Tax Bloc Formation among Leviathans

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Abstract

Stable "blocs" of countries are characterized, in a simple model of tax competition for mobile (physical) capital. Here a bloc is defined as a group of countries which agree to set a common (source–based) tax rate on capital. Different blocs behave non–cooperatively in setting tax rates. Although the stable outcome may not be for all countries to coalesce into one bloc, any stable outcome can have at most two distinct blocs.

Question

Why are there so many tax havens?

This paper does NOT provide an answer to that question ;

it provides a very simple model of tax competition, and coalition formation, in which very few (one or zero) tax havens exist in any stable outcome

assumptions

physical capital, not portfolio [ie the return to capital is taxed in the country in which production takes place]

fixed aggregate (world) supply of capital

quadratic production function

governments care only about tax revenue

no side payments among countries in a coalition (hence the term “bloc”)

no serious modelling of coalition formation game (much less serious than done by Burbidge et al in 1997 AER)

4 main results

1. for a given bloc structure, everything depends on a single “concentration index”, a function of the size distribution of the blocs

2. if bloc i is larger than bloc j, then bloc i will gain from a merger of the two blocs

3. if a bloc structure contains more than 2 blocs, then at least one pairwise merger of blocs will benefit both parties to the merger

4. the “likely” stable outcome is one very large bloc (and maybe another smaller bloc)

The Model

Wilson–Zodrow–Mieszkowski capital tax competition model except that

1. game is played by (a finite number of) **blocs** of countries, not (necessarily) single countries

2. blocs care only about their tax revenue, not about residents' private good consumption

3. quadratic production function [homogeneous output per (immobile) worker as a function of capital employed per worker]

Confiscation of the Return to Capital

With fixed aggregate capital stock, and governments which want to maximize tax collections :

a “coalition of the whole” [a bloc consisting of all the countries together] would want to confiscate all capital earnings

[But I do assume that capital owners can withhold capital if the tax rates were so high that the net return were negative.

assumption 3 in the paper, that

$$a \geq \frac{(2 - s_i)(1 + s_i)}{3s_i(1 - s_i)} b\bar{k}$$

for any **country** i's share s_i of population, ensures that tax rates will never be set this high, no matter what the bloc structure]

The Free–Rider Problem

There are strategic advantages to being a small country outside any bloc in this model.

Undercutting the high taxes of the big blocs can give a small country a very high tax base per capita.

These free–rider incentives get stronger, the better coordination is among other countries :

more “concentration” of the rest of the world leads to higher taxes in the rest of the world,

raising the payoff to undercutting in the small countries.

Nonetheless : large blocs will tend to form, and to stay together, in this model.

Tax Competition Equilibrium

under assumption 3, if there are 2 or more blocs playing the tax competition game, then there is a unique Nash equilibrium to that game, in which the world net return to capital ρ is strictly positive

the return is determined by the "concentration index"

$$\zeta \equiv \sum_{i=1}^{M} \frac{s_i}{2 - s_i}$$

where there are $2 \leq M \leq N$ blocs, and where s_i is the share of population in bloc i

limits : $\zeta = 1$ when there is just one bloc ("coalition of the whole") ; $\zeta = \frac{1}{2}$ if there is an infinite number of infinitessimal blocs

Tax Competition Equilibrium (continued)

average tax rate : $\bar{t} = \frac{\zeta}{1-\zeta} b\bar{k}$

return to capital : $\rho = a - \frac{1}{1-\zeta} b\bar{k}$

$$t_i = \frac{1}{(2-s_i)(1-\zeta)}$$

tax revenue per capita in bloc i :

$$\pi_i = \frac{1-s_i}{b(2-s_i)^2(1-\zeta)^2}$$

implications :

Prop. 2 : in a given bloc structure, smaller blocs have bigger payoffs

The Incentives to Merge

Prop. 3 : any merger will raise ζ, and thus benefit blocs which didn't merge

LEMMA 5 : The total payoff to $i \cup j$ is higher than i's payoff plus j's payoff (when the other blocs in the bloc structure don't change).

but no side payments are allowed here : I'm assuming that $i \cup j$'s payoff must be divided among constituent countries of $i \cup j$ in proportion to their population

THEOREM 1 : If $s_i \geq s_j$, then constituent countries of bloc i gain from a merger of blocs i and j.

but the smaller party may lose from a merger (without side payments)

An Example of a Small Bloc Losing from a Merger

s_1	s_2	s_3
0.55	0.40	0.05

merger of #2 with #3 lowers payoff to (former) bloc #3

modified example : if $s_i = 0.40$ and $s_j = 0.5$, then j loses from merger with i

no matter how the remaining 55% of the world's population is aligned

this result follows from the example above, and from

THEOREM 2 : a merger between blocs k and m, makes a merger between blocs i and j more attractive to i and j

The Main Result

THEOREM 3 : If $M > 2$, then there is some mutually beneficial pairwise merger.

so (for example), a blocs 1 and 2 would gain from merger, in the example above

Stable Bloc Structures

(definition) : a bloc structure is a partition of the N countries into $M \leq N$ blocs

my definition of stability : a bloc structure is stable if a there is no merger of 2 or more of the blocs, which benefits all of the merging blocs ; b there is no secession by a "sub–bloc" of some bloc B, which benefits the seceding sub–bloc (when all the other blocs in the bloc structure stay the same, and when the sub–bloc's complement in B stays together)

THEOREM 4: Using the above definition of stability, the only stable bloc structures have 1 or 2 blocs.

(follows almost immediately from Theorem 3)

Other People's Notions of Stability

Hart and Kurz (1983) : two definitions of stability

γ version : groups considering deviation from a bloc structure assume that their complements dissolve into singletons

δ version : groups considering deviation from a bloc structure assume that their complements stay together

e.g. : $\mathcal{P} = (\{1,2,4,5,6\},\{3,7,8\},\{9,10\})$ and countries 1,2 and 3 are considering forming their own bloc

under γ conjectures : their deviation leads to $(\{1,2,3\},\{4\},\{5\},\{6\},\{7\},\{8\},\{9,10\})$

under δ conjectures : their deviation leads to $(\{1,2,3\},\{4,5,6\},\{7,8\},\{9,10\})$

γ–stable : no deviation by a group of countries which benefits all of the group, under γ conjectures

δ–stable : no deviation by a group of countries which benefits all of the group, under δ conjectures

note : γ conjectures are (sort of) the same as the "strict unanimity" rule of Burbidge et al (AER, 1997) ; δ conjectures are (sort of) the same as the "similarity" rule in Burbidge et al

Bloch (*Games & Econ B, 1995*) : no side payments, "Rubinstein–like" game of countries sequentially proposing blocs, and prospective members of proposed blocs then either accepting or rejecting–and–counterproposing

Relations Among Stable Structures

$\Sigma \equiv$ set of strongly stable bloc structures (my definition)

$\Gamma \equiv$ set of γ stable bloc structures ; $\Delta \equiv$ set of δ stable bloc structures

$\Xi_u \equiv$ set of (Burbidge et al) coalition proof Nash equilibria under the strict unanimity rule ; $\Xi_s \equiv$ set of (Burbidge et al) CPNEs under the similarity rule

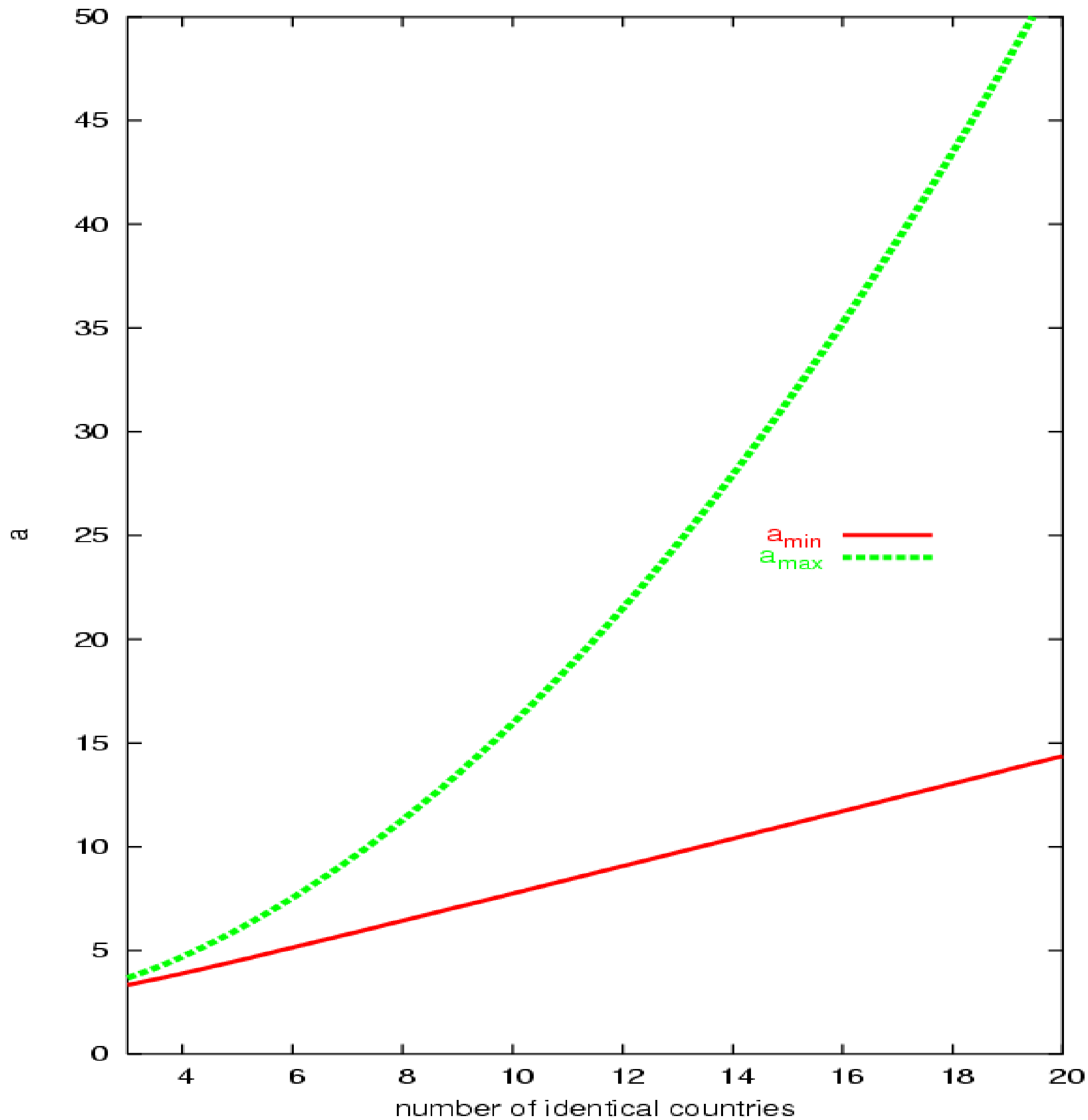
$\Upsilon \equiv$ set of subgame perfect Nash equilibria to Bloch's game

$$\Upsilon \supset \Gamma \supset \Delta = \Sigma$$

$$\Xi_u \supset \Gamma \supset \emptyset \qquad \Xi_s \supset \Delta$$

with all inclusions strict (at least for some examples)

Figure 1



50
45
40
35
30
25
20
15
10
5
0
a
4
6
8
10
12
14
16
18
20
number of identical countries
a_{min}
a_{max}

examples : Identical Countries

($b = 1, \bar{k} = 1$)

i $N = 12, a = 20$ no δ stable bloc structure

partition	Π_1	Π_2	Π_2	$\bar{t}$
$(\{1, 2, 3, \ldots, 12\})$	19.00	na	na	19.00
$(\{1, 2, 3, \ldots 10\}, \{11, 12\})$	3.23	6.53	na	4.13
$(\{1, 2, 3, \ldots 11\}, \{12\})$	5.82	20.48	na	8.06
$(\{1, 2, \ldots, 10\}, \{11\}, \{12\})$	3.10	6.32	6.32	4.03
$(\{1\}, \{2\}, \{3\}, \ldots, \{12\})$	1.09	1.09	1.09	1.09

ii $N = 10, a = 15$ 2–bloc stable structure

partition	Π_1	Π_2	Π_2	$\bar{t}$
$(\{1, 2, 3, \ldots, 10\})$	14.00	na	na	19.00
$(\{1, 2, 3, \ldots 8\}, \{9, 10\})$	2.81	5	na	3.50
$(\{1, 2, 3, \ldots 9\}, \{10\})$	5.95	14.94	na	6.74
$(\{1, 2, \ldots, 8\}, \{9\}, \{10\})$	2.67	4.79	4.79	3.38
$(\{1\}, \{2\}, \{3\}, \ldots, \{10\})$	1.11	1.11	1.11	1.11