# EMPIRICAL EVIDENCE ON HORIZONTAL COMPETITION IN TAX ENFORCEMENT

José María Durán Cabré
Alejandro Esteller Moré
Luca Salvadori

**Barcelona Institute of Economics (IEB)**
**University of Barcelona**

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# Outline:

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# Motivations and Objectives

- Enforcement strategies are crucial elements of the tax management process
- In federal countries the auditing policies represent a further instrument on which local authorities can interact
- Tax administration interactions: a substantial lack of research
- Absence of empirical analysis

**Main research question:**

- Are the sub-central tax administrations interacting when setting their enforcement policies?

# Regional Tax Administration in Spain

- The “Comunidades Autónomas” (CAs) administer several wealth taxes since the mid-eighties.
- Reforms (1997 and 2002) legislative power to modify significant tax parameters.
- The Inheritance and Gift Tax (IGT) – evidence of mobility-based competition:
  - “The regional tax competition” (El Periodico , 2007)
  - “The fiscal war among regions threatens the IGT” (El País, 2007)
  - “Regional taxation and voting with feet” (Expansión, 2011)

# The Literature

**Horizontal tax competition on statutory tax parameters**

Brennan, Buchanan (1980); Zodrow, Mieszkosky (1986); Wilson (1986)

**Horizontal tax competition on Tax Administration**

Janeba, Peters (1999); **Cremer, Gahvari (2000);** Stöwhase Traxler (2005)

**Horizontal tax competition: evidence from wealth taxes**

Bird (1991); Conway, Rork (2004); Duff (2005); Brulhart, Parchet (2011)

**Tax Administration determinants**

Slemrod, Yitzhaki (1987, 2002); Slemrod *et al.* (2009)

Young *et al.* (2001); Baretti et al. (2002); Esteller-Moré (2005, 2011)

# The theoretical framework

## Mobility-based tax competition in presence of evasion

- 2 symmetric regions: total population normalized to 1.
- 2 institutions ➔ government ($t$) and administration ($\beta$)

## Two *stages* solved by backward induction:

1. Regional tax administration set tax auditing policy $\beta$ maximizing the total tax revenue: $r_{\beta}^{'} = -2n^{'}{}_{\beta}(a) \times r > 0$
2. Individuals decide where to reside: $n_1 = \frac{1}{2} + \frac{U_1{}^* - U_2{}^*}{2a}$

## The slope of the administration's reaction function:

$$\frac{\partial \beta_1}{\partial \beta_2} = -\frac{n_{1_{\beta_2}} \times r_{1_{\beta_1}}}{R_{1_{\beta_1 \beta_1}}(\beta_1, \beta_2; t_1, t_2, a)} > 0$$

# The empirical framework (1):

Dynamic spatial econometric approach to test the theory

$$\beta_{it} = \alpha\beta_{it-1} + \gamma\beta_{-it-1} + \boldsymbol{\mu X_{it}} + \vartheta_i + \tau_t + \varepsilon_{it}$$

Where:

$\alpha$ accounts for the inertia

$\gamma$ Is the autoregressive coefficient and $\beta_{-it-1} \equiv \sum_{j=1}^{N} w_{ij}\ \beta_{jt-1}$

$\gamma \neq 0$ ➔ There is interaction

$\gamma > 0$ ➔ Horizontal Tax Competition

Time-space recursive model (Anselin *et al.* 2008)
System GMM procedure (Arellano, Bover, 1995)

# The empirical framework (2): Stata commands

- We used the command "spmat" (Drukker et al, 2011) to build the spatial matrix based on the inverse of the distance between centroids and to build the neighbours vectors.

```
spmat idistance W1 longitude latitude, id(reg_num) dfunction(dhaversine)
normalize(spectral)

foreach b in years {
foreach c in variables {
spmat lag W`c'`b' W1 `c'`b‘
}
}
```

- We used the command "xtabond2" (Roodman, 2009) to perform the system GMM estimator

```
xtabond2 audits L.audits L.Waudits year2-year22 control_variables, /*
*/gmm(L.audits , lag(2 5) collapse) gmm(L.Waudits, lag(2 5) collapse) /*
*/ iv( year2-year22 control_variables ) robust
```

# The empirical framework (2): Data

| Variable | Observations | Mean | Median | SD | Max | Min |
|---|---|---|---|---|---|---|
| Audits | 307 | 370.5961 | 195 | 486.5621 | 2550 | 0 |
| Tax Returns | 308 | 21187 | 13442 | 18234.62 | 88528 | 1641 |
| Leftish government | 322 | 0.4627329 | 0 | 0.4993853 | 1 | 0 |
| Election year | 322 | 0.2546584 | 0 | 0.4363471 | 1 | 0 |
| Deduction | 322 | 0.1335404 | 0 | 0.3406872 | 1 | 0 |
| Deficit-GDP ratio | 308 | -0.0028976 | -0.0017705 | 0.0070989 | 0.0298811 | -0.026144 |
| Transfers-GDP ratio | 294 | 0.3977149 | 0.3853665 | 0.1348314 | 1.373906 | 0.1117062 |
| Per Capita GDP | 322 | 11.52553 | 11.35349 | 5.497171 | 23.01702 | 2.174576 |
| Auditing Profitability | 280 | 8.936545 | 4.650814 | 12.75857 | 108.2774 | 0 |

# The empirical framework (3): Basic Results

| VARIABLES | (1)<br>Audits | (2)<br>Audits | (3)<br>Audits | (4)<br>Audits |
|---|---|---|---|---|
| L.audits | 0.807*** | 0.800*** | 0.913*** | 0.812*** |
| | (4.569) | (4.671) | (7.167) | (6.234) |
| L.Waudits | 0.320* | 0.238* | 0.355* | 0.270* |
| | (1.822) | (1.690) | (1.813) | (1.836) |
| Observations | 237 | 237 | 237 | 237 |
| Internal Instruments | YES | YES | YES | YES |
| # Instruments | 30 | 32 | 33 | 35 |
| Gmm lag limits | (2, 5) | (2, 5) | (2, 5) | (2, 5) |
| AR(1) (*p*-value) | 0.051 | 0.049 | 0.011 | 0.035 |
| AR(2) (*p*-value) | 0.887 | 0.912 | 0.565 | 0.976 |
| Hansen-test (*p*-value) | 1.000 | 1.000 | 1.000 | 1.000 |
| Fixed Effects | YES | YES | YES | YES |
| Time Effects | YES | YES | YES | YES |

Note: Control variables are omitted. Spectral normalization is applied: the (i, j)th element of W becomes e wij = wij/v, where v is the largest of the moduli of the eigenvalues of W. The results remains qualitatively the same if we apply minmax standardization or row normalization.

*t* statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# The empirical framework (4): Further Results

| VARIABLES | (1) Audits | (2) Audits | (3) Audits |
|---|---|---|---|
| L.audits | 0.820*** | 0.826*** | 0.834*** |
| | (6.697) | (6.901) | (6.102) |
| L.Waudits | 0.242** | 0.248** | 0.196 |
| | (2.104) | (2.094) | (1.381) |
| L.Waudits×post97 | -0.322** | | |
| | (-2.534) | | |
| L.Waudits×D97-01 | | -0.321** | |
| | | (-2.465) | |
| L.Waudits×post01 | | -0.239* | |
| | | (-1.734) | |
| L.Waudits×deduction | | | -0.652** |
| | | | (-2.269) |
| Observations | 237 | 237 | 237 |
| Internal Instruments | YES | YES | YES |
| # Instruments | 42 | 45 | 40 |
| Gmm lag limits | (2, 5) | (2, 5) | (2, 5) |
| AR(1) (*p*-value) | 0.035 | 0.035 | 0.031 |
| AR(2) (*p*-value) | 0.786 | 0.758 | 0.973 |
| Hansen-test (*p*-value) | 1.000 | 1.000 | 1.000 |
| Fixed Effects | YES | YES | YES |
| Time Effects | YES | YES | YES |



Note: See previous note. *t* statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# CONCLUSIONS

- **Theoretical framework result**
  Regional enforcement reaction function positively sloped: regional administrations compete on auditing policies.
- **The empirical analysis corroborates the HC hypothesis**
  We obtain a high degree of inertia in the auditing policy setting and coefficients for the spatial lag congruent with the Nash equilibrium condition (0.38 – 0.66) .
- **From Opaque to Transparent competition**
  - The competition on the enforcement policy disappears when the legal power on IGT is decentralized and it is possible to compete on the statutory tax parameters.
  - Decentralization is welcome since has the advantage to switch from an opaque competition to a transparent one.

# A further (forced!) welfare conclusion: A full Decentralization reduces the SE

$$e(\underbrace{t}_{(+)}, \underbrace{\beta}_{(-)})$$

Switching the competition from enforcement policies to statutory tax rates, the decentralization of the normative power benefits the economy also because reduces tax evasion.

# CONTROL VARIABLES

| VARIABLES | (1) Audits | (2) Audits | (3) Audits | (4) Audits | (5) Audits | (1) Audits | (2) Audits | (3) Audits |
|---|---|---|---|---|---|---|---|---|
| Leftish government | -233.735** | -53.907 | -34.527 | -3.522 | -4.096 | -4.669 | -4.895 | -3.485 |
| | (-2.193) | (-0.982) | (-0.804) | (-0.170) | (-0.208) | (-0.264) | (-0.230) | (-0.163) |
| Election year | -101.380 | -34.505** | -37.684** | -33.477** | -33.315** | -27.053* | -31.638* | -37.983** |
| | (-1.102) | (-2.254) | (-2.210) | (-2.158) | (-2.114) | (-1.655) | (-1.815) | (-1.996) |
| Deficit/GDP | 5740.946 | -270.497 | 27.531 | 137.939 | -393.251 | -319.061 | -763.501 | 26.451 |
| | (1.061) | (-0.141) | (0.014) | (0.067) | (-0.180) | (-0.152) | (-0.354) | (0.012) |
| Transfers/expenditure | -130.466 | 226.583 | 233.558 | 225.265 | 252.761 | 218.924 | 208.353 | 232.217 |
| | (-0.530) | (1.136) | (1.168) | (1.219) | (1.410) | (1.156) | (1.078) | (1.271) |
| Tax Return | -0.001 | 0.003 | 0.003 | 0.003 | 0.002 | 0.002 | 0.003 | 0.002 |
| | (-0.108) | (1.421) | (1.486) | (1.041) | (1.027) | (1.232) | (1.589) | (0.964) |
| Deduction | | | 76.970** | 59.932*** | 49.657*** | 44.531*** | 72.272*** | 91.448** |
| | | | (2.307) | (2.724) | (2.774) | (2.960) | (3.483) | (2.185) |
| L.WDeduction | | | -168.552* | -271.726** | -332.964*** | -198.526 | -278.812* | -341.017*** |
| | | | (-1.726) | (-2.226) | (-2.748) | (-1.487) | (-1.834) | (-3.060) |
| Per capita GDP | | | | 4.151 | 9.031 | -4.910 | -1.843 | 5.686 |
| | | | | (0.324) | (1.007) | (-0.758) | (-0.220) | (0.446) |
| L.audit_profitability | | | | -0.418 | -0.490 | -0.113 | -0.158 | -0.425 |
| | | | | (-0.316) | (-0.372) | (-0.095) | (-0.134) | (-0.307) |
| Tax Return×d_foral | | | | 0.004 | 0.004 | 0.003 | 0.004* | 0.004 |
| | | | | (1.147) | (1.136) | (1.227) | (1.688) | (1.117) |
| _cons | | -211.897* | -175.954 | -195.919 | -279.633 | 36.460 | -105.899 | -197.627 |
| | | (-1.671) | (-1.187) | (-0.678) | (-1.170) | (0.170) | (-0.396) | (-0.689) |