

Ecological Fiscal Transfers in Brazil - Incentivizing or refinancing conservation?

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Structure

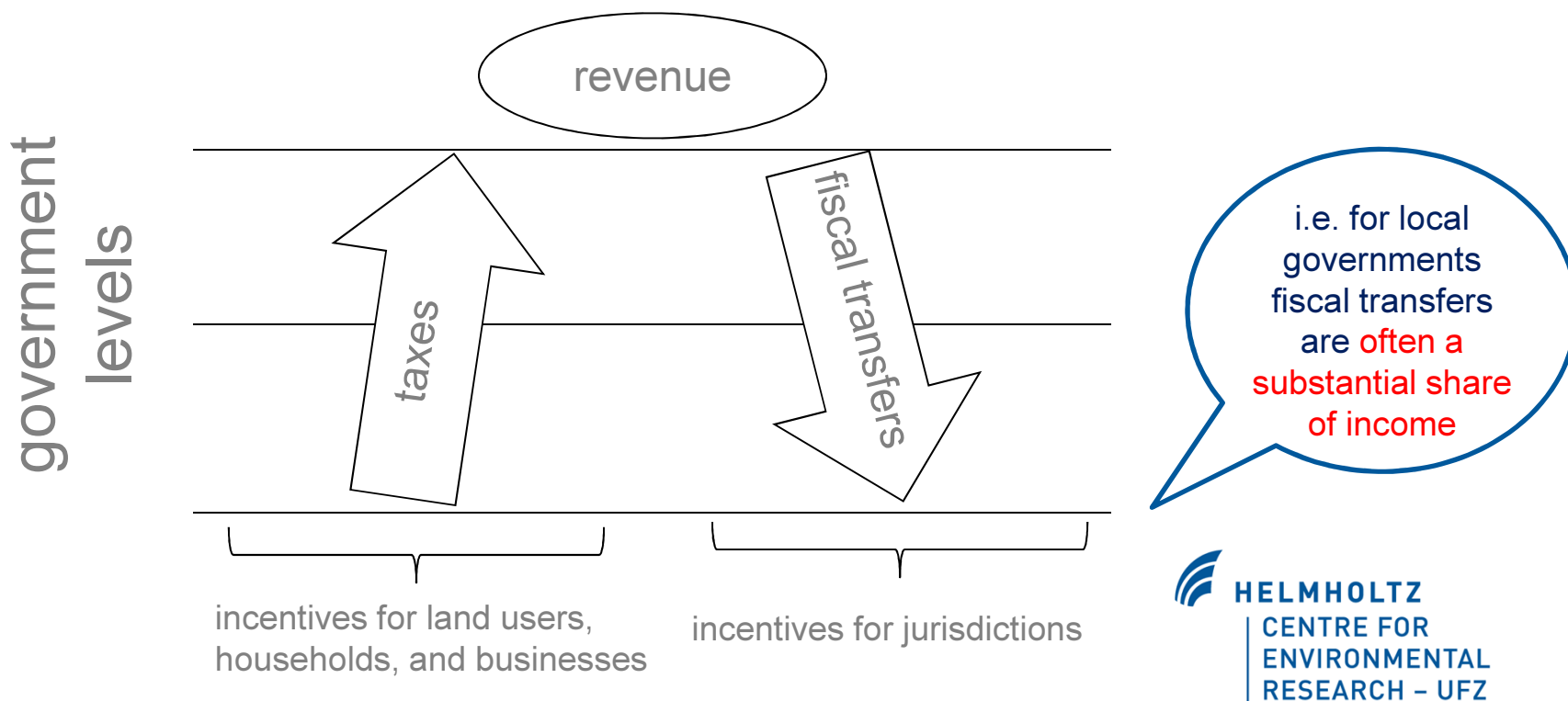
- 1. Introduction – why ecological fiscal transfers?**
- 2. The case of the Brazilian ICMS-Ecológico**
 - institutional rules
 - theoretical functioning
 - empirical approach
- 3. Preliminary results**
- 4. Discussion**
- 5. Conclusion**

1) Introduction – fiscal transfers

general purpose of intergovernmental fiscal transfers

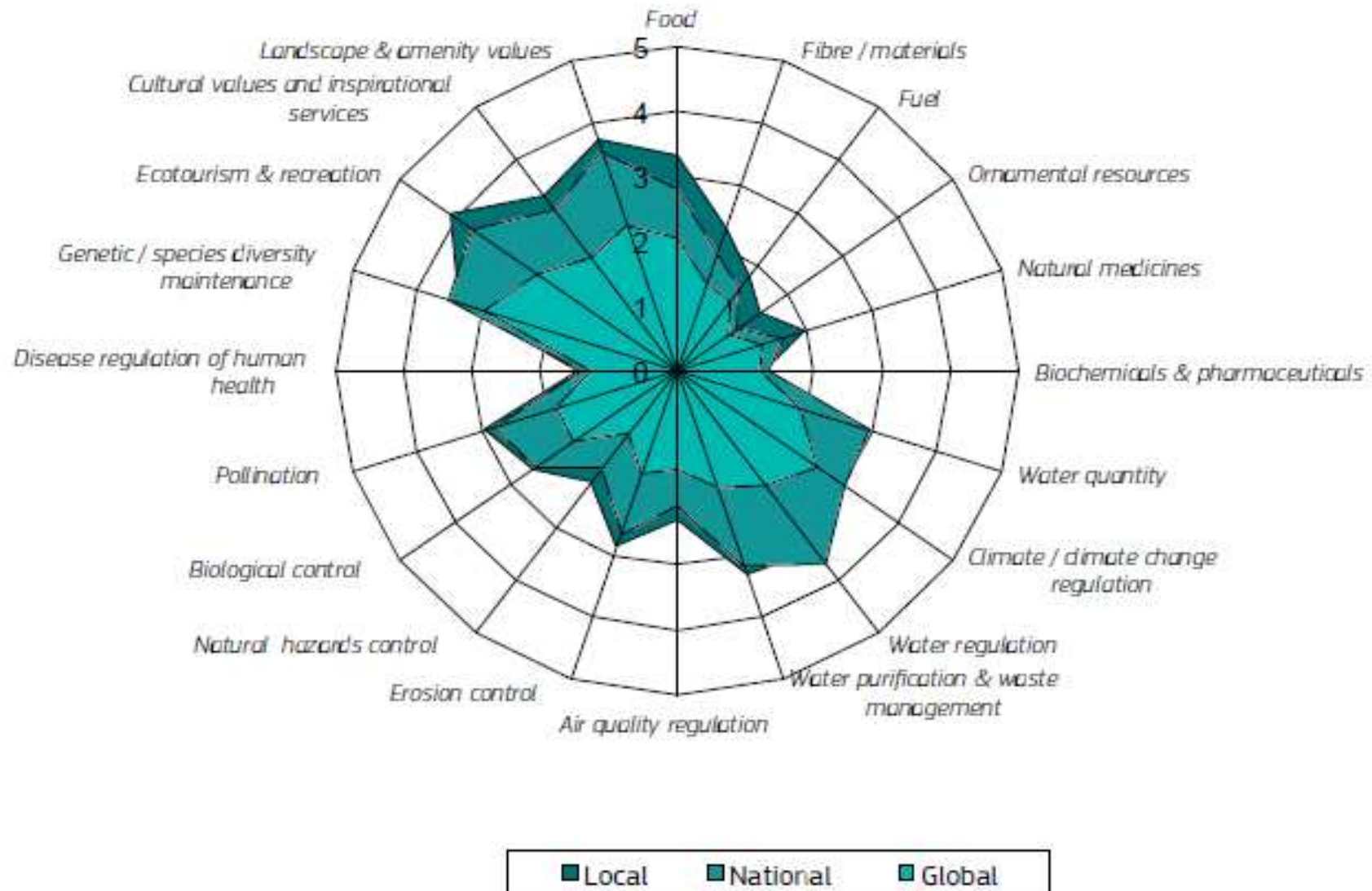
intergovernmental fiscal transfers redistribute tax revenue among government levels to ensure sufficient fiscal capacity to fulfill public functions

- and can be used to internalize external effects of public policies



1) Introduction: why *ecological* fiscal transfers?

spatial spillovers of ecosystem services from protected areas



2) The case of the Brazilian ICMS-Ecológico

Study object:

The Brazilian value added tax revenue is redistributed among municipalities according to constitutionally defined shares and state law criteria ...

...for some states it includes indicators for nature conservation: *Imposto Sobre Circulação de Mercadorias e Serviços – Ecológico (ICMS-E)*

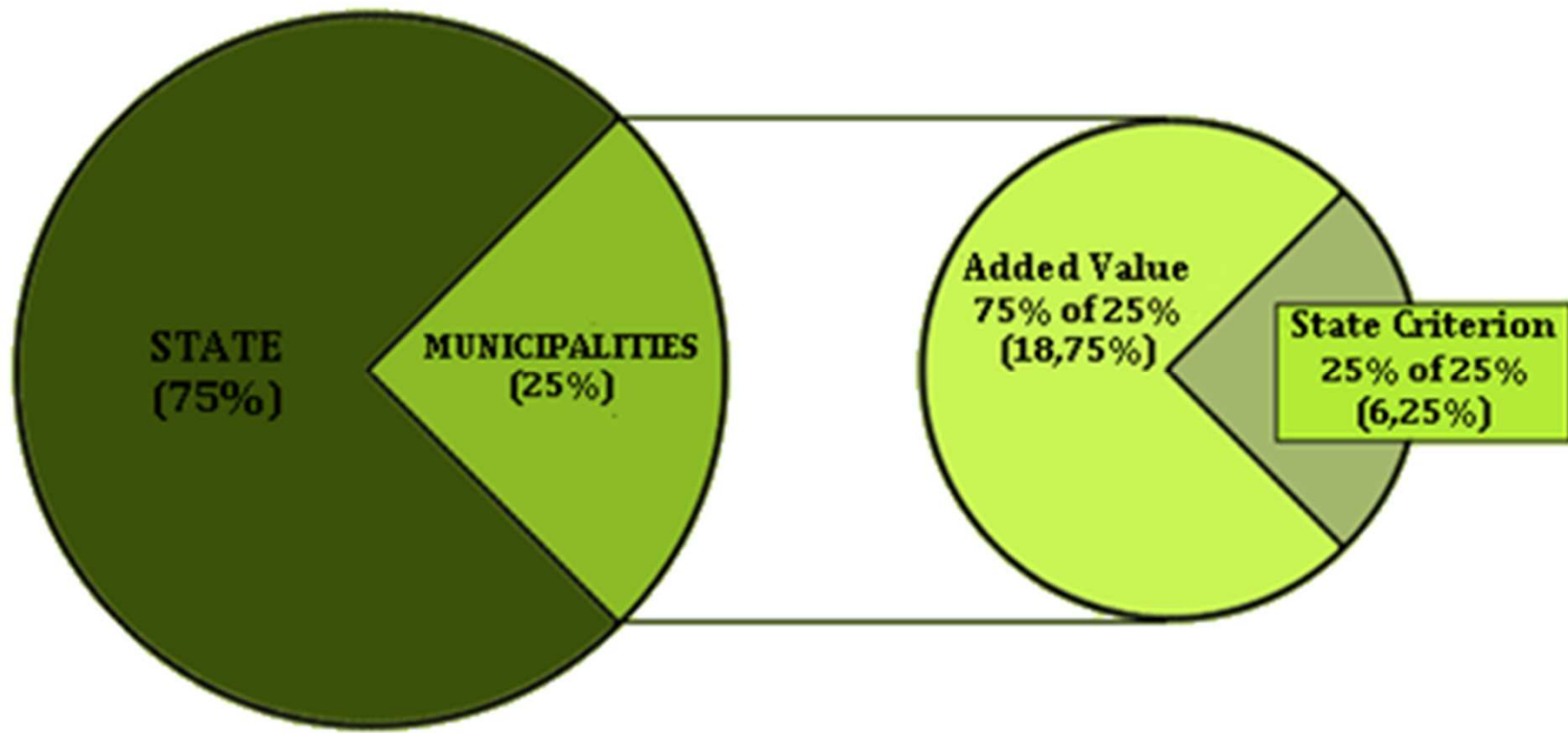
Research question:

Does the implementation of ICMS-E create an incentive to designate additional protected areas among Brazilian states?

2) ICMS-E – institutional rules (1)

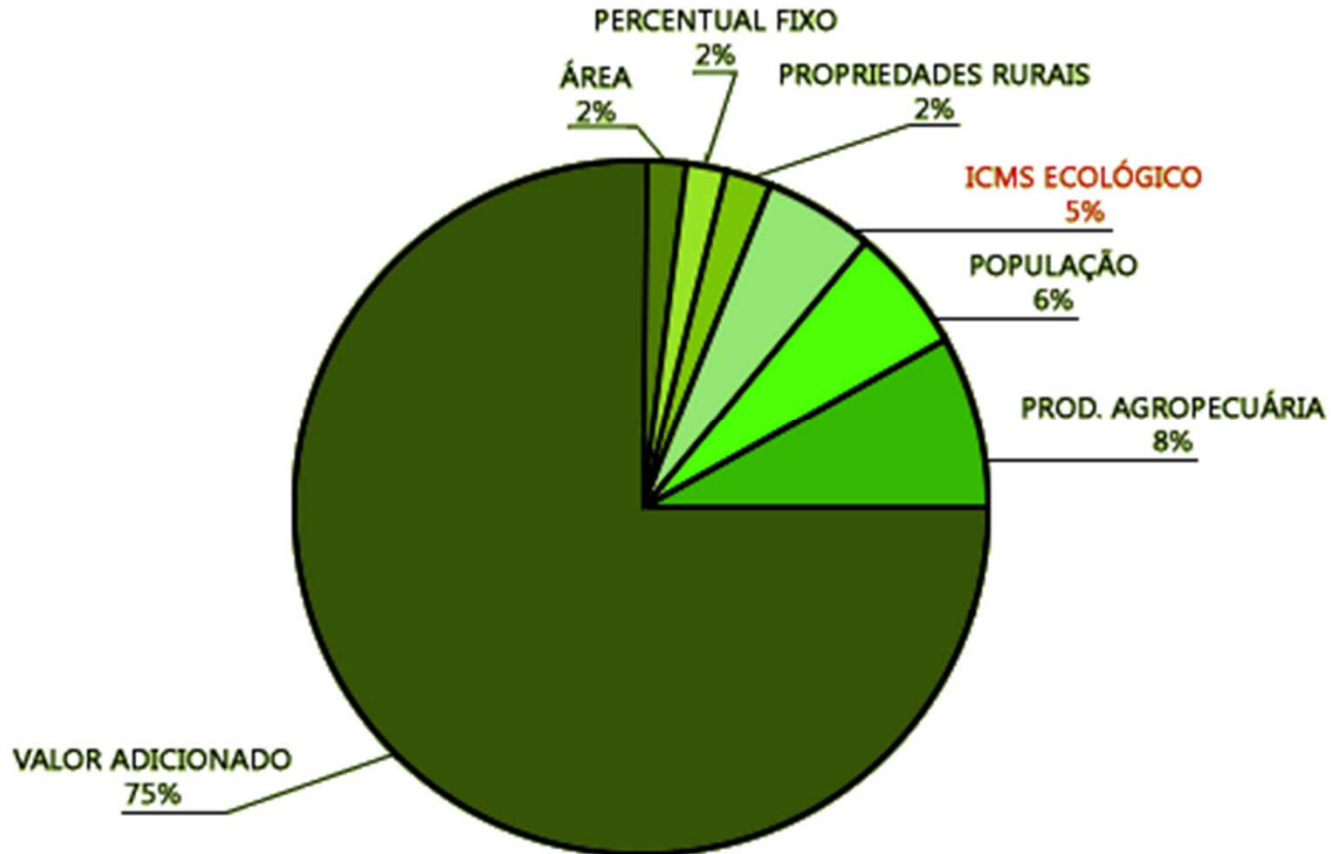
Redistribution of Value Added Tax (VAT) defined by Brazilian constitution

- 75 % go to states where VAT was generated
- 25 % go to municipalities, of which ...



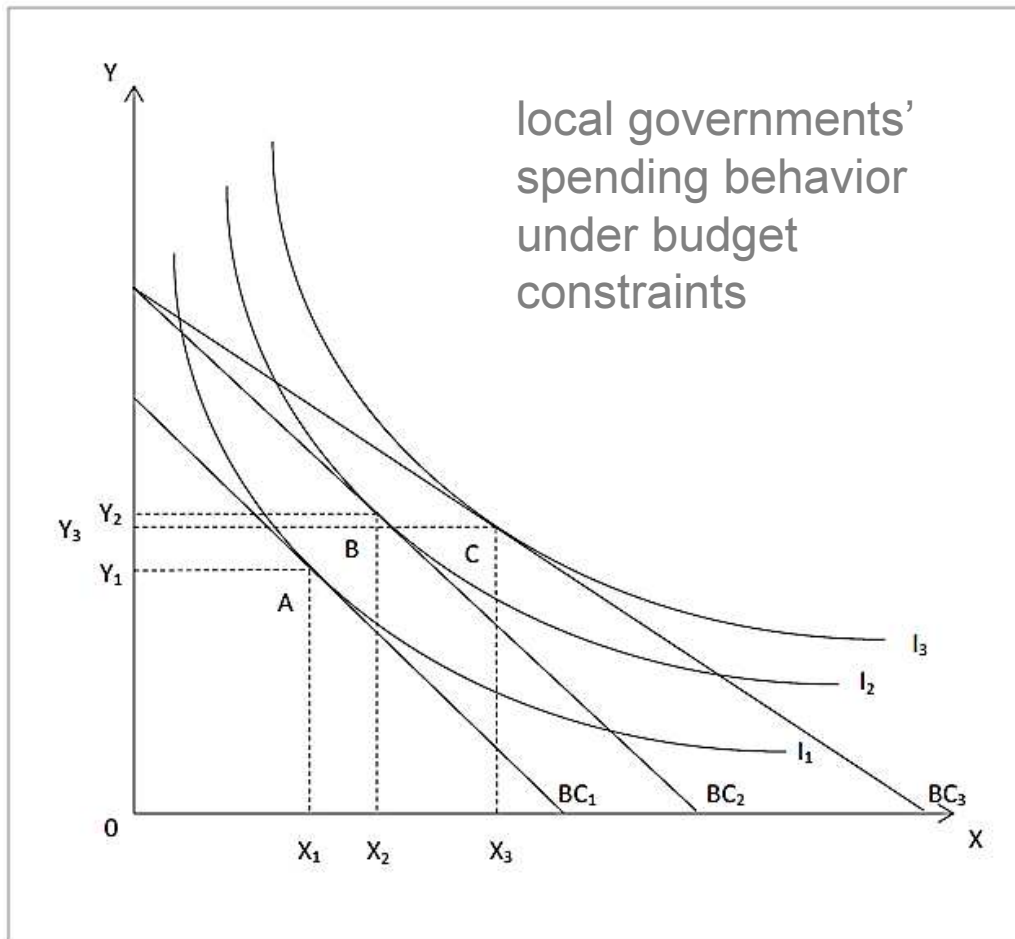
2) ICMS-E – institutional rules (2)

- $\frac{3}{4}$ go to municipalities where it was generated
- $\frac{1}{4}$ goes to municipalities according to state law criteria (see hypothetical example)



2) ICMS-E – theoretical functioning

– a simplification to generate hypothesis



Hypothesis

- an increase in municipal budget leads to increased spending on nature conservation and other public goods or services
- especially, if protected areas become a source of income via EFT – an increase is to be expected

2) ICMS-E – empirical approach

- we analyze the effect of the introduction of ICMS-E among Brazilian states on protected area coverage with panel data from 1991 to 2009
 - controlling for socio-economic, biophysical, time-invariant individual, time-varying differences, and interactions of variables

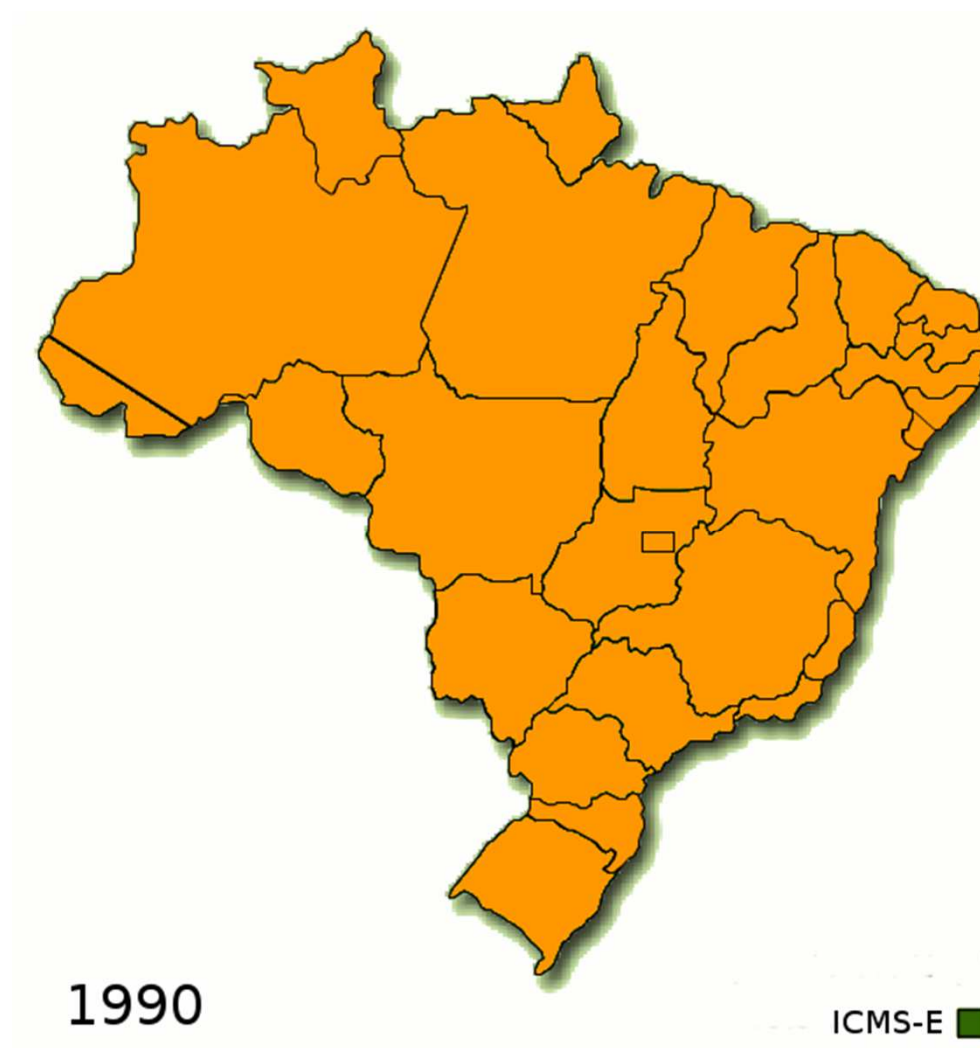
→ Does the introduction of ICMS-E increase the share of protected areas?

- formally (see appendix for definition of variables):

$$- PA_{it} = \beta_0 + \beta_1 icms_e_{it} + \beta_2 agr_{it} + \beta_3 ind_{it} + \beta_4 ser_{it} + \beta_5 pop_{it} + \beta_6 inc_{it} + \beta_7 arpa_{it} + \beta_8 oPA_{it} + \beta_9 biome_{ji} + \beta_{10} int_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

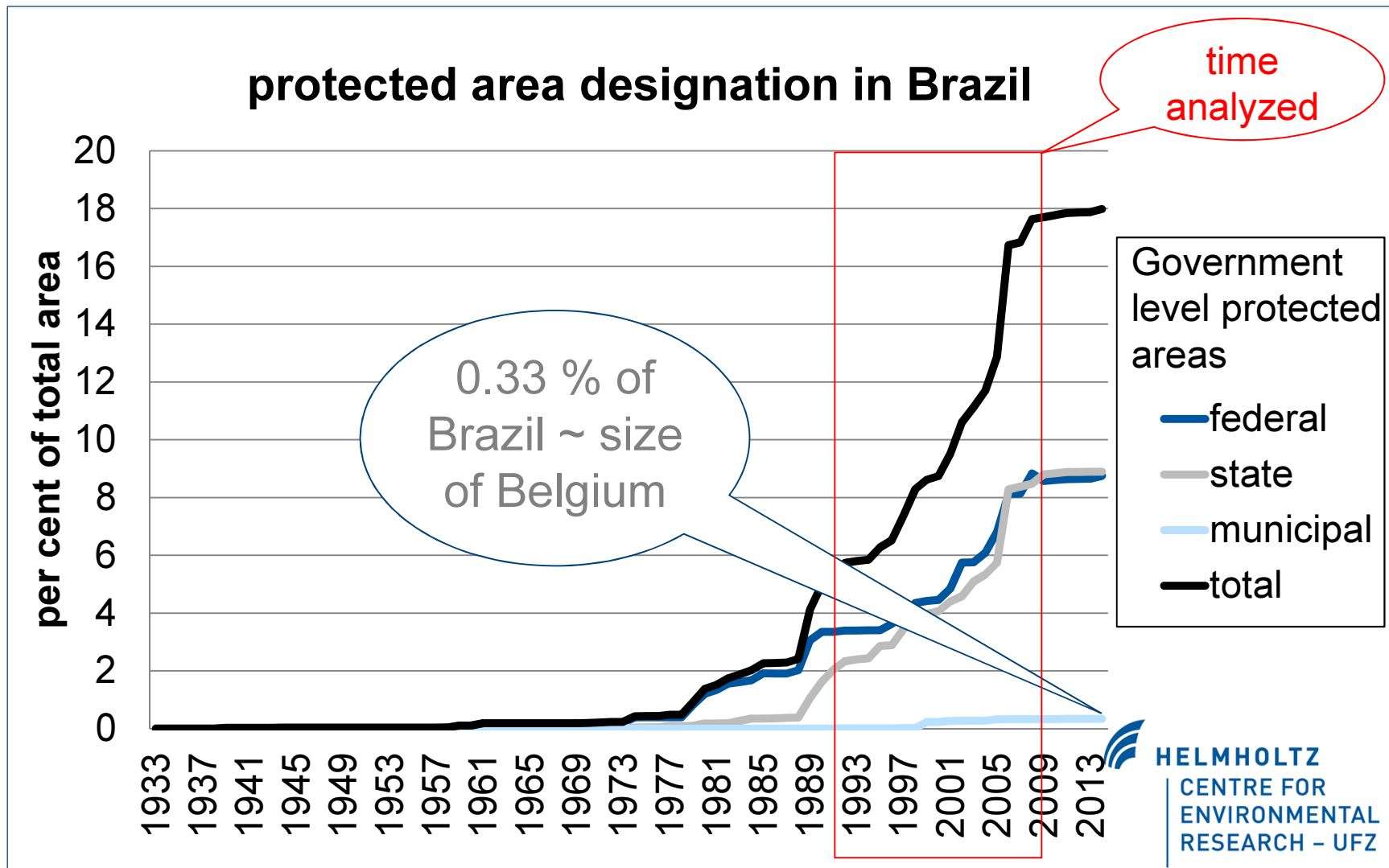
2) ICMS-E – empirical approach: data (1)

implementation of ICMS-E over time



2) ICMS-E – empirical approach: data (2)

designation of protected areas over time



authors' calculation based on

<http://www.mma.gov.br/areas-protegidas/cadastro-nacional-de-ucs>

3) Preliminary results (1)

– ICMS-E and municipal protected areas (PA)

Dependent variable: ln of *municipal protected area share* in percent of total area

model:	(mun 1)	(mun 2)	(mun 3)
<i>variables</i>			
<i>icms_e</i>	1.079*** (0.245)	2.904*** (0.556)	-15.064 (13.988)
<i>agr</i>	0.677*** (0.202)	0.502*** (0.187)	0.585*** (0.184)
<i>ind</i>	-0.910* (0.466)	-1.200*** (0.391)	-1.317*** (0.343)
<i>ser</i>	1.416 (1.160)	0.658 (1.003)	0.078 (0.948)
<i>pop</i>	2.233*** (0.552)	1.848** (0.765)	1.779*** (0.632)
<i>inc</i>	3.138*** (0.477)	1.166** (0.553)	1.242** (0.616)
<i>arpa</i>	0.431 (0.337)	1.047*** (0.370)	1.086*** (0.320)
<i>fed</i>		0.522*** (0.110)	0.547*** (0.119)
<i>sta</i>		0.151 (0.041)	0.075 (0.111)
<i>fed*icms_e</i>		-1.432*** (0.228)	-1.808*** (0.486)
<i>sta*icms_e</i>		-0.181 (0.145)	-0.611* (0.320)
<i>agr*icms_e</i>			-0.458 (0.319)
<i>ind*icms_e</i>			1.299 (1.325)
<i>ser*icms_e</i>			2.799 (1.942)
<i>pop*icms_e</i>			-1.599*** (0.502)
<i>inc*icms_e</i>			3.464*** (1.289)
<i>intercept</i>	-23.472*** (5.100)	-13.411*** (4.596)	-10.925*** (3.891)
<i>biome D_i</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
<i>effects</i>	<i>individual re</i>	<i>individual re</i>	<i>individual re</i>
<i>adj. R²</i>	0.31	0.39	0.41

The panel data sample is balanced with n=27, T=19, N=513. Robust standard errors are reported in parenthesis below the estimated coefficients. Individual coefficients are indicated with *10%, **5% or ***1% significance levels. Biome D_i represent dummy variables for the different biomes. A individual random effects (re) model is employed.

- overall, there is a positive significant correlation of ICMS-E with PA

→ there are on average higher PA shares with ICMS-E than without

- GDP per capita correlates positively and significantly with PA

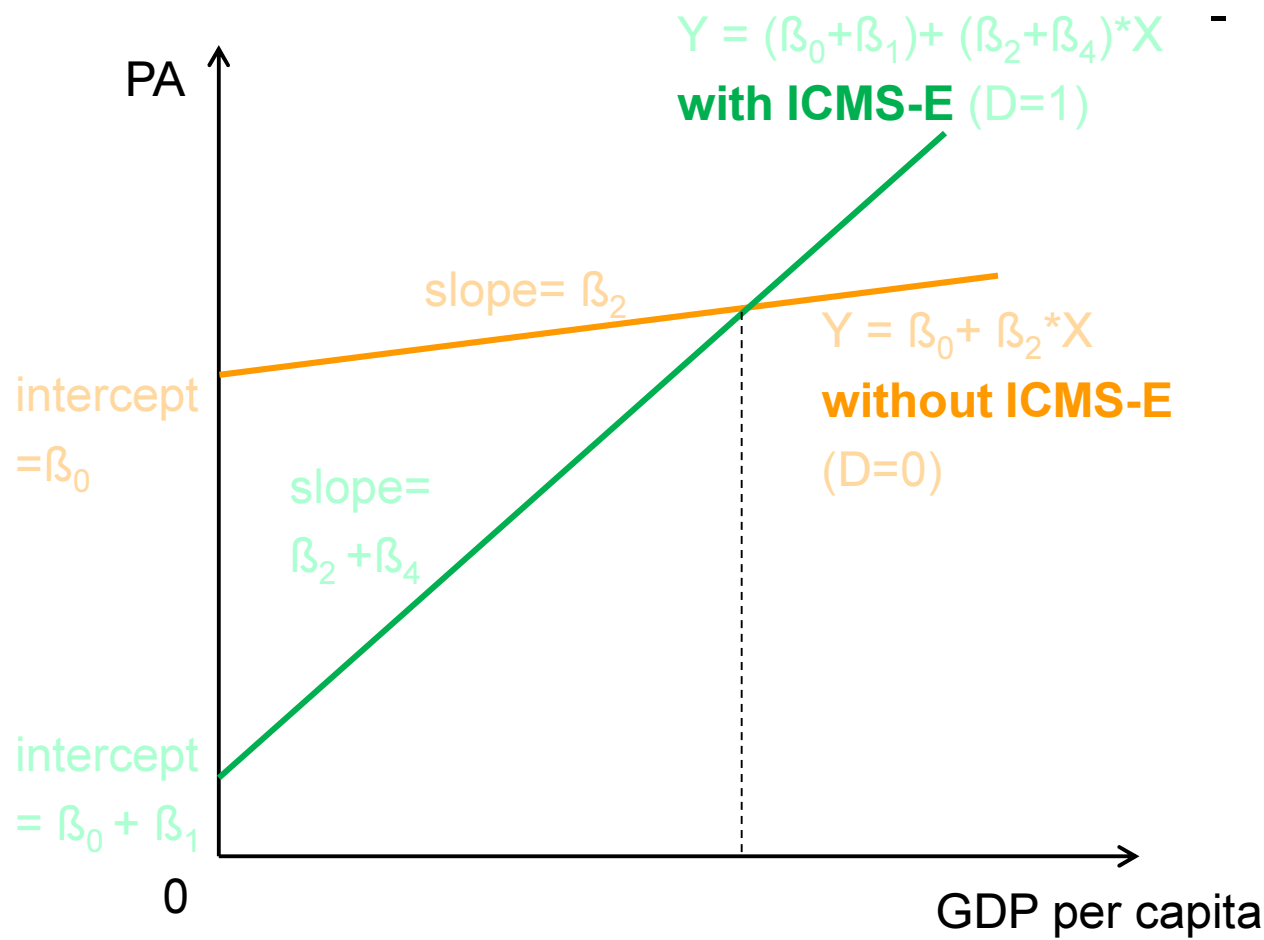
→ on average, richer states have higher PA shares

- the interaction of ICMS-E with GDP per capita is positive ...

3) Preliminary results (2)

– ICMS-E and municipal protected areas (PA)

for $Y = \beta_0 + \beta_1 D + \beta_2 X + \beta_4 DX$



- the interaction of ICMS-E with GDP/cap is positive

→ on average, richer states with ICMS-E have a significantly higher PA share than states without

but poorer states don't

4) Discussion

- **potential interpretation**
 - ICMS-E refinances other public functions for municipalities in poorer states **but** creates an incentive for municipal protected area designation in richer states
- **issues remain that have to be solved**
 - statistically: corner solution required, both cross-sectional dependence and auto-correlation, and a potential spatial correlation

5) Concluding remarks

- ecological fiscal transfers are a promising instrument because they require no additional budget
- ecological fiscal transfers provide local governments with income for hosting protected areas
- preliminary results from Brazil indicate several effects of the introduction of ICMS-E, e.g., a positive correlation with higher protected area shares (~ incentive effect)
- hence, ICMS-E is likely increasing the provision of undersupplied ecosystem services from protected areas, and increase welfare
- results may inform design and decisions on ecological fiscal transfers in Portugal, France, Germany, Switzerland, Indonesia, Poland, ... (World Bank, OECD, GIZ, etc.)

further reading

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Appendix – Variables and Indexes

Variables:

PA: protected area share of state territory in %

icms_e: dummy variable for ICMS-E: 1 if ecological fiscal transfers in force in state *i* year *t*, 0 if otherwise

agr: share of valued added by agriculture of valued added by economic activity (*agr+ind+ser*) in % (constant prices R\$2000) in thousands

ind: share of valued added by industry of valued added by economic activity (*agr+ind+ser*) in % (constant prices R\$2000) in thousands

ser: share of valued added by service of valued added by economic activity (*agr+ind+ser*) in % (constant prices R\$2000) in thousands

pop: population density cap/km²

inc: GDP per capita in constant prices R\$2010 in thousands

arpa: dummy variable for a policy on protected areas in the amazon 1 if in force in state *i* year *t*, 0 if otherwise

oPA: other government level protected areas (e.g. state level PAs *sta* and federal level PAs *fed* when regressing on municipal PAs *mun*)

biome: set of dummy variables for the biomes in Brazil:

ama: amazon biome 1 if major share of state *i* territory

cer: cerrado biome 1 if major share of state *i* territory

caa: caatinga biome 1 if major share of state *i* territory

mat: mata atlantica biome 1 if major share of state *i* territory

pan: pantanal biome 1 if major share of state *i* territory

pam: pampa biome 1 if major share of state *i* territory

int: set of interaction variables of *icms_e* with *agr*, *ind*, *ser*, *pop*, and *inc*, respectively

Indexes:

i indexes the 26 federal states and the federal district

t indexes years from 1991-2009