Towards a theory of

NON-TERRITORIAL INTERNAL EXIT

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The paper in a slide

This is about *crypto*secession and the limits of taxation

A model of partial, non-territorial internal exit

Competitive dynamic between incumbent and potential governments in non-territorial political systems

Fiscal exploitation is reduced (and eventually eliminated) as capability to move to non-territorial jurisdictions increases

Citizen opacity vs. govt. legibility $\Leftrightarrow$ fiscal exploitation vs. equivalence

The spectre of cryptoanarchy

A spectre is haunting the modern world, the spectre of crypto anarchy. Computer technology is on the verge of providing the ability for individuals and groups to communicate and interact with each other in a totally anonymous manner. The State will of course try to slow or halt the spread of this technology, citing national security concerns, use of the technology by drug dealers and tax evaders, and fears of societal disintegration. Many of these concerns will be valid.

Timothy C. May, *The Crypto Anarchist Manifesto* (1992)

Secession and the limits of taxation

Buchanan & Faith (1987) in the *American Economic Review*

Problem of public economics ⟺ allocative efficiency in public goods

Free rider problem ⟺ underprovision ⟺ centralised (monopoly)

Exploitation problem ⟺ overprovision ⟺ competitive + internal exit

Internal exit (secession) ⟺ jurisdictions formation + limits exploitation

Today bitcoin-blockchain-crypto technologies provide the platform for their theory of internal exit to play out

Basic internal exit model

Sharing coalition extract fiscal surplus (net transfers)

Non-sharers net losers of political process ⟺ potential for secession

Public good must be provided for any private production to take place

Non-discriminatory, proportional income tax levied on all citizens

Minimum (non-exploitative) tax rate equals average cost of public good

Sharing coalition uses its power to tax above non-exploitative rate and transfer fiscal surplus to sharers in equal proportions

Secession

The main constraint to fiscal exploitation is 'liberty of secession'

Non-sharers can secede without cost but *must* then finance and provide the public good themselves (if they are to produce private income)

Threat of secession (and extent of fiscal exploitation) determined by

- cost function for public good
- private product function for citizens

Both are a function of size

- cost of public good typically decreases (or constant)
- private product typically increases (or constant)

Outline of the *B&F* model

Community of K people

Individual private product, or income, of $g(K)$

Public good cost function $f(K)$ where $f'(K) \geq 0$

Community income sufficient to finance public good $Kg(K) > f(K)$

Fiscal surplus (transfer) $T = tKg(K) - f(K)$

Non-exploitative tax rate $t_0(K) = f(K) / Kg(K)$ covers cost with no surplus

Post-tax incomes

Non-sharer post-tax income $P = g(K)(1 - t)$

Sharing coalition of M people

Sharer post-tax income $B = g(K)(1 - t) + T / M$

Remaining $S = N - M$ citizens are potential seceders

Seceders set a non-exploitative tax rate $t_0(S) = f(S) / Sg(S)$

Seceder post-tax income $P(S) = g(S) - f(S)) / S$

Set the secession-proof tax rate

Secession-proof tax rate t^* maximises post-tax net income of sharers without inducing secession of non-sharers

At equilibrium, secessionists are indifferent between leaving and receiving $P(S)$ or remaining and receiving $P^*(N)$

$$P^*(N) = P(S) \Leftrightarrow g(N)(1 - t^*) = g(S) - f(S)) / S$$

$$t^* = (g(N) - g(S)) / g(N) + f(S) / Sg(N)$$

Then calculate tax rate, transfers, and payoffs for various assumptions about scale economies (public) and agglomeration economies (private)

Recap of basic internal exit

Trade-off smaller incomes in smaller polities (but with smaller tax costs) versus larger incomes in larger polities (and larger tax costs)

Sharers set the secession-proof tax rate that maximises their post-tax post-transfer income

Non-sharers must accept 'optimal exploitation' since secession only reduces their post-tax income

This is the main finding of *B&F*: secession limits over-taxation and exploitation (but does not eliminate it)

Changes to internal exit model

Internal exit model: remain in original polity as sharer or non-sharer or secede to new polity as non-sharer

Crypto exit model: partially cryptosecede as non-sharer while remaining in original polity and appear to have lower income

Citizens pay for order in their polity ⟺ only trade among themselves

Cryptoseceders pay for order in new polity ⟺ still trade with everyone

They retain citizenship in original polity—and access to the larger market for private product—but appear to have lower income, and thus pay lower taxes

Cryptosecession coefficient

Cryptosecession is partial exit

β is the portion of income behind veil of cryptography, while $\alpha = 1 - \beta$ is the 'state accessible product' that remains

With perfect 'crypto infrastructure' $\beta \rightarrow 1$, but more likely $0 < \beta < 1$

β represents the state of crypto technology, or more accurately, the *relative* development of technologies of citizen opacity vs. state legibility

So what changes?

Solve to find the secession-proof *and* cryptosecession-proof tax rates

1. Since players can now use cryptosecession as a means of escaping fiscal exploitation, the secession-proof condition will be changed

   $\Rightarrow$ Secession-proof rate is lower compared to internal exit model

2. The incentive to cryptosecede persists at the secession-proof rate

   $\Rightarrow$ Cryptosecession-proof rate is lower too

Both the secession-proof and cryptosecession-proof tax rates decrease as the cryptosecession coefficient increases

Equilibrium tax rates

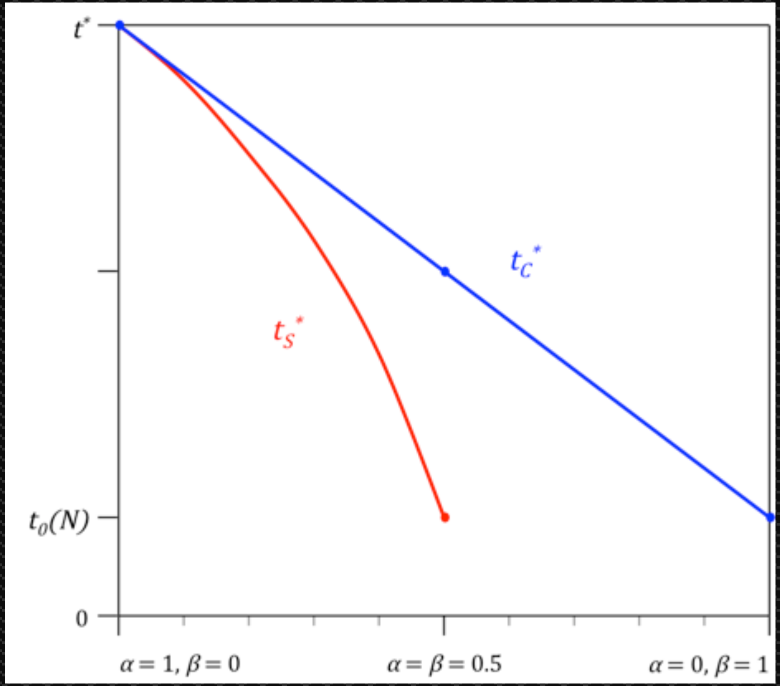
New secession-proof tax rate with the capability to cryptosecede is $t_s^* = ((\alpha-\beta) / \alpha)\ t^* + (\beta / \alpha)\ t_0(N)$

As $\beta \to 1$, $t_s^* \to t_0(N)$ and the outcome converges on fiscal equivalence

At $\beta = \alpha$ non-exploitation $t_s^* = t_0(N)$

Cryptosecession-proof tax rate

$t_c^* = \alpha\ t^* + \beta\ t_0(N)$



Sharers must reduce taxing proclivity from old optimally exploitative t^* towards non-exploitative $t_0(N)$ in respect of crypto capability of citizens β

Crypto undermines secession

If the secession-proof tax rate is breached no potential seceder will maintain any stake in the original polity

But even at secession-proof rate there is incentive to reduce tax burden by conducting economic activity behind the veil of cryptography

And even at an over-exploitative tax rate non-sharers might decide not to formally secede, and rather cryptosecede from within a unitary state

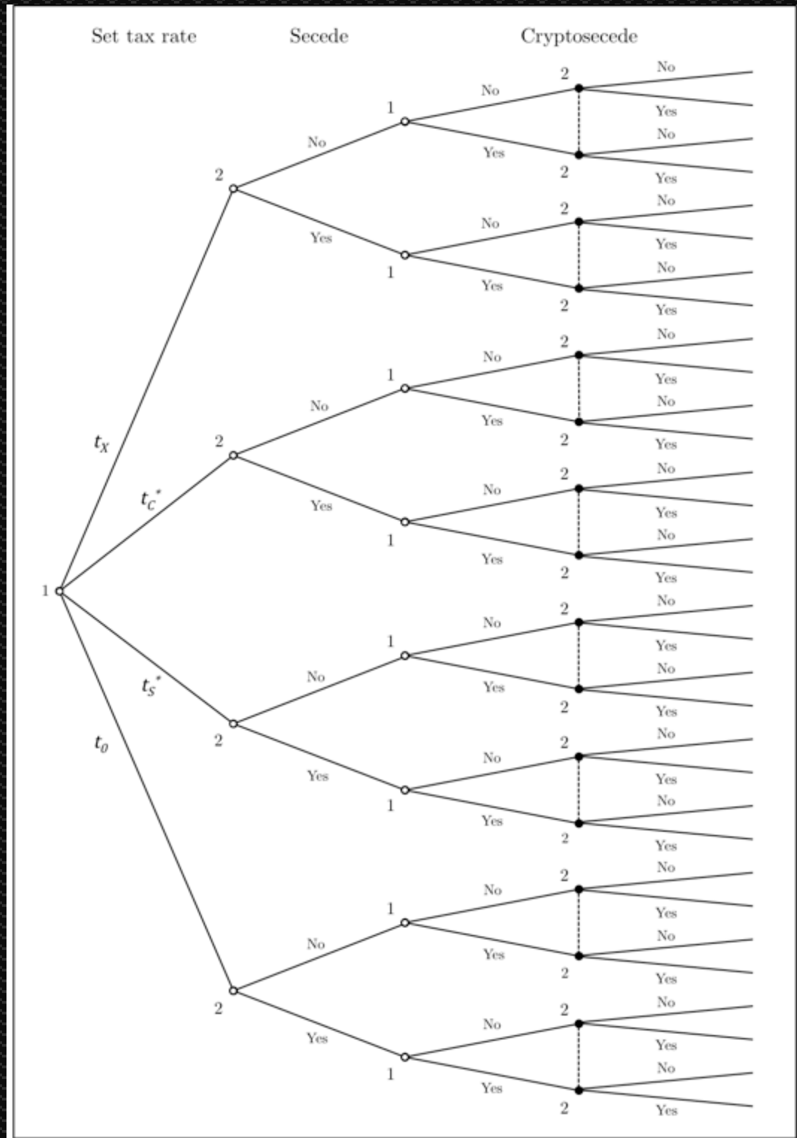
Capacity to cryptosecede undermines the secession-proof condition if payoffs are larger by cryptoseceding from within a unitary polity

The cryptosecession game

1. Sharers: set tax rate t_x, t_s, t_c, or t_0
2. Non-sharers: secede or not
3. Both players simultaneously: cryptosecede or not

Eight simultaneous-move subgames for the third decision point

Then backward induction over first two decision points



Top half of the decision tree

Non-sharers

Sharers	No crypto	Yes crypto
No crypto	$\Pi^1 = (1 - t_x)g(N) + \frac{t_x N g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_x)g(N)$	$\Pi^1 = (1 - t_x)g(N) + \frac{t_x(M + \alpha S)g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_x)\alpha g(N) + (1 - t_0(S))\beta g(S)$
Yes crypto	$\Pi^1 = (1 - t_x)\alpha g(N) + \big(1 - t_0(M)\big)\beta g(M) + \frac{t_x(\alpha M + S)g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_x)g(N)$	$\Pi^1 = (1 - t_x)\alpha g(N) + \big(1 - t_0(N)\big)\beta g(N) + \frac{t_x \alpha N g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_x)\alpha g(N) + \big(1 - t_0(N)\big)\beta g(N)$

Normal-form subgame 1: Over-exploitative $\boldsymbol{t_X}$ and no secession

Non-sharers

Sharers	No crypto	Yes crypto
No crypto	$\Pi^1 = \big(1 - t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - t_0(S)\big)g(S)$	$\Pi^1 = \big(1 - t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - 2t_0(S)\big)g(S)$
Yes crypto	$\Pi^1 = \big(1 - 2t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - t_0(S)\big)g(S)$	$\Pi^1 = \big(1 - t_0(M)\big)\alpha g(M) + \big(1 - t_0(N)\big)\beta g(N)$ $\Pi^2 = \big(1 - t_0(S)\big)\alpha g(S) + \big(1 - t_0(N)\big)\beta g(N)$

Subgame 2: Over-exploitative $\boldsymbol{t_X}$ and secession

Non-sharers

Sharers	No crypto	Yes crypto
No crypto	$\Pi^1 = (1 - t_C^*)g(N) + \frac{t_C^* N g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_C^*)g(N)$	$\Pi^1 = (1 - t_C^*)g(N) + \frac{t_C^*(M + \alpha S)g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_C^*)\alpha g(N) + (1 - t_0(S))\beta g(S)$
Yes crypto	$\Pi^1 = (1 - t_C^*)\alpha g(N) + \big(1 - t_0(M)\big)\beta g(M) + \frac{t_C^*(\alpha M + S)g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_C^*)g(N)$	$\Pi^1 = (1 - t_C^*)\alpha g(N) + \big(1 - t_0(N)\big)\beta g(N) + \frac{t_C^* \alpha N g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_C^*)\alpha g(N) + \big(1 - t_0(N)\big)\beta g(N)$

Subgame 3: Cryptosecession-proof $\boldsymbol{t_C^*}$ and no secession

Non-sharers

Sharers	No crypto	Yes crypto
No crypto	$\Pi^1 = \big(1 - t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - t_0(S)\big)g(S)$	$\Pi^1 = \big(1 - t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - 2t_0(S)\big)g(S)$
Yes crypto	$\Pi^1 = \big(1 - 2t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - t_0(S)\big)g(S)$	$\Pi^1 = \big(1 - t_0(M)\big)\alpha g(M) + \big(1 - t_0(N)\big)\beta g(N)$ $\Pi^2 = \big(1 - t_0(S)\big)\alpha g(S) + \big(1 - t_0(N)\big)\beta g(N)$

Subgame 4: Cryptosecession-proof $\boldsymbol{t_C^*}$ and secession

Bottom half of the decision tree

Non-sharers

Sharers	No crypto	Yes crypto
No crypto	$\Pi^1 = (1 - t_S^*)g(N) + \frac{t_S^* N g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_S^*)g(N)$	$\Pi^1 = (1 - t_S^*)g(N) + \frac{t_S^*(M + \alpha S)g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_S^*)\alpha g(N) + (1 - t_0(S))\beta g(S)$
Yes crypto	$\Pi^1 = (1 - t_S^*)\alpha g(N) + \big(1 - t_0(M)\big)\beta g(M) + \frac{t_S^*(\alpha M + S)g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_S^*)g(N)$	$\Pi^1 = (1 - t_S^*)\alpha g(N) + \big(1 - t_0(N)\big)\beta g(N) + \frac{t_S^* \alpha N g(N) - f(N)}{M}$ $\Pi^2 = (1 - t_S^*)\alpha g(N) + \big(1 - t_0(N)\big)\beta g(N)$

Subgame 5: Optimally exploitative $\boldsymbol{t_S^*}$ and no secession

Non-sharers

Sharers	No crypto	Yes crypto
No crypto	$\Pi^1 = \big(1 - t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - t_0(S)\big)g(S)$	$\Pi^1 = \big(1 - t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - 2t_0(S)\big)g(S)$
Yes crypto	$\Pi^1 = \big(1 - 2t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - t_0(S)\big)g(S)$	$\Pi^1 = \big(1 - t_0(M)\big)\alpha g(M) + \big(1 - t_0(N)\big)\beta g(N)$ $\Pi^2 = \big(1 - t_0(S)\big)\alpha g(S) + \big(1 - t_0(N)\big)\beta g(N)$

Subgame 6: Optimally exploitative $\boldsymbol{t_S^*}$ and secession

Non-sharers

Sharers	No crypto	Yes crypto
No crypto	$\Pi^1 = (1 - t_0(N))g(N)$ $\Pi^2 = (1 - t_0(N))g(N)$	$\Pi^1 = (1 - t_0(N))g(N)$ $\Pi^2 = (1 - t_0(N))\alpha g(N) + (1 - t_0(S))\beta g(S)$
Yes crypto	$\Pi^1 = (1 - t_0(N))\alpha g(N) + \big(1 - t_0(M)\big)\beta g(M)$ $\Pi^2 = (1 - t_0(N))g(N)$	$\Pi^1 = (1 - t_0(N))g(N)$ $\Pi^2 = (1 - t_0(N))g(N)$

Subgame 7: Non-exploitative $\boldsymbol{t_0}$ and no secession

Non-sharers

Sharers	No crypto	Yes crypto
No crypto	$\Pi^1 = \big(1 - t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - t_0(S)\big)g(S)$	$\Pi^1 = \big(1 - t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - 2t_0(S)\big)g(S)$
Yes crypto	$\Pi^1 = \big(1 - 2t_0(M)\big)g(M)$ $\Pi^2 = \big(1 - t_0(S)\big)g(S)$	$\Pi^1 = \big(1 - t_0(M)\big)\alpha g(M) + \big(1 - t_0(N)\big)\beta g(N)$ $\Pi^2 = \big(1 - t_0(S)\big)\alpha g(S) + \big(1 - t_0(N)\big)\beta g(N)$

Subgame 8: Non-exploitative $\boldsymbol{t_0}$ and secession

Solving with backward induction

Decision point 3:

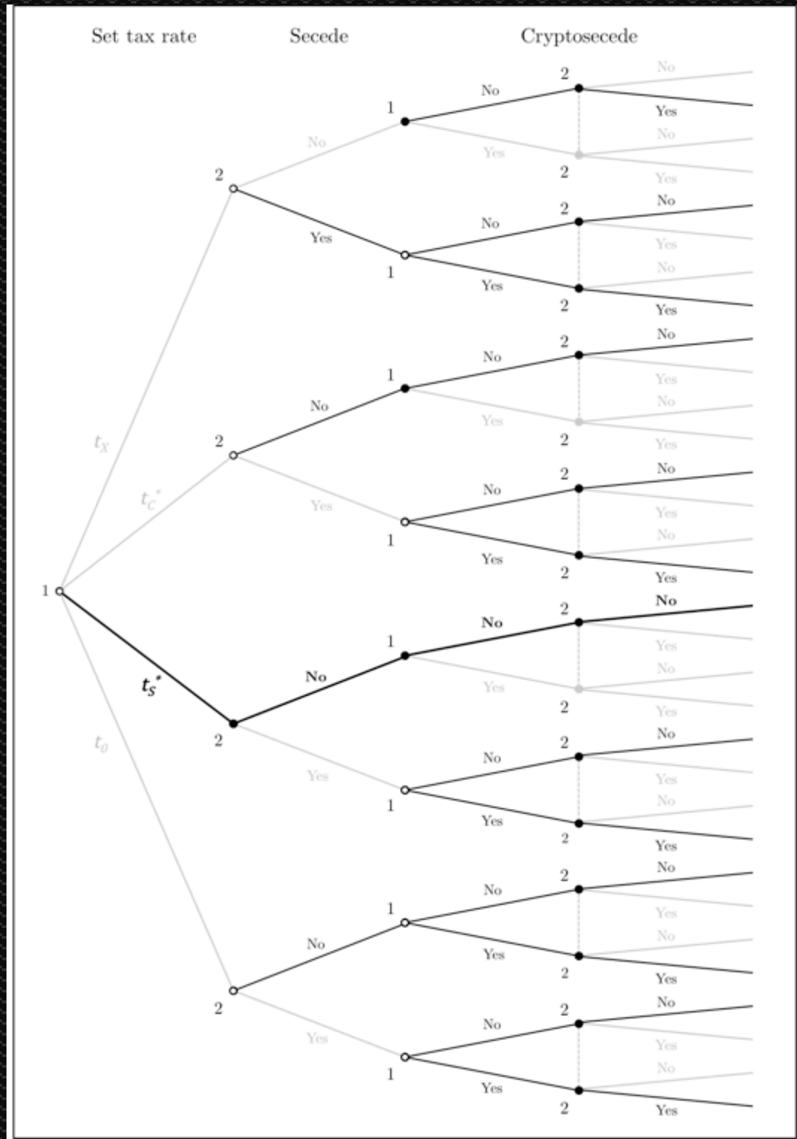
- NE solutions from the 8 subgames

Decision point 2:

- Non-sharers will choose to secede in branch 1
- Non-sharers will choose to not secede in branches 2-4

Decision point 1:

- Sharers will set secession-proof t_S



The solution to the crypto game

Somewhat ironically, the solution to the cryptosecession game is that there is no cryptosecession (but this mirrors the outcome in *B&F*)

While secession and cryptosecession do not occur, their threat serves to discipline government overtaxation and limit fiscal exploitation

The secession-proof tax rate $t_s^* = ((\alpha-\beta) / \alpha)\, t^* + (\beta / \alpha)\, t_0(N)$ is less than the basic internal exit model, set somewhere between $t_0(N) < t_s^* < t^*$

It all comes back to beta

All depends on the ability to secede to crypto economy, which in turn depends on the relative development of crypto technologies of opacity versus state technologies of legibility β

Fiscal exploitation will be eliminated if citizen opacity and government legibility are perfectly balanced $\beta = \alpha$

Any $\beta > \alpha$ undermines ability to finance the public good in the original polity and precipitates political disintegration

However once crypto catches up to balance $\beta = \alpha$ there is fiscal equivalence and no incentive for further crypto technological progress

So are we at crypto utopia yet?

Difficult to imagine 50% of the economy could be hidden from the reaches of the state (i.e., crypto economy eclipsing the visible economy)

Well and truly still within the $\beta < \alpha$ range of opacity-legibility spectrum

Crypto economy is trivially small compared to formal markets

- World market cap approx. 70 trillion US dollars
- Crypto market cap approx. 7 billion US dollars
- That's four orders of magnitude smaller, i.e., $\beta = 0.0001$

It could be some time before cryptosecession comes to exert limits on the taxing proclivity of government!