = \frac{g}{m_A} - \frac{1-g}{2-\sigma-m_A}; \quad \frac{(1-g)(1-\theta)}{\theta(2-m_A-m_B)} = \frac{g}{m_B} - \frac{1-g}{\sigma-m_B}. \tag{12}$$

Solving them simultaneously defines a Nash equilibrium in the two countries' *uncoordinated* monetary policy decisions. Algebraically,

Although the reaction functions cannot be solved in closed form, some results do follow. E.g., if $\theta < 1$, the elasticity of substitution is greater than one, then a government's setting its own monetary policy ignores the externality it generates for the other government. That is, each government supplies more of the public good than is socially optimal, since it ignores the negative effects on the foreigners of the associated withdrawing of resources from private production. Furthermore, it is possible to show that the *larger* of the two countries devotes a *smaller* share of its resources to the public good. This in turn implies that the larger country supplies a greater amount of the public good than the smaller one.

In sum, the public good is financed by money printing. Size matters because it affects the range of tradeable varieties. With national currencies, the exchange rate determined by international trade equilibrium: if flexible, it is determined by market clearing; if fixed, clearing establishes relationship between national monetary policies. With national currencies, total real consumption in each country depends on its labor endowment, not monetary policy. Money issues are like lump-sum taxes.

2.3 Common Currency

With countries A and B sharing a common currency, the exchange rate is always equal to one, and the international financial equilibrium does not constrain monetary policy. Nominal wages are equalized across the two countries, and for monetary equilibrium, we have that:

$$(2-\sigma)w + \sigma w = 2w = 2w_{-1} + M_A + M_B. \tag{13}$$

Per capita consumption of each variety is the same across the two countries:

$$c_A = c_B = \frac{1}{2}\frac{\alpha\theta}{\beta(1-\theta)}.$$

The total number of varieties produced is $(2 - m_A - m_B)^{\frac{1-\theta}{\alpha}}$. The associated indirect utility functions for the two countries are:

$$U_A = K'_A + \frac{1-g}{\theta}\ln(2 - m_A - m_B) + g\ln m_A, \tag{14}$$

$$U_B = K'_B + \frac{1-g}{\theta}\ln(2 - m_A - m_B) + g\ln m_B, \tag{15}$$

where

$$K'_A \equiv K_A + (1-g)\ln\frac{2-\sigma}{2}, \quad K'_B \equiv K_B + (1-g)\ln\frac{\sigma}{2},$$

Even though the two countries share a currency, they can still pursue uncoordinated money creation. If money creation aims at maximizing (14), respectively (15), and thus ignore the intercountry externality, expressed by m_A's presence in the RHS of (14), respectively of (15), it would lead to too much inflation. These quantities can in fact be obtained in closed form. That is:

$$m_A = m_B = \frac{2g\theta}{2g\theta + 1 - g}. \tag{16}$$

Monetary policy, and the magnitude of the public good provided do not depend on country population sizes, but of course the constants K'_A, K'_B in (14 – 15) do.

A common central bank ought to internalize this externality and instead pursue monetary policy with an objective of maximizing a weighted sum of countries' utilities:

$$\max_{m_A, m_B} : (2-\gamma)U_A(m_A, m_B) + \gamma U_B(m_A, m_B), \tag{17}$$

with a given set of weights $(2-\gamma, \gamma)$. The resulting optimal monetary policy is:

$$m_A = \min\left\{2 - \sigma, (2-\gamma)\frac{g\theta}{1-g+g\theta}\right\}, \quad m_B = \min\left\{\sigma, \gamma\frac{g\theta}{1-g+g\theta}\right\}. \tag{18}$$

If each country's welfare is assigned the same weight, $\gamma = 1$, then as one can see, by comparing (18) with (16), the coordinated monetary policy is less expansionary than the uncoordinated one. Uncoordinated monetary policy is unnecessarily expansionary, a well known phenomenon that has been discussed by the literature; see Casella (1992), p. , 856, fn. 4.

A strictly democratic setting — a person, a vote — would require that different countries' utilities be weighted by their respective population shares. That is, in (17), $\gamma = \sigma$. As a consequence, monetary policy would reflect relative population sizes. But, what other considerations are there in setting the relative weights? How do weights affect the attractiveness of different countries' joining the monetary union. Similarly, given that they are in a monetary union, how do weight setting deters them from leaving the union?

Casella (1992) proves that in her model, there exists a minimum $\bar{\sigma}$ such that for all $\sigma < \bar{\sigma}$ the small country will require a larger relative weight in aggregate welfare than its relative size. That is, $\forall \sigma, \sigma < \bar{\sigma}$, all cooperative equilibria, if they exist, will have $\gamma > \sigma$. This is concisely summarized in *ibid.*, Fig. 3.A, which plots the minimum percentage weight γ, as function of the smaller country's relative size, for such a country to be in a currency union, and in *ibid.,* Fig. 3.B, which plots the minimum percentage weight γ, as function of the smaller country's relative size, for such a country to coordinate monetary policy, when countries have their own national currencies. The intuition of this result is that when a country is very small, it must demand more than proportional weight in the cooperative agreement. If this were not the case, the control exercised by the larger economy would result in a very unbalanced solution of the externality problem: the small country would end up facing the costs of the coordination without reaping enough of the benefits. Casella emphasizes that since the small country's alternative is to revert to the Nash equilibrium, "this cannot be used as a threat by the large country to enforce cooperation."

3 International Equilibrium with Fiscal Systems

In view of the Fiscal Compact Treaty of 2012, it is natural to explore the scope for fiscal coordination within a monetary union. Taking cues from Sibert (1992), I assume that each government finances its public good from tax revenue, which allows for country-specific inefficiency in tax collection, and from its share of seignorage. The model also allows for effects of differences in size between the two countries in the style of Casella (1992). As already indicated, both Casella and Sibert recognize that lump-sum taxation and money

creation cannot coexist: the former would be completely offset by the latter. In developing the case fiscal coordination within a monetary union, it is important to allow for proportional taxation of labor income, wages. That together with inefficiency in tax collection allows for meaningful tradeoffs. Critical conceptual problems are present here, even in the autarky case, that is whether the central bank and the government act in an uncoordinated way, whereby the resulting Nash equilibria involves setting of monetary and fiscal policy. I formulate the autarkic case first in order to fix ideas and set notation.

3.1 Autarky with a fiscal system

Under autarky, each individual in country A consumes an equal amount, $c_{aut,A} = \frac{1}{2-\sigma}\frac{\alpha\theta}{\beta(1-\theta)}$, of each variety. The provision of the public good is financed by money creation and taxation. That is public spending is equal to $M_A + \kappa_A\tau_A w_A$ (and similarly for country B), where τ_A denotes the tax rate on wage income and κ_A the fraction of nominal tax revenue which the government collects. Thus, in real terms, the budget constraint may be expressed as:

$$\Gamma_A = \ell_{\Gamma_A} = m_A + (2-\sigma)\kappa_A\tau_A.$$

The range of varieties produced is given by:

$$n_A = (2 - \sigma - m_A - (2-\sigma)\kappa_A\tau_A)\frac{1-\theta}{\alpha}.$$

The corresponding value of the utility function for country A (and similarly for country B) is:

$$U_A = (1-g)\ln\left(((2-\sigma)(1-\tau_A) - m_A)\frac{1-\theta}{\alpha}\left[\frac{1}{2-\sigma}\frac{\alpha\theta}{\beta(1-\theta)}\right]^{\theta}\right)^{1/\theta} + g\ln[m_A + (2-\sigma)\kappa_A\tau_A]. \tag{19}$$

Optimal provision of the public good is the same as in the autarky case:

$$\Gamma_{aut,A} = \frac{\theta g}{\theta g + 1 - g}(2-\sigma),$$

and thus is independent of how it is financed. Following Sibert (1992), optimizing (19) with respect to τ_j, given $\kappa_j \neq 0$, determines fiscal policy as distinct from monetary policy. Or

else, only $(2-\sigma)\tau_j + m_j$ may be defined. The inflation rate follows from equilibrium in the money market. That is, from each individual's budget constraint, we have:

$$n_A c_{aut,A} \frac{\beta}{\theta} w_A = (1-\tau_A) w_{A,-1}.$$

And from money market equilibrium, we have:

$$(2-\sigma)(1-\tau_A) w_A = (2-\sigma)(1-\tau_A) w_{A,-1} + M_A.$$

Walras' law is again confirmed, provided that $\kappa_j = 0$, or else the adding up property is violated.

3.2 National currencies with a fiscal system

If τ_j is the tax rate on wages, then inefficiency in tax collection leaves a tax revenue of $\kappa_j \tau_j w_j$. Thus, the public good is financed by a combination of seignorage and tax revenue

$$\Gamma_A = \ell_{\Gamma A} = m_A + (2-\sigma)\kappa_A \tau_A,\ \Gamma_B = \ell_{\Gamma B} = m_B + \sigma \kappa_B \tau_B.$$

The range of varieties produced in each country satisfy:

$$n_A = (2 - \sigma - m_A - (2-\sigma)\kappa_A \tau_A)\frac{1-\theta}{\alpha},\ n_B = (\sigma - m_B - \sigma \kappa_B \tau_B)\frac{1-\theta}{\alpha}$$

From money market equilibrium we have:

$$(2-\sigma)(1-\tau_A) w_A = (2-\sigma)(1-\tau_A) w_{A,-1} + M_A,$$

from which we obtain an expression for wage inflation,

$$(1-\tau_A)\frac{w_{A,-1}}{w_A} = 1 - \tau_A - \frac{m_A}{2-\sigma},$$

and similarly for country B. Using this condition with the budge constraints allows us to solve for consumption per person of each variety. That is:

$$(n_A + n_B) c_A \frac{\beta}{\theta} w_A = (1-\tau_A) w_{A,-1}.$$

Therefore, per capita consumption of varieties in the two countries are:

$$c_A = \frac{\alpha\theta}{\beta(1-\theta)(2-\sigma)} \frac{(2-\sigma)(1-\tau_A) - m_A}{(2 - m_A - m_B - (2-\sigma)\kappa_A\tau_A - \sigma\kappa_B\tau_B)}; \tag{20}$$

$$c_B = \frac{\alpha\theta}{\beta(1-\theta)\sigma} \frac{\sigma(1-\tau_B) - m_B}{(2 - m_A - m_B - (2-\sigma)\kappa_A\tau_A - \sigma\kappa_B\tau_B)}$$

The corresponding utility functions are:

$$U_A = K_A + \frac{(1-g)(1-\theta)}{\theta} \ln[2 - m_A - m_B - (2-\sigma)\kappa_A\tau_A - \sigma\kappa_B\tau_B]$$

$$+(1-g)\ln[(2-\sigma)(1-\tau_A) - m_A] + g\ln(m_A + (2-\sigma)\kappa_A\tau_A), \tag{21}$$

$$U_B = K_B + \frac{(1-g)(1-\theta)}{\theta} \ln[2 - m_A - m_B - (2-\sigma)\kappa_A\tau_A - \sigma\kappa_B\tau_B]$$

$$+(1-g)\ln[\sigma(1-\tau_B) - m_B] + g\ln(m_B + \sigma\kappa_B\tau_B). \tag{22}$$

3.3 Common currency with a fiscal system

We derive the the counterpart for the case of common currency with national fiscal systems by working from condition for equilibrium in the money market. That is, the sum of the money holdings of the old generations plus money creation in the two economies equal to the sum of the money holding by young generations:

$$(2-\sigma)(1-\tau_A)w_A + \sigma(1-\tau_B)w_B = (2-\sigma)(1-\tau_A)w_{A,-1} + \sigma(1-\tau_B)w_{B,-1} + M_A + M_B. \tag{23}$$

Since nominal wages are equalized across the two countries, we may solve for $\frac{w_{A,-1}}{w_A}$ to get:

$$\frac{w_{A,-1}}{w_A} = \frac{2 - (2-\sigma)\tau_A - \sigma\tau_B - m_A - m_B}{2 - (2-\sigma)\tau_A - \sigma\tau_B}.$$

The total number of varieties is:

$$n_A + n_B = \frac{1-\theta}{\alpha}(2 - m_A - m_B - (2-\sigma)\kappa_A\tau_A - \sigma\kappa_B\tau_B).$$

$$c_A = (1-\tau_A)\frac{\alpha\theta}{\beta(1-\theta)} \frac{2 - (2-\sigma)\tau_A - \sigma\tau_B - m_A - m_B}{(2 - m_A - m_B - (2-\sigma)\kappa_A\tau_A - \sigma\kappa_B\tau_B)(2 - (2-\sigma)\tau_A - \sigma\tau_B)}, \tag{24}$$

$$c_B = (1-\tau_B)\frac{\alpha\theta}{\beta(1-\theta)} \frac{2 - (2-\sigma)\tau_A - \sigma\tau_B - m_A - m_B}{(2 - m_A - m_B - (2-\sigma)\kappa_A\tau_A - \sigma\kappa_B\tau_B)(2 - (2-\sigma)\tau_A - \sigma\tau_B)} \tag{25}$$

In the special case of no fiscal system, $\tau_A = \tau_B = 0$, we are back to $c_A = c_B = \frac{1}{2}\frac{\alpha\theta}{\beta(1-\theta)}$: all varieties are consumed in equal amounts.

The indirect utility functions are given by:

$$U_A = K'_A + \frac{(1-g)}{\theta}\ln(2-m_A-m_B-(2-\sigma)\kappa_A\tau_A-\sigma\kappa_B\tau_B)+g\ln(m_A+(2-\sigma)\kappa_A\tau_A)+(1-g)\ln(1-\tau_A)$$
$$-(1-g)\ln(2-(2-\sigma)\tau_A-\sigma\tau_B);$$
$$U_B = K'_B + \frac{(1-g)}{\theta}\ln(2-m_A-m_B-(2-\sigma)\kappa_A\tau_A-\sigma\kappa_B\tau_B)+g\ln(m_B+\sigma\kappa_B\tau_B)+(1-g)\ln(1-\tau_B)$$
$$-(1-g)\ln(2-(2-\sigma)\tau_A-\sigma\tau_B);$$

National fiscal authorities would set tax policies so as to maximize U_A with respect to τ_A, and U_B with respect to τ_B, while taking monetary policy as given.

The objective the central bank for the monetary union seeks (m_A, m_B) to maximize,

$$(2-\gamma)U_A + \gamma U_B,$$

now becomes:

$$K + 2\frac{1-g}{\theta}\ln(2-m_A-m_B-(2-\sigma)\kappa_A\tau_A-\sigma\kappa_B\tau_B) - 2(1-g)\ln(2-(2-\sigma)\tau_A-\sigma\tau_B)$$
$$(2-\gamma)g\ln(m_A+(2-\sigma)\kappa_A\tau_A)+(2-\gamma)(1-g)\ln(1-\tau_A)+\gamma g\ln(m_B+\sigma\kappa_B\tau_B)+\gamma(1-g)\ln(1-\tau_B).$$

From the first-order conditions for the union's central bank with respect to (m_A, m_B), we have that the resources allocated to the public good in each country are given by:

$$\Gamma_A = m_A + (2-\sigma)\kappa_A\tau_A = (2-\gamma)\frac{g\theta}{1-g+g\theta}, \Gamma_B = m_B + \sigma\kappa_B\tau_B = \gamma\frac{g\theta}{1-g+g\theta}.$$

Notably, such an allocation to the public good provision coincides with the solution for optimal union-wide monetary policy with no fiscal system, which implies lower money growth in the monetary union in the presence of a fiscal system than in its absence. The national fiscal authority provide for some of the resources necessary for optimal provision of the public good.

Suppose that fiscal policy is under the control of national governments. Seeking τ_A (alternatively, τ_B) to maximize U_A (alternatively, U_B) leads to first-order conditions, which

once the results above for optimum monetary policy have been used may be simplified as follows:

$$\frac{1}{2-\sigma}\frac{1}{1-\tau_A} - \frac{1}{2-(2-\sigma)\tau_A - \sigma\tau_B} = \frac{\kappa_A(1-g+g\theta)}{(1-g)\theta}\left[\frac{1}{2-\gamma} - \frac{1}{2}\right]; \tag{26}$$

$$\frac{1}{\sigma}\frac{1}{1-\tau_B} - \frac{1}{2-(2-\sigma)\tau_A - \sigma\tau_B} = \frac{\kappa_B(1-g+g\theta)}{(1-g)\theta}\left[\frac{1}{\gamma} - \frac{1}{2}\right]. \tag{27}$$

It is straightforward to establish conditions under which feasible optimum national tax rates exist. In view of the fact that Eq. (26–27) are quadratic functions, we note that in general there exist two sets of solutions. At any rate, the optimal tax rates of both countries are simultaneously determined.

Manipulation of Eq. (26–27) yields:

$$\frac{1}{2-\sigma}\frac{1}{1-\tau_A} - \frac{1}{\sigma}\frac{1}{1-\tau_B} = \frac{1-g+g\theta}{2(1-g)\theta}\left[\kappa_A\frac{\gamma}{2-\gamma} - \kappa_B\frac{2-\gamma}{\gamma}\right].$$

Numerous comparative dynamics results are possible. E.g., suppose that the fiscal systems of the two countries are equally efficient, $\kappa_A = \kappa_B$. Then the sign of the LHS above is positive (negative) if $\gamma < (>)1$, that is if country B is given less weight in setting monetary policy for the monetary union. Also, suppose that country B is also smaller, that is $\sigma < 1$. Then it follows that country A, the larger of the two, pays a higher tax rate. The condition above also implies that, other things being equal, the optimal tax rate of the country with a more efficient tax system would be higher. The above result allows us to explore what is implied for national optimal tax rates by the finding of Cassella's (1992), that the smaller country must be given more than proportional (to its population share) representation in order to voluntarily participate in a monetary union. Imposing the condition that $\gamma > \sigma$ constrains the relationship between the two respective taxes rates, country sizes and efficiencies of tax systems.

We conclude by emphasizing the fact that this simple theory shows that even though national fiscal authorities are entrusted with setting national fiscal policy, monetary union introduces profound interdependence which makes the country-specific optimal tax rates depend on the sizes of both countries as well as the efficiency of their tax systems. The result follows from a skeletal model, where countries differ only with respect to their sizes.

Notably, the model does not allow for debt financing. Nonetheless, debt financing is trivially easy to introduce in the overlapping generations model of the present paper, ala Samuelson–Diamond if the economy is dynamically inefficient.

This paper revisits the question of the role of weights that countries of different sizes are assigned in the setting of monetary policy for a monetary union, in the context of presence of national fiscal systems. Such systems are assumed to be balanced, and public goods in each member of the monetary union are financed by a combination of seignorage and tax revenue. The most important conclusion is that the financial interdependence among economies of country-members of a monetary union spills over into national tax rates. Under the assumption that national tax rates are decided democratically within each country, supranational considerations in setting union-wide monetary policy complicate questions of democratic accountability.

As is well known, a series of treaties binding EU and EZ member countries have established weights for different types of decisions, that vary monotonically with country populations but are not proportional to them. See Figure 1. Germany has the largest weight and Malta the smallest by a ratio of 10 to 1 or so, which is a lot less than than the ratio of their populations, which is roughly 160 to 1. There are also numerous other aspects of collective decision making in the EU that confer virtual veto power to individual members. For example, at Poland's insistence, the new treaty allows that at the wish of a single member to revert to old Nice Treaty rules. The Lisbon Treaty more power to smallest states and Germany; Spain, Poland and middle-sized states appear to be biggest losers.

We have already discussed above the Treaty on Stability, Coordination and Governance in the Economic and Monetary Union, which was signed March 2, 2012 (by all EZ members, and all other EU members, except the UK and Czech Republic), took effect January 1, 2013. This treaty strengthens Stability and Growth Pact and provides for rules for coordination and oversight over the national fiscal policies. One should look into the details in order to determine how different countries' sizes matter. Roughly speaking, this treaty provides for the following important matters. A *Balanced budget rule* constrains "annual structural deficit" at less 0.5% GDP (if debt as a share of GDP <60%, and a structural deficit at most

of 1%. A *Debt brake rule* is instituted, if debt $>$ 60% GDP, which requires reducing it at an average annual rate of at least one twentieth (5%) of the exceeded percentage points. An *Automatic correction mechanism* states that If a country is not compliant with balanced budget, or debt brake rules, the automatic correction mechanism is to be triggered. This is to be defined individually by each state, and should comply with a respective EU directive. Also, the treaty institutes National Fiscal Advisory Councils, so as to make fiscal policy setting more in line with monetary policy setting and ensure national monitoring of observance. It also institutes debt issuance coordination, for "better coordination and planning." Finally, requirements are strengthened for countries to comply with need for policies for improving competitiveness, employment and financial stability.

4 The United States versus the Eurozone

It is interesting to see how this new treaty will play out in the years to come. Still, it is important to carry out a rough comparison with the US. First and foremost, the EZ lacks discretionary union-wide macroeconomic policy tools and its fiscal tools are essentially ly national. However, there exist spillovers among EZ and EU and non EZ countries that do require macro policy coordination. In that vein, one could interpret emergency response as discretionary macro policy. Similarly, US government assistance to US states in distress in the past provide cases in point. We return to this matter further below. Figures 2 and provide an interesting contrasts between the EU/EZ versus the US at a glance. Notably, transfers within the US fiscal union vary widely: the minimum one is for New Jersey, 0.61$ is spent by the US, per $ of US taxes; the maximum is for New Mexico, 2.06$ per $ of US taxes. Moreover, federal taxes minus federal spending over 1990–2009 as a share of 2009 state GDP were lowest for New Mexico, -261%, and and highest for Delaware, 206%. See Figure 3, from Reinhardt (2012). Carlino and Inman (2013) show that due to interstate spillovers states can increase their own state employment by increasing their own deficits. By defining spillovers to employment in neighboring states in terms of common cyclical patterns among state economies, they show that for large states, aggregate spillovers to its

economic neighbors are approximately two-thirds of the large state's job growth. There is ample potential for actively coordinating the management of stabilization policies. They also find evidence evidence of a negative impact on state jobs when these deficits are scheduled for repayment.

The US experience provides additional lessons for the EZ and for the Future EU Architecture. Alexander Hamilton (1755–1804) let the US assume the states debt (incurred during the revolutionary period and clearly understood the need for the US to have *US tax revenue*, in order for US to borrow. US states that had spent on infrastructure, such as on canals and roads, defaulted in mid-1800s. This episode has had long-run consequences. E.g., England is still still trying to collect from Mississippi. See Figure 4, from Wallis ????. This US experience shows that the US federated nation creation needs EZ-wide tax revenue, in order to me able to borrow via Eurobonds. It also shows that US ederated states' defaults have long-lasting spillovers. Canadian provinces incurred large spreads in the 19th cent, but they were able to go back to markets. As Wallis says: "There is nothing wrong with raising taxes to support government services that voters want and are willing to pay for." But, governmental structures are needed "so that both voters and legislatures are forced to make decisions about taxing, spending, and borrowing simultaneously."

5 Concluding Remarks

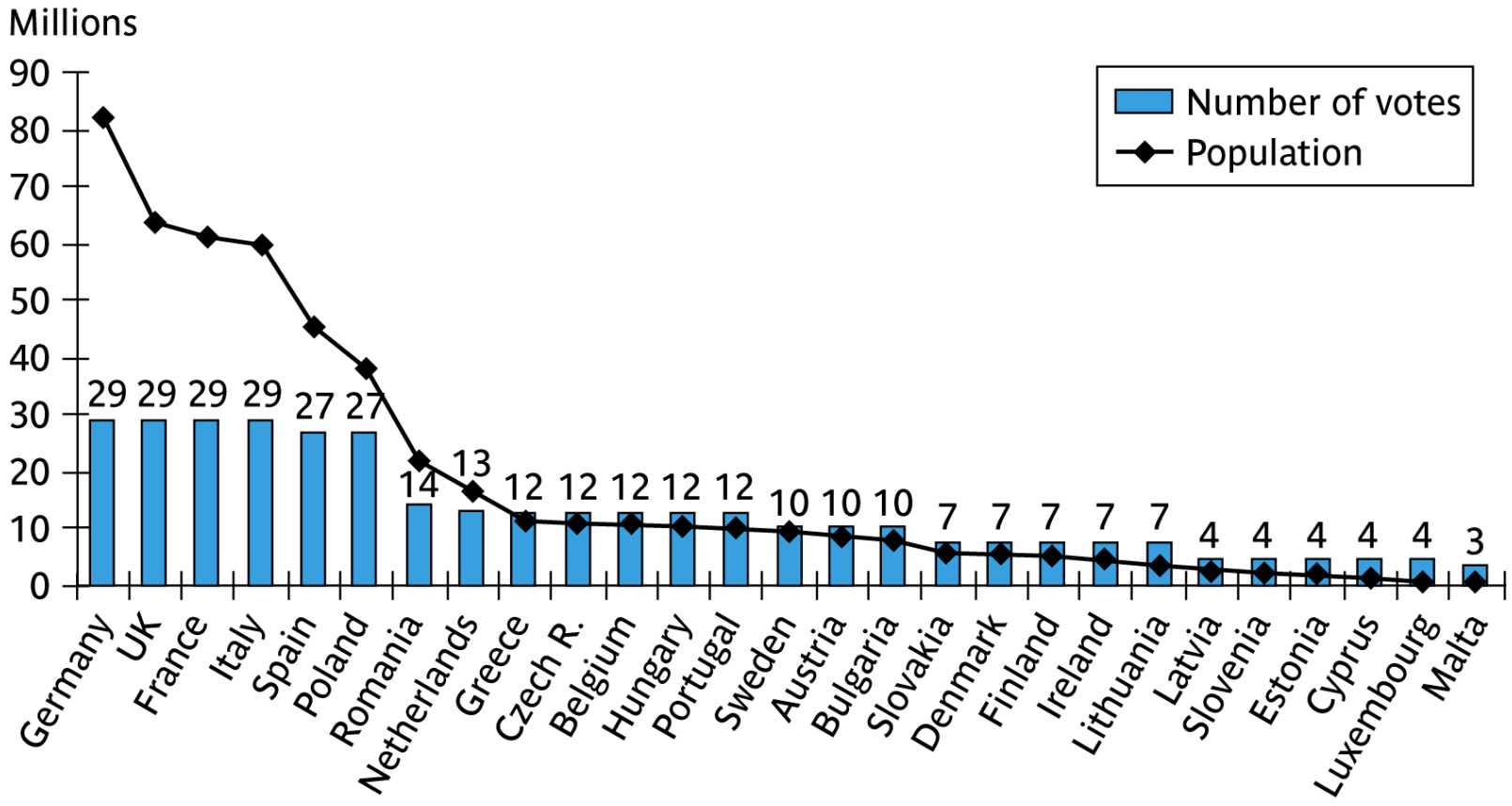
In view of the evidence provided by Wallis and our daily experience with the EZ sovereign debt crisis, the difficulties of the present are not incompatible with our experiencing the infancy period of a nascent federated state in Europe. In numerous ways that have been documented widely, the EZ is made up of very diverse countries. E.g, in a stunning calculation, reported by J. P. Morgan (2012), the major countries of the EZ are more diverse than the East Asian Tigers, the UK and its English speaking offshoots, and even countries whose names begin with the letter "M"! In spite of such diversity, catastrophic wars among the core European countries, that have fought many vicious conflicts over the last few years, have been prevented. Given this political success, there is vast scope for coming to terms

with the international coordination that is necessary to carry out fiscal policy that operated along with monetary policy and is designed to optimize outcomes over the entire union. The present paper provides a narrow glimpse at the role of size in the interdependence of broad macroeconomic aggregates. It is the simplest way to account for the democratic deficit in macroeconomic policy setting across the country-members of a monetary union. The mechanism for setting country-specific fiscal policy may be enriched in order to account for other dimensions of how different parties gain and lose from macroeconomic policy. The issues emphasized in this paper may be examined fruitfully in much more general settings, such as that of Farhi and Werning (2012), where, for example, fiscal policy may function as an insurance device when shocks are asymmetric. Fortunately, a burgeoning literature is now emerging on this important topic.

List of Figures

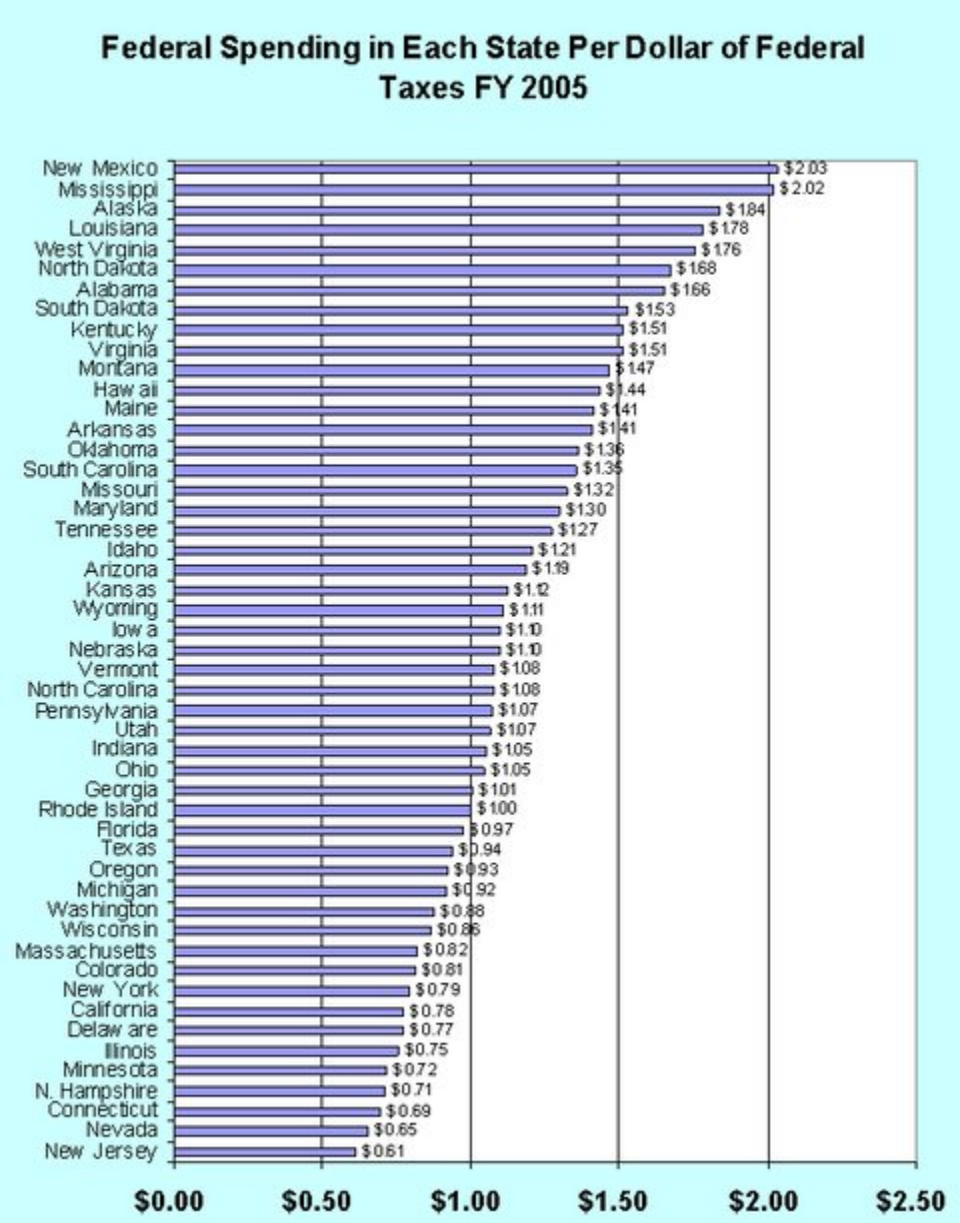
- Figure 1. "Economical View of Decision-Making." Chapter 3, Baldwin and Wyplosz (2012).
- Figure 2. "EU/EZ vs. US Union at a Glance." Author's.
- Figure 3. "Federal Spending in Each State per Dollar of US Tax." 2005. Reinhardt (2012).

Economical view of decision-making



	US	EU/EZ
Fiscal policy	Federal	National
Federal Budget	24% GDP	1% balanced
countercycl. transfers	e.g., unempl. insurance	??
as automatic stabilizers		??
State/local budgets	23% GDP balanced	can borrow
State/local borrowing subsidized	yes	in crisis
State/local borrowing subsidized	lower interest	higher interest
Total public sector	41% GDP	50% GDP
Monetary policy	Federal	ECB/NCBs

Figure 2


Federal Spending in Each State Per Dollar of Federal Taxes FY 2005
New Mexico $2.03
Mississippi $2.02
Alaska $1.84
Louisiana $1.78
West Virginia $1.76
North Dakota $1.68
Alabama $1.66
South Dakota $1.53
Kentucky $1.51
Virginia $1.51
Montana $1.47
Hawaii $1.44
Maine $1.41
Arkansas $1.41
Oklahoma $1.36
South Carolina $1.35
Missouri $1.32
Maryland $1.30
Tennessee $1.27
Idaho $1.21
Arizona $1.19
Kansas $1.12
Wyoming $1.11
Iowa $1.10
Nebraska $1.10
Vermont $1.08
North Carolina $1.08
Pennsylvania $1.07
Utah $1.07
Indiana $1.05
Ohio $1.05
Georgia $1.01
Rhode Island $1.00
Florida $0.97
Texas $0.94
Oregon $0.93
Michigan $0.92
Washington $0.88
Wisconsin $0.86
Massachusetts $0.82
Colorado $0.81
New York $0.79
California $0.78
Delaware $0.77
Illinois $0.75
Minnesota $0.72
N. Hampshire $0.71
Connecticut $0.69
Nevada $0.65
New Jersey $0.61
$0.00
$0.50
$1.00
$1.50
$2.00
$2.50

6 References

Baldwin, Richard, and Charles Wyplosz. 2011. *The Economics of European Integration.* McGraw-Hill, fourth edition.

Calmfors, Lars and Simon Wren Lewis, 2011, "What Should Fiscal Councils Do?" *Economic Policy*, 26, pp. 649-695.

Carlino, Gerald A. and Robert P.Inman. 2013. "Local Deficits and Local Jobs: Can US States Stabilize their Own Economies?" *Journal of Monetary Economics.* 60:517–530.

Casella, Alessandra. 1992. "Participation in a Currency Union." The American Economic Review, 82(4):847–863.

ECB 2009. "Rotation of Voting Rights in the Governing Council of the ECB." *Monthly Bulletin*, July. 91–99. http://www.ecb.int/pub/pdf/other/mb200907_pp91-99en.pdf

Farhi, Emmanuel, and Ivan Werning. 2012. "Fiscal Unions." Working paper, MIT.

IMF Staff. "The Functions and Impacts of Fiscal Councils." July 2013.

http://www.imf.org/external/np/pp/eng/2013/071613.pdf

J. P. Morgan. 2012. "Europe and the Road Less Traveled." *Eye on the Market.* May 2.

Reinhardt, Uwe E. 2012. "How Richer States Finance Poorer Ones." New York Times, April 27. http://economix.blogs.nytimes.com/2012/04/27/how-richer-states-finance-poorer-ones/

Sibert, Anne. 1992. "Government Finance in a Common Currency Area." *Journal of International Money and Finance.* 11():567–578.

Wallis, John J., Richard Sylla, Arthur Grinath III. 2004. "Sovereign Default and Repudiation: The Emerging-Market Debt Crisis in U.S. States, 1839–1843." NBER Working Paper 10753 http://www.nber.org/papers/w10753.