Fiscal implications of climate change impacts and adaptation policies in EU Mediterranean countries: An application to sea level rise

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Presentation overview

1. Overview;
2. Rationale for the analysis;
3. Framing the topic:
   a. adaptation;
   b. Budgetary effects of adaptation;
4. Methodology;
5. Results:
   a. real side effects;
   b. budgetary effects: government income, savings and expenditures;
6. Knowledge gaps:
7. Conclusions.

Rationale for the analysis

Challenges in the EU Mediterranean Countries:

- **Aging population** (over 65 population: from 11.9% (France) to 14.9% (Italy) in 2013,Eurostat);
- **Financial crisis**;
- **Growing levels of deficit** (from 2.8% of GDP (Italy) to 12.2% of GDP (Greece) in 2013, Eurostat) **and debt** (from 92.1% of GDP (Spain) to 174.9% of GDP (Greece) in 2013, Eurostat) ;
- **High unemployment levels** (unemployment rate: from 12.2 % (France) to 27.3% (Greece) in 2013, Eurostat);

Overstretched public budgets

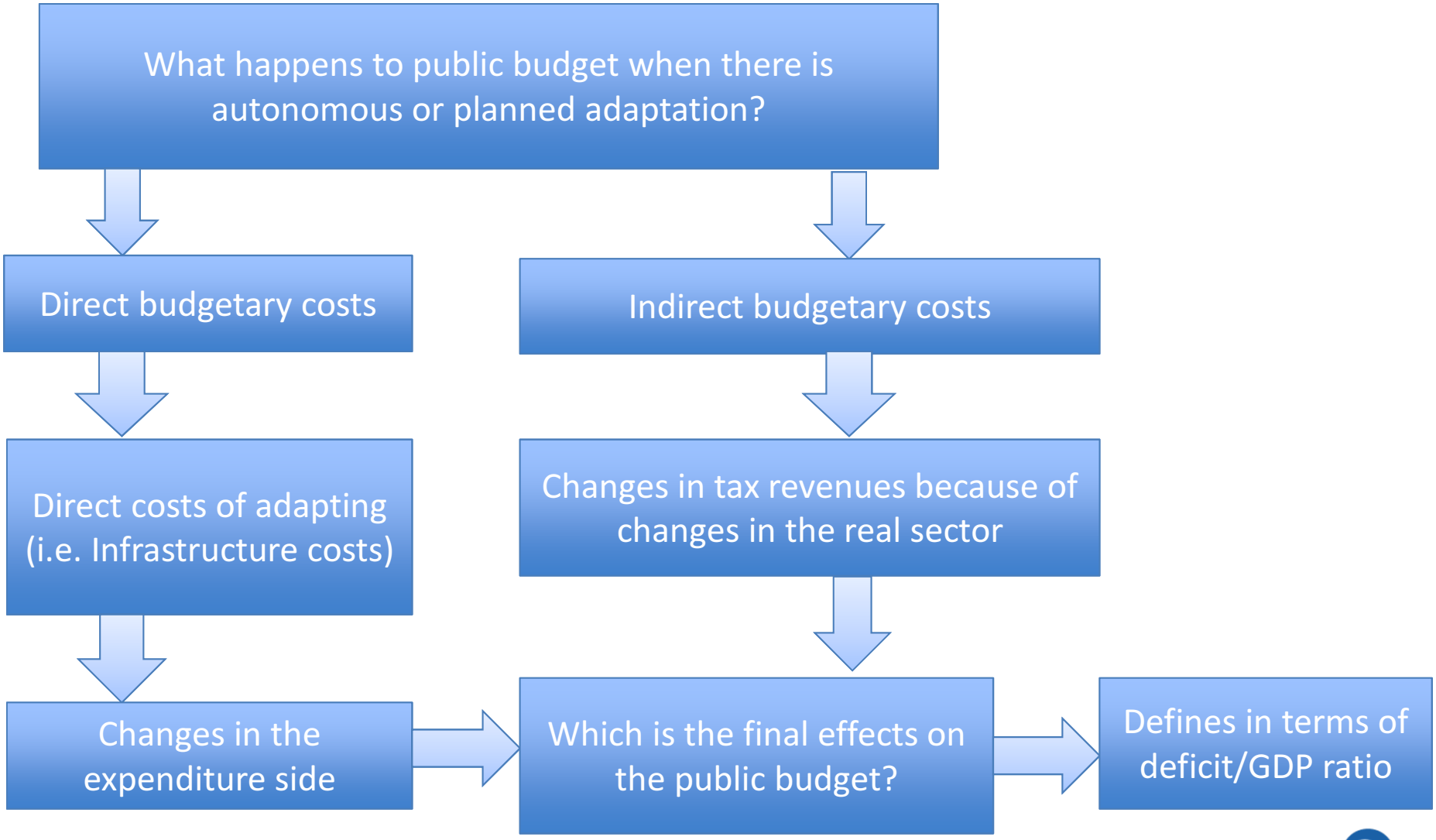
Is there the possibility to spend for adaptation?

Is there any consideration to suggest a publicly financed adaptation strategy?

Framing the topic: adaptation

	Autonomous adaptation	Planned adaptation
	• Autonomous changes in producers and consumers behaviour as a response to price signals due to Climate Change (CC)	• Direct policies and strategies to reduce the impact of Climate change (CC)
Effects	• Changes in real economy (GDP, production) • Indirect budgetary effects (?) • NO direct budgetary costs: no direct action to contrast CC impacts	• Changes in real economy (GDP, production) • Direct budgetary costs • Indirect budgetary costs (?)
In our analysis	• It is consistent with our «**no action**» scenario	• It is consistent with our «**full adaptation**» scenario

Framing the topic: budgetary effects of adaptation



Methodology: CGE models

Computable ➔ Quantitative

General ➔ Treatment of all commodities, sectors and production factors in the treated society

Equilibrium ➔ Demand and supply of each commodity and factor are balanced through the price mechanism

Common features:

- Multiple interacting agents;
- Individual behavior based on optimization;
- Typically disaggregate, with many agents and markets;
- Equilibrium allocations which are not solutions to a single (planner's) optimization problem.

Methodology: the ICES model

1. **Multisectoral multiregional CGE model calibrated on 2007 data** (Global Trade Analysis Project database version 8);
2. **Production structure**: multi-level nested production function;

   Primary inputs: labour, capital, land (only for agriculture)

   intermediate inputs;
3. **Trade**: Modelled to capture cross-hauling phenomena (Armington assumption);
4. **Final demand**:
   a. representative household: earns income and use it to consume and save;
   b. government: collects tax revenues and income from other sources and it spends and saves;
   c. investment demand: according to international capital mobility.
5. In this analysis comparative static framework.

Experiment design

Regional aggregation
France
Greece
Italy
Portugal
Spain
Rest of the EU
Rest of the World

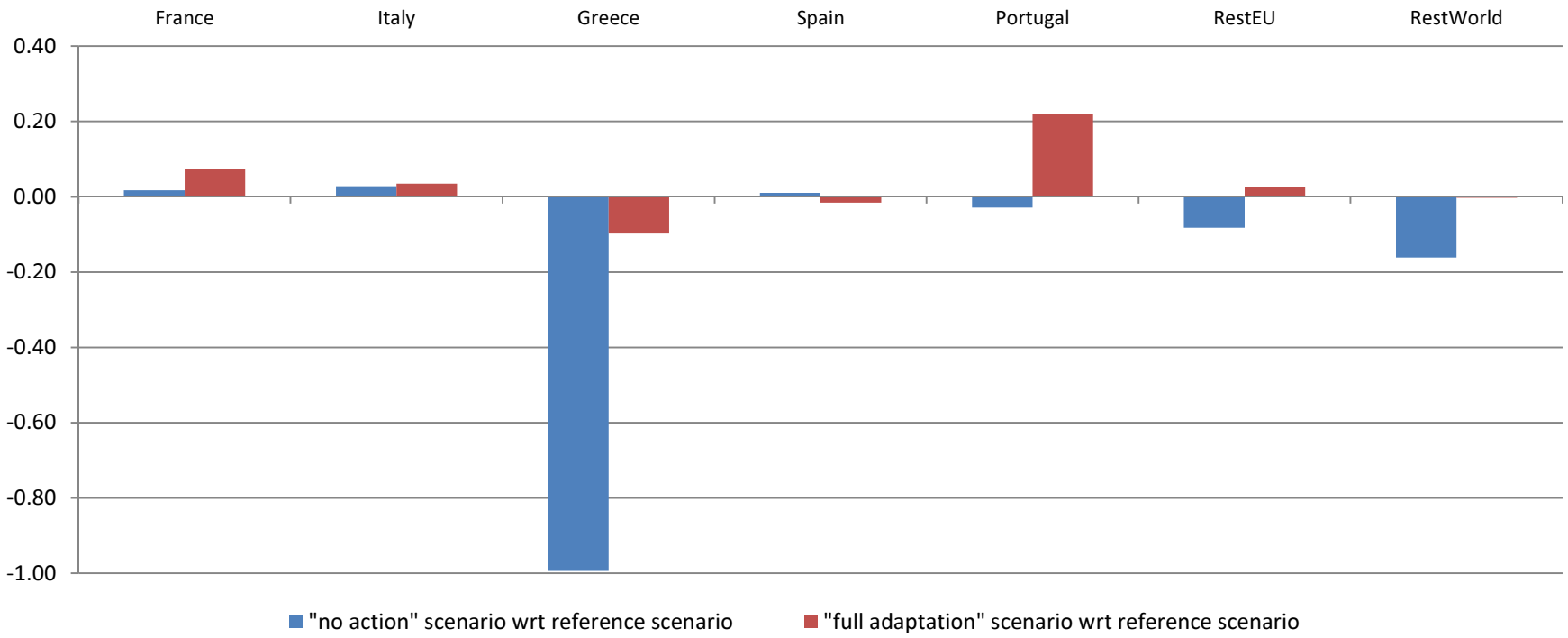
Sectoral aggregation
Primary sector: Agriculture
Energy sectors: Coal, Oil, Gas, Oil products, Electricity from fossil fuels, Electricity from renewables (nuclear, biomass, Hydro, Solar, Wind)
Industry and services: Energy intensive industries, Other industries and services, Construction, Public services

Scenarios
Baseline: no Sea Level Rise (SLR) and no adaptation
«NO action» scenario: only SLR impacts
«full adaptation» scenario: publicly financed adptation

Input data: SLR impacts and direct adaptation costs

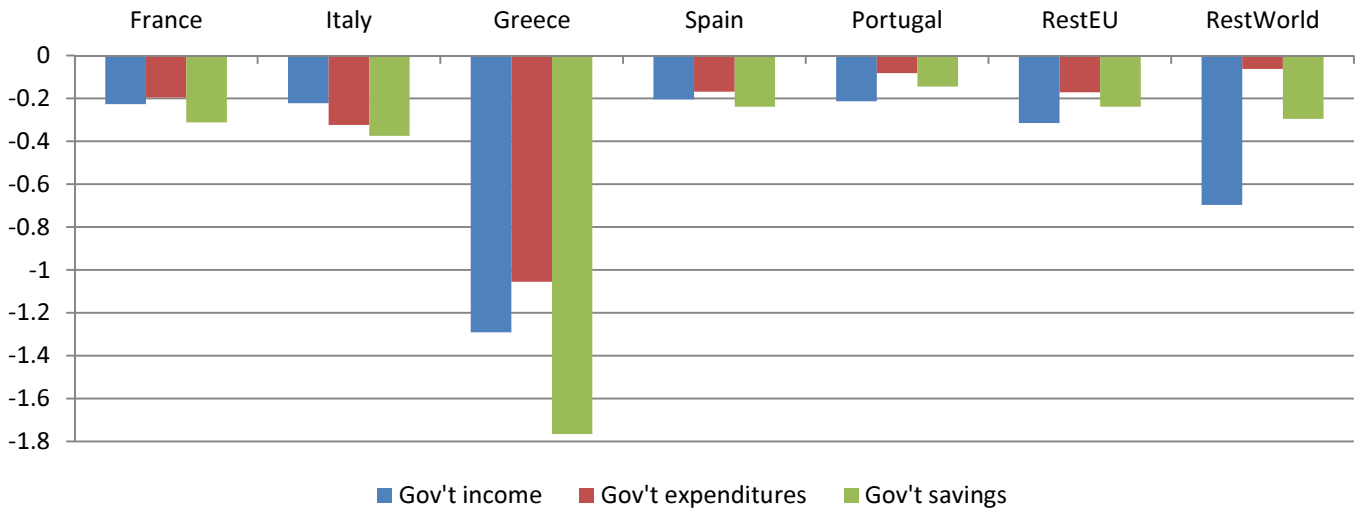
	SLR impacts (% changes in 2050 with respect to 2007)	Adaptation expenditure (2007 US dollar)
France	-0.0197	22132
Greece	-1.9627	6588
Italy	-0.0159	9297
Portugal	-0.2606	5261
Spain	-0.0001	6483
Rest of Eu	-0.2522	417872
Rest of World	-0.4372	2613212

Results: GDP effects

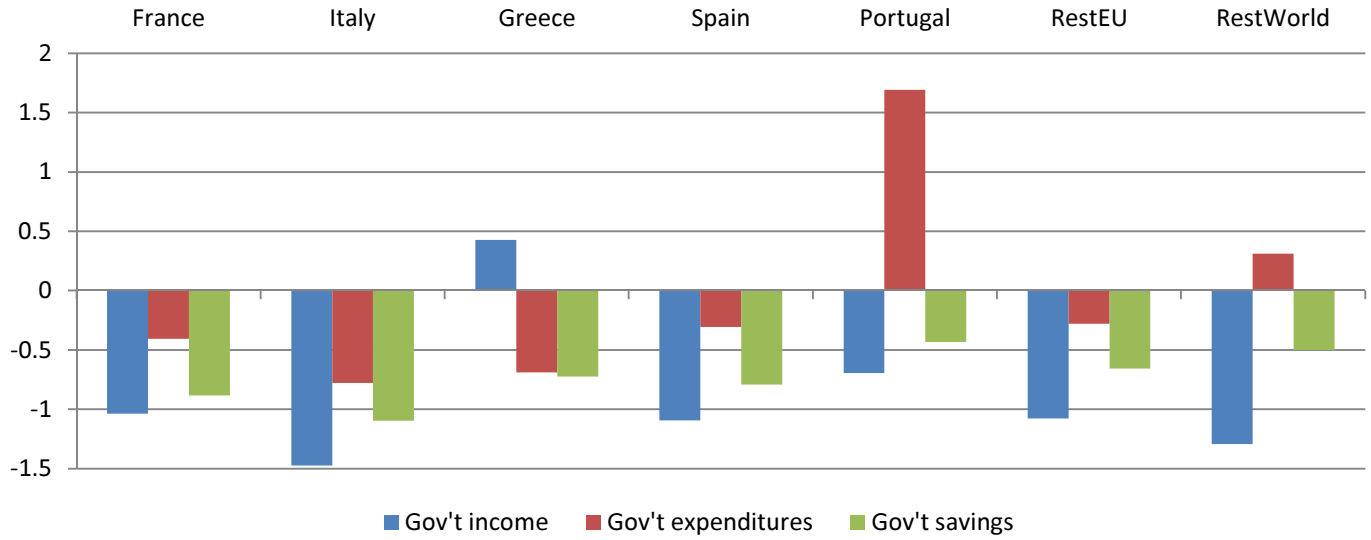


Results: public sector results

- «**no action**» scenario

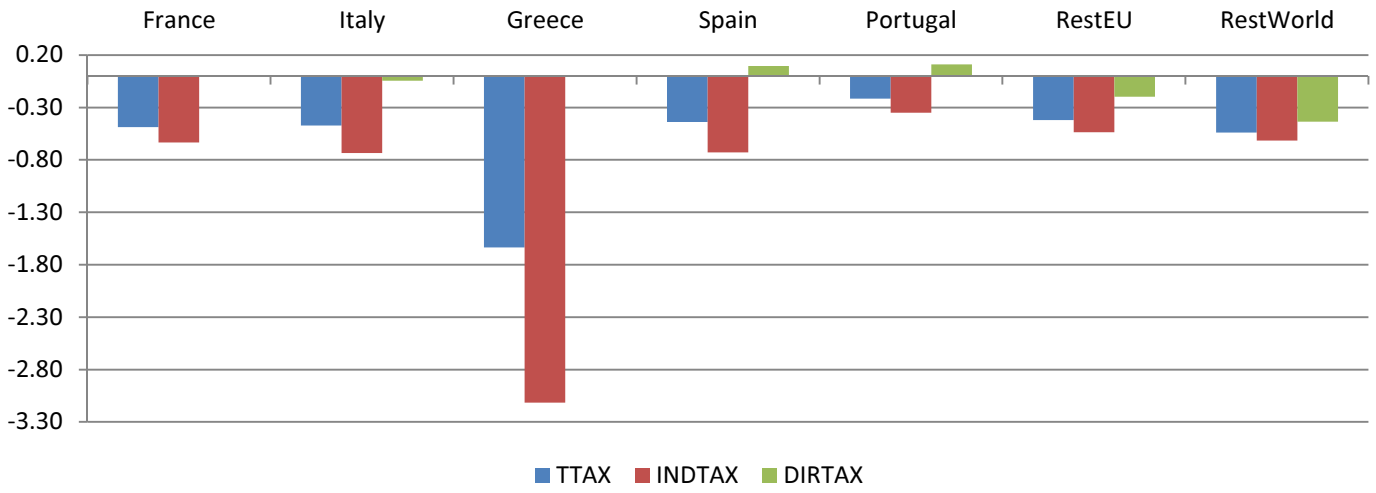


- «**full adaptation**» scenario

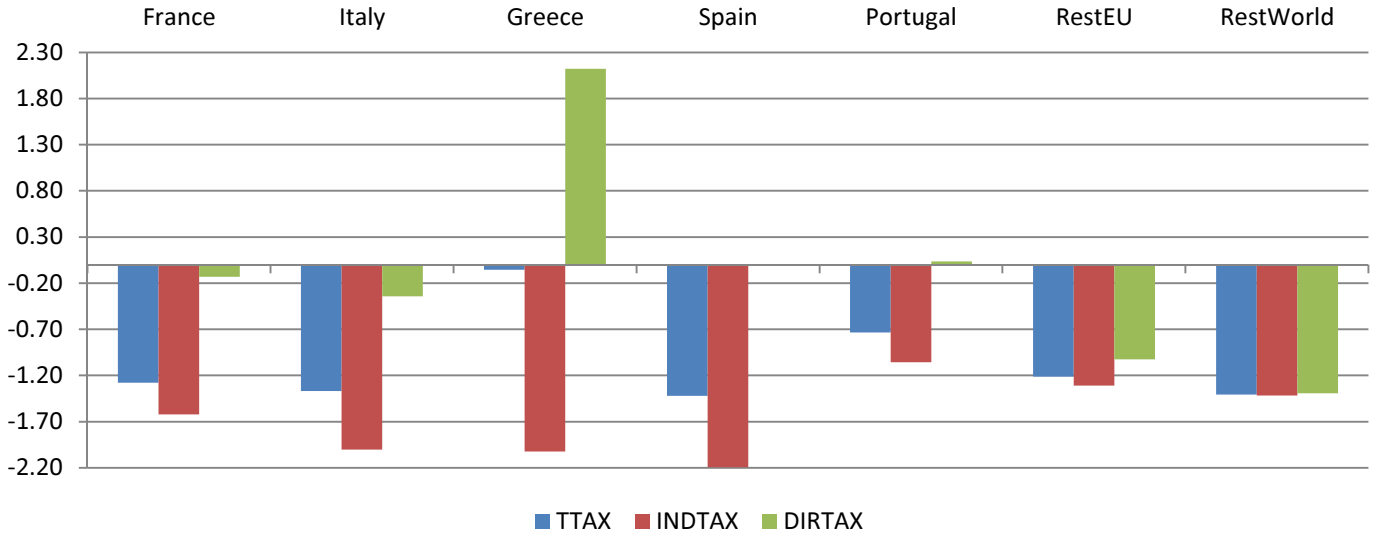


Results: direct and indirect budgetary effects

- «**No action**» scenario



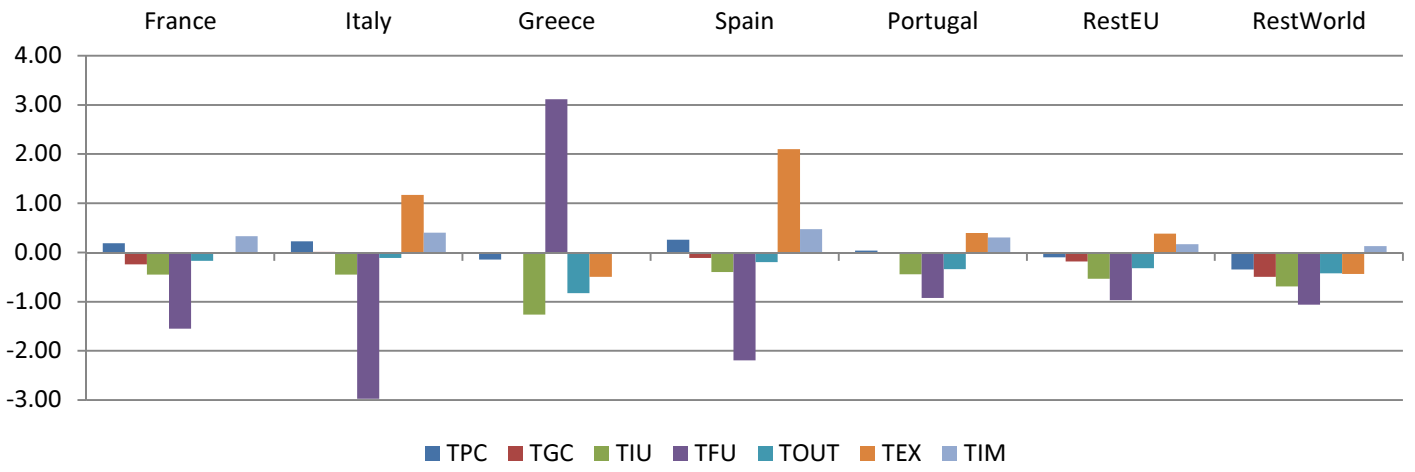
- «**full adaptation**» scenario



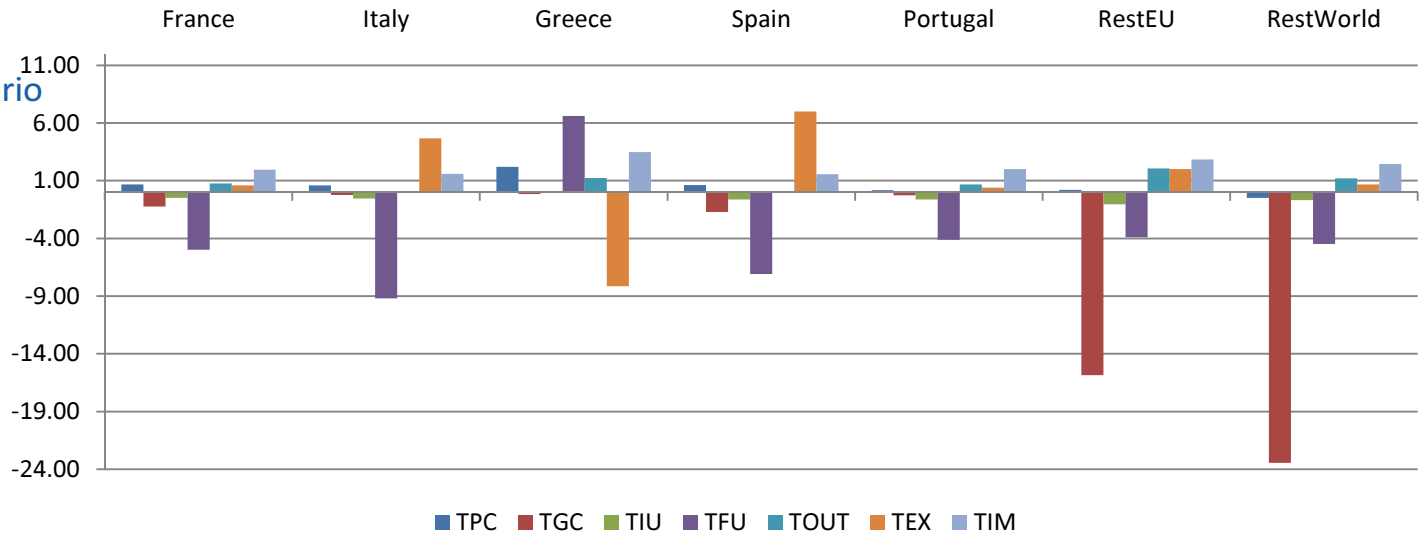
Where: TTAX= total tax revenues; INDTAX= total indirect tax reveneus; DIRTAX= total direct tax revenues

Results: focus on indirect tax revenues

- «**No action**» scenario

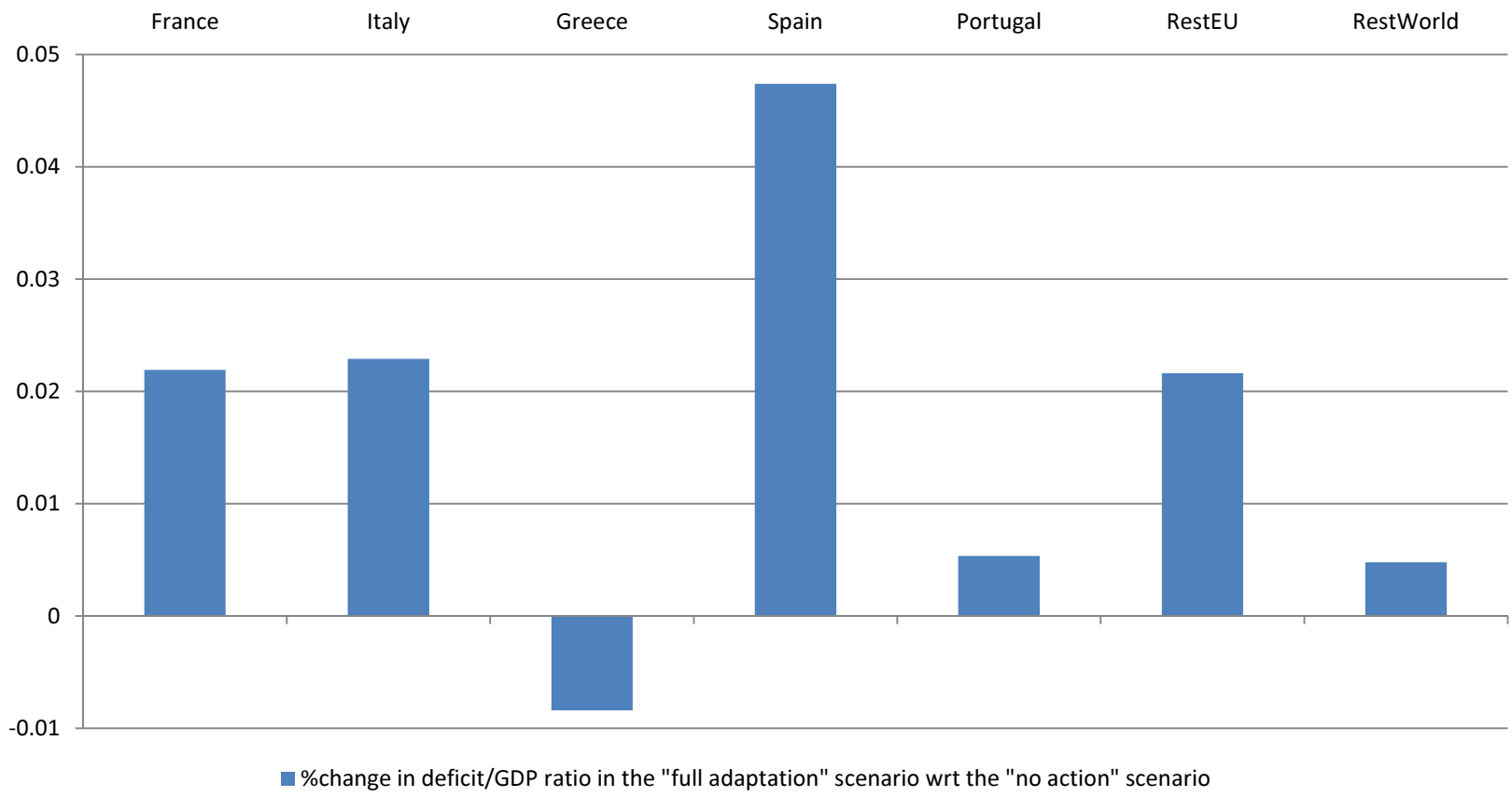


- «**Full adaptation**» scenario



Where: TPC= total tax revenues on private consumption; TGC= total tax revenues on gov't consumption; TIU= total tax revenues on intermediates; TFU= total tax revenues on factor use; TOUT= total tax revenues on production; TEX = total tax revenues on exports;TIM= = total tax revenues on imports

The effects on the Deficit/GDP ratio



Addressing knowledge gaps

1. **Addressed knowledge gaps**:
   a. Introduce an explicit government institution to analyze budgetary effects of adaptation in a general equilibrium framework;
   b. Set up of a framework to analyze indirect budgetary effects of adaptation;

2. **Residual knowledge gaps:**
   a. Introduce recursive dynamics;
   b. Extend the analysis of budgetary effects of adaptation to other Climate Change impacts;
   c. Model adaptation in a more sophisticated way.

Conclusions

1. In a general equilibrium framework, we detect the budgetary effects of adaptation to climate change (specifically to SLR);
2. Adaptation expenditures have effects on both the real side and the budgetary situation of the government;
3. From this analysis we infer that a full adaptation strategy is a winning strategy in terms of GDP and production, and it could have positive effects on the deficit/GDP ratio in most cases.
4. Final results are mainly driven by:
   a. initial impacts;
   b. Structure of the tax system in each country;
   c. Modelling of adaptation.

Thanks for your attention

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