Saving Europe? Some Unpleasant Supply-Side Arithmetic of Fiscal Austerity

Enrique G. Mendoza
University of Pennsylvania and NBER

Linda L. Tesar
University of Michigan and NBER

Jing Zhang
University of Michigan

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Motivation

- Until recently, tax policy debates in Europe centered around harmonization vs. tax competition (Sorensen 2001, Kellerman and Kammer, 2009)
  - efforts to bring national VATs into alignment
  - remove barriers to labor and capital mobility, create integrated factor markets
  - recent (unsuccessful) effort to reach agreement on the CCCTB, the Common Consolidated Corporate Tax Base
- European debt crisis changed the focus from harmonization and put the emphasis on the spillover effects of sovereign default, fiscal consolidation and the need to implement country-specific austerity measures
- Most analysis has focused on countries as separate entities, ignoring the constraints on fiscal policy from being part of an integrated economic union.
  - Evaluation of fiscal space (Abiad and Ostry 2005, Ostry et. al 2010)
  - Laffer curves (Trabandt and Uhlig 2009 and 2012)
  - Fiscal devaluation - tax policy to mimic adjustment in the terms of trade (Farhi, Gopinath and Itskhoki 2011)

This paper

provides a quantitative assessment of alternative tax policies:

- Two country model with integrated capital markets; calibrated to two regions of the European Union; calibration reflects pre-crisis stance of fiscal policy
- Model captures dynamic adjustment in capital and bond holdings
- International spillovers: changes in domestic tax policy will have an impact on foreign allocations, including foreign fiscal balance
- Strategic interactions: impact on revenue when foreign country is passive, and when foreign country adjusts its tax rates (cooperatively or strategically)

The fiscal "shock"

- an unanticipated incease in public debt/GDP (in periphery regions, averaged about 24 percentage points)
- what might countries do to return to solvency?

This paper

Questions we are interested in:

- If government expenditures are unchanged, what are the responses of taxes on factor payments and consumption that could restore fiscal solvency? (given Laffer curves, is there a tax rate that restores solvency?)
- What are the international externalities that result from these unilateral tax policy changes?
- Given international externalities, what happens if national tax authorities recognize these externalities and engage in strategic interactions? Do one-shot Nash outcomes differ from unilateral tax outcomes?
- What is the scope for international cooperation, and over what objectives might governments find room for cooperation?
- What considerations would enter if we introduce haircuts that partially redistribute the effect of the fiscal shock across countries?

International externalities

Three channels for the international transmission of adjustment in domestic tax policy.

1. Relative prices: national tax changes alter the prices of financial assets (including internationally traded assets and public debt instruments) as well as factor prices at home and abroad;
2. World distribution of wealth - allocations of capital and net foreign assets respond to tax changes

   requires solution of both the transition dynamics as well as the change in the long-run equilibrium (which will be a function of the transition dynamics)

3. Erosion of tax revenues - national tax policies affect the ability of foreign governments to raise tax revenue, forcing them to restore their fiscal solvency by adjusting their own taxes or outlays.

We find that these channels are important for evaluating current austerity proposals in Europe. Recognition of spillovers introduces new dimensions for coordinated policy responses.

Framework for analysis

Assumptions:

- government actions fully credible, no time consistency issues
- focus on representative taxpayer, abstract from tax schedules
- flat tax rates on labor, capital and consumption
- taxes reflect overall macro distortions
- empirical methodology allows one to measure taxes using macro data
- flexible prices; single, traded good (eventual extension to include nontraded goods)
- international trade in one-period bonds (limited capital mobility)

Simplicity of model allows one to incorporate dynamics (capital adjustment over time) and capture strategic interactions

Households (home country):

Maximize lifetime utility over consumption and leisure

$$\sum_{t=0}^{\infty} \beta^t \frac{\left(c_t(1-l_t)^a\right)^{1-\sigma}}{1-\sigma},$$

$\sigma > 1$, coefficient of relative risk aversion
$a > 0$, elasticity of labor supply

subject to:

$$\begin{aligned}(1+\tau_c)c_t + (1+\gamma)(k_{t+1} + q_t b_{t+1} + q_t^g d_{t+1}) + \left(\frac{\eta}{2}\left(\frac{x_t}{k_t} - z\right)^2 - 1\right) k_t \\ = (1-\tau_L) w_t l_t + (1-\tau_K)(r_t - \delta)k_t + b_t + d_t + e_t,\end{aligned}$$

b private international bonds (discount bonds with price q)
d government bonds
z steady state investment
η capital adjustment cost
γ rate of rate of labor-augmenting technical progress

Firms:

Maximize profits by hiring capital and labor to equal their marginal product.

Cobb-Douglas production:

$$y_t = F(k_t, l_t) = k_t^{1-\alpha} l_t^{\alpha} = w_t l_t + r_t k_t$$

where $0 < \alpha < 1$, α is labor's share of income

Public sector:

$$d_t - (1+\gamma) q_t^g d_{t+1} = \tau_C c_t + \tau_L w_t L_t + \tau_K (r_t - \delta) k_t - (g_t + e_t)$$

d_t government debt
g_t government spending
e_t transfers

- Left hand size: the change in government debt
- Right hand size: the primary government deficit
- No international trade in equity or in government bond

Competitive equilibrium

A competitive equilibrium for this two-region economy is a sequence of prices the $\{r_t,\ r_t^*,\ q_t,\ q_t^g,\ q_t^{g*},\ w_t,\ w_t^*\}$ and allocations $\{k_{t+1},\ k_{t+1}^*,\ b_{t+1},\ b_{t+1}^*,\ x_t,\ x_t^*,\ l_t,\ l_t^*,\ c_t,\ c_t^*,\ d_{t+1},\ d_{t+1}^*\}$ for $t = 0, ..., \infty$ such that: (a) households in each region maximize utility subject to budget constraints and no-Ponzi game constraints, taking as given all fiscal policy variables as well as pre-tax prices and factor rental rates, (b) firms maximize profits subject to the Cobb-Douglas technologies taking as given pre-tax factor prices, and (c) the government budget constraints hold for given tax rates and exogenous sequences of government purchases and entitlements, and (d) the following market-clearing conditions hold in the global markets of goods and bonds:

$$y_t + y_t^* = c_t + c_t^* + x_t + \frac{\eta}{2}\left[\frac{x_t}{k_t} - z\right]^2 k_t + x_t^* + \frac{\eta^*}{2}\left[\frac{x_t^*}{k_t^*} - z^*\right]^2 k_t^* + g_t + g_t^*,$$

$$b_t + b_t^* = 0$$

Three Tax Wedges

$$\frac{(1+\gamma)u_1(c_t, 1-l_t)}{\beta u_1(c_{t+1}, 1-l_{t+1})} = (1-\tau_K)[F_1(k_{t+1}, l_{t+1}) - \delta] + 1 = \frac{1}{q_t} = \frac{1}{q_t^g}$$

$$\frac{(1+\gamma)u_1(c_t^*, 1-l_t^*)}{\beta u_1(c_{t+1}^*, 1-l_{t+1}^*)} = (1-\tau_K^*)[F_1(k_{t+1}^*, l_{t+1}^*) - \delta] + 1 = \frac{1}{q_t} = \frac{1}{q_t^{g*}}$$

$$\frac{u_2(c_t, 1-l_t)}{u_1(c_t, 1-l_t)} = \frac{(1-\tau_L)}{(1+\tau_C)} F_2(k_t, l_t)$$

- MRS in consumption will be equalized across countries
- Capital MPK can differ across countries
- τ_L and τ_C jointly distort the *intratemporal* relationship between the marginal product of labor and the MRS between leisure and consumption.
- τ_L and τ_C do not have symmetric implications for revenue, consumption tax is like a wealth tax; receive more revenue from τ_C per unit of distortion

Calibration

We group eurozone countries into two regions:

Region H: GIIPS (Greece, Ireland, Italy, Portugal, Spain)

- larger debt/GDP
- trade balance deficits

Region F: EU10 (Austria, Belgium, Estonia, Finland, France, Germany, Luxembourg, Netherlands, Slovakia, Slovenia)

- lower debt/GDP
- lower private consumption

Calibrate to fiscal policy and macro aggregates as of 2008.

Measuring tax distortions: Aggregate effective tax rates

Mendoza, Razin and Tesar (1994)
Carey and Tchilinguirian (2000)
Sorensen (2001)
Trabandt and Uhlig (2009, 2012)

Why not use statutory tax rates?

- Taxes can have different labels, but effectively generate the same distortion
- Differences and complexity of tax exemptions, deductions and credits make it difficult to judge actual tax burdens from stated tax rates
- Tax system itself does not conform to macro model
- Available information on tax systems varies across countries

This approach relies on the wedge between reported pre-tax and post-tax macro variables. These are equivalent to relationships between tax bases (pre-tax) and tax revenues (revenues collected on that base).

Details on labor and capital income taxes

- contribution of employers to social security and private pension plans - modification to the original Mendoza, Razin and Tesar calculations - will make labor tax base bigger and therefore labor tax smaller than previous estimates

- treatment of income of self-employed workers - adjustment made by Trabandt and Uhlig and Carey and Tchilingiurian, not made here. Requires assumption about fraction of labor income that should be attributed to "capital" as owners of their own firms.

Pre-tax reform calibration

$$\frac{k}{y} = \frac{\beta(1-\alpha)(1-\tau_K)}{(1+\gamma)-\beta[1-\delta(1-\tau_K)]}$$

$$\frac{x}{y} = (\gamma+\delta)\frac{k}{y}$$

$$\frac{c}{y} = 1 - \frac{x}{y} - \frac{g}{y} - \frac{tb}{y}$$

$$I = \frac{\left(\frac{1-\tau_L}{1+\tau_C}\right)\alpha}{a\frac{c}{y} + \left(\frac{1-\tau_L}{1+\tau_C}\right)\alpha}$$

First two can be solved knowing capital tax rate and technology parameters. Second two depend on dynamics of NFA position.

Steady state allocations

Technology and preferences

symbol	value	definition and source
δ	0.015	quarterly rate of depreciation (6% p.a.)
α	0.61	labor share of income, based on EU labor market share
γ	0.002	rate of labor-augmenting technical change (0.9% p.a.)
η	2	capital adjustment cost
β	0.991	rate of time discount (1% p.a.)
σ	2	coefficient of risk aversion
a	2.675	Frisch elasticity of labor supply
ϕ	0.544	(GIIPS GDP)/(EU10 GDP) in 2008

Steady state allocations

Fiscal policy parameters and balanced-growth allocations

		GIIPS		EU10	
		DATA	MODEL	DATA	MODEL
*	τ_C	0.14	0.14	0.18	0.18
*	τ_L	0.33	0.33	0.36	0.36
*	τ_K	0.20	0.20	0.21	0.21
*	g/y	0.20	0.20	0.21	0.21
	REV$/y$	0.36	0.33	0.39	0.36
	Transfers$/y$	0.16	0.13	0.18	0.15
	c/y	0.59	0.61	0.55	0.55
	x/y	0.24	0.23	0.20	0.23
*	tb/y	-0.03	-0.03	0.03	0.02

Fiscal policy adjustment in Europe

Baseline is the stance of fiscal policy in Europe in 2008, just prior to financial crisis
Government budget constraint from date 0 (2008) forward:

$$\frac{d_0}{y_0} = \left[\sum_{t=0}^{\infty}(\Pi_{s=0}^{t} q_s)\,(REV_t - EXP_t)\right]\frac{1}{y_0}$$

where $EXP_t = g_t + e_t$

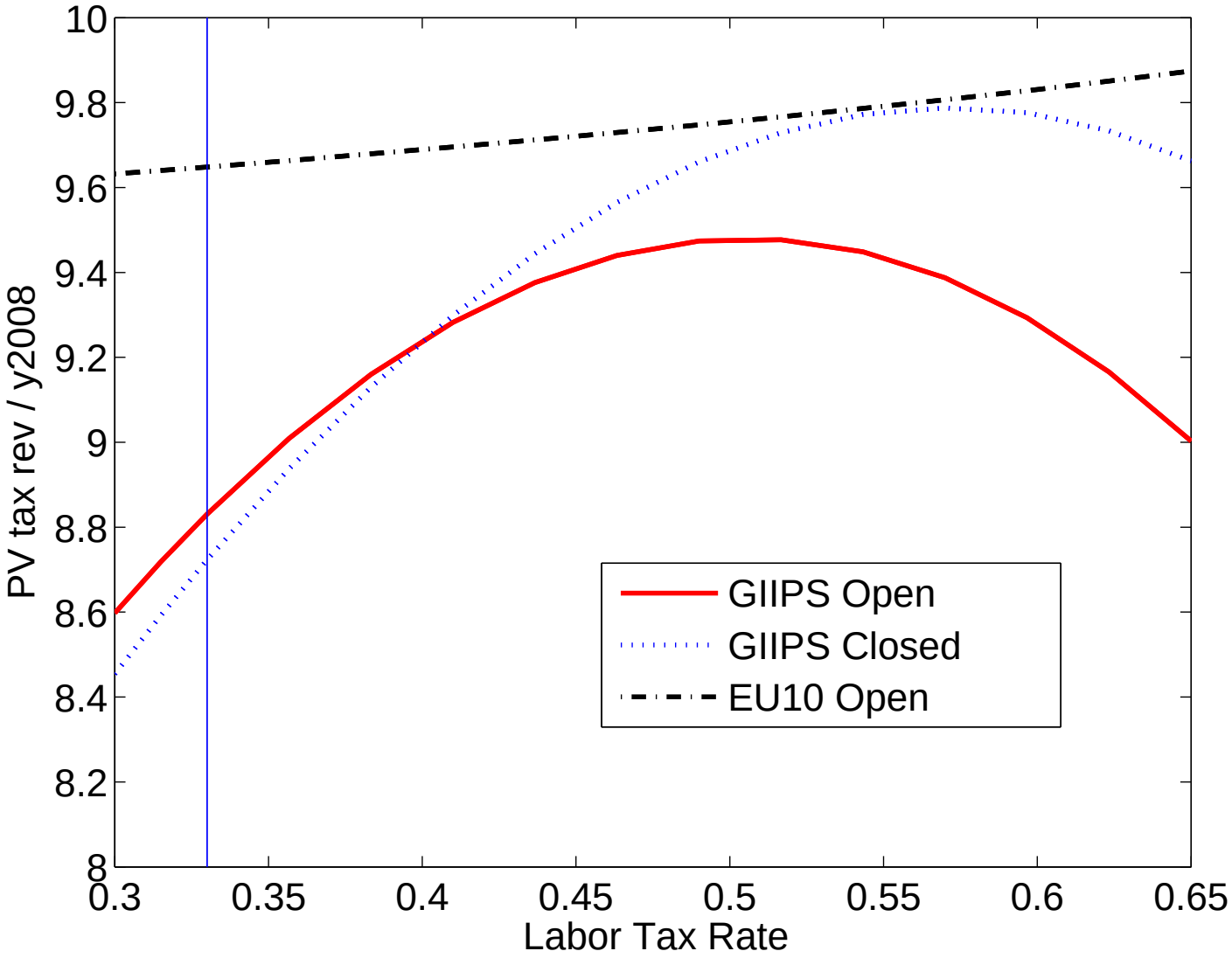
- Assume no Ponzi scheme on debt (i.e. tax and expenditure policy as of 2008 was sustainable).
- Assume some shock occurs to bump up government debt (bank bailout? Higher transfer payments? Collapse of property taxes?)

GIIPS: increase of 0.24 of 2008 GDP
EU10: increase of 0.17 of 2008 GDP

Solution

- Shooting algorithm to jointly solve for transition path and post-reform steady state allocations
- Long run consumption depends on steady state external debt, which is endogenous to transition path.
- In closed economy welfare gains will be different because household trades off long-run benefits of higher capital stock against short-run sacrifice of consumption (savings) to accumulate capital
- In open economy, cost of transition can be smoothed through international borrowing. Will affect welfare, could alter foreign fiscal balance and will affect the trade balance.

Figure: Laffer Curves for the GIIPS Labor Tax Rate



Macroeconomic Effects of an Increase in the Labor Tax Rate, GIIPS

	Open Economy				Closed Economy	
	GIIPS		EU10		GIIPS	
Tax rates	Old	New	Old	New	Old	New
τ_C	0.14	0.14	0.18	0.18	0.14	0.14
τ_L	0.33	0.37	0.36	0.36	0.33	0.37
τ_K	0.21	0.21	0.20	0.20	0.21	0.21
Change in PV of tax rev as % of initial GDP		0.24		0.02		0.30
Welfare effects (percent)						
Transitional cost		0.24		0.33		0.79
+ steady-state gain		-2.31		-0.22		-2.67
= net change		-2.07		0.11		-1.88
Percentage changes	Impact Effect	Long-Run Effect	Impact Effect	Long-Run Effect	Impact Effect	Long-Run Effect
y	-1.91	-4.22	-0.38	0.26	-2.49	-3.58
c	-3.74	-4.73	-0.38	-0.06	-3.14	-4.82
k	0.00	-4.22	0.00	0.26	0.00	-3.58
Percentage point changes						
tb/y	2.69	-0.56	-1.53	0.23		
x/y	-2.06	-0.00	1.07	0.00	-0.12	0.00
r	-0.00	0.00	-0.00	0.00	-0.00	0.00
$1 - l$	0.57	0.77	0.12	-0.05	0.77	0.68

Figure: Macro Responses to a Labor Tax Rate Increase in GIIPS

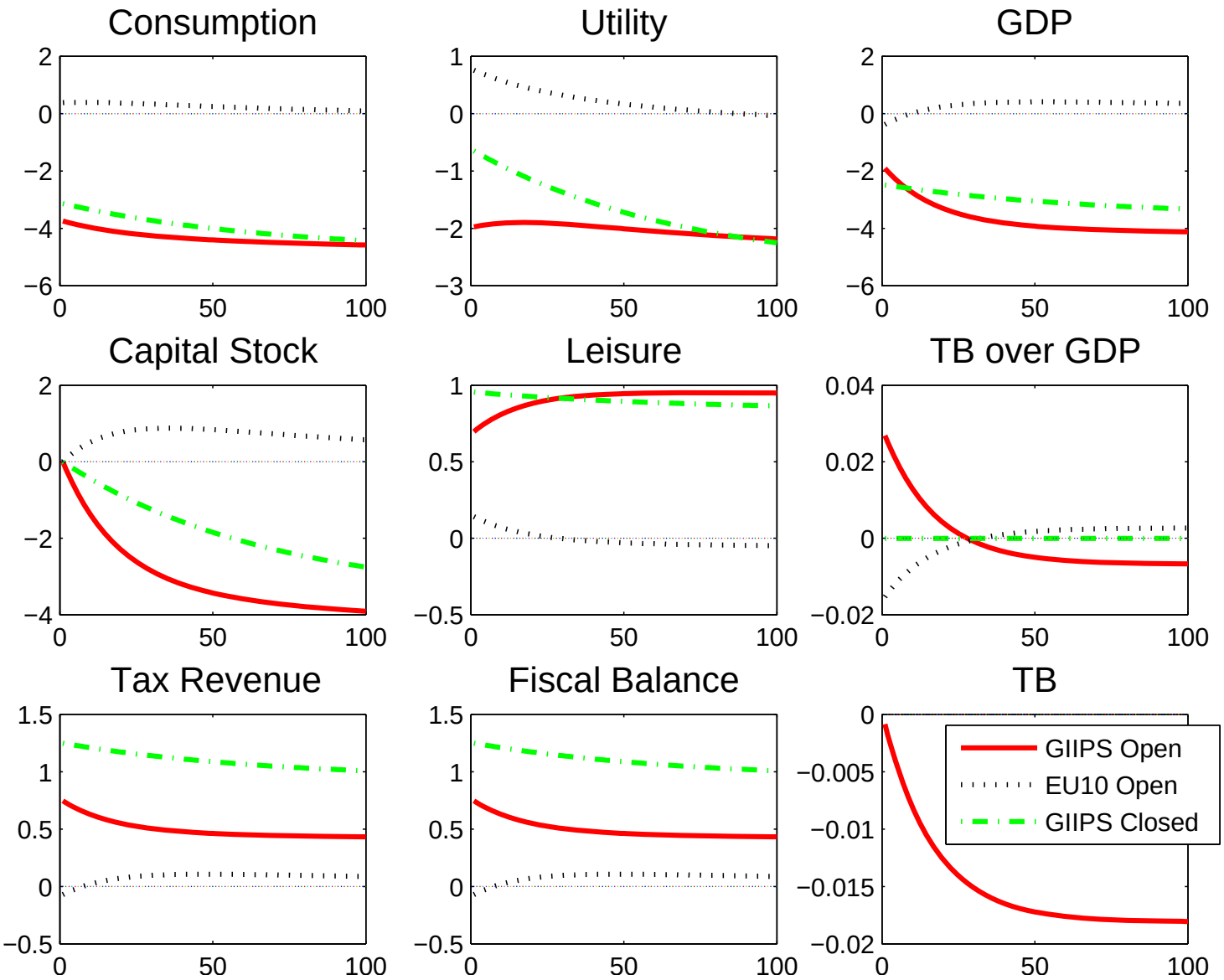
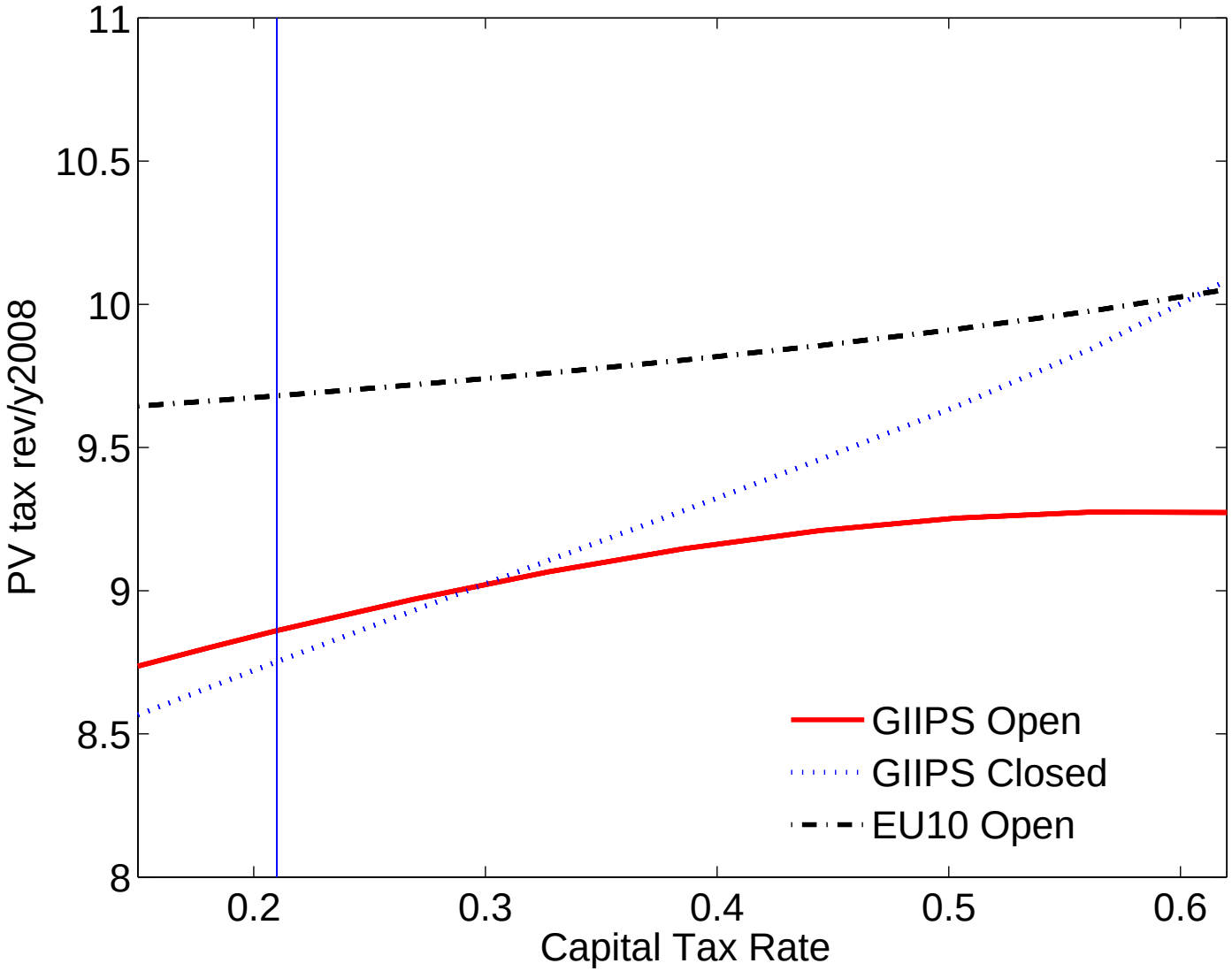


Figure: Laffer Curves for the GIIPS Capital Tax Rate



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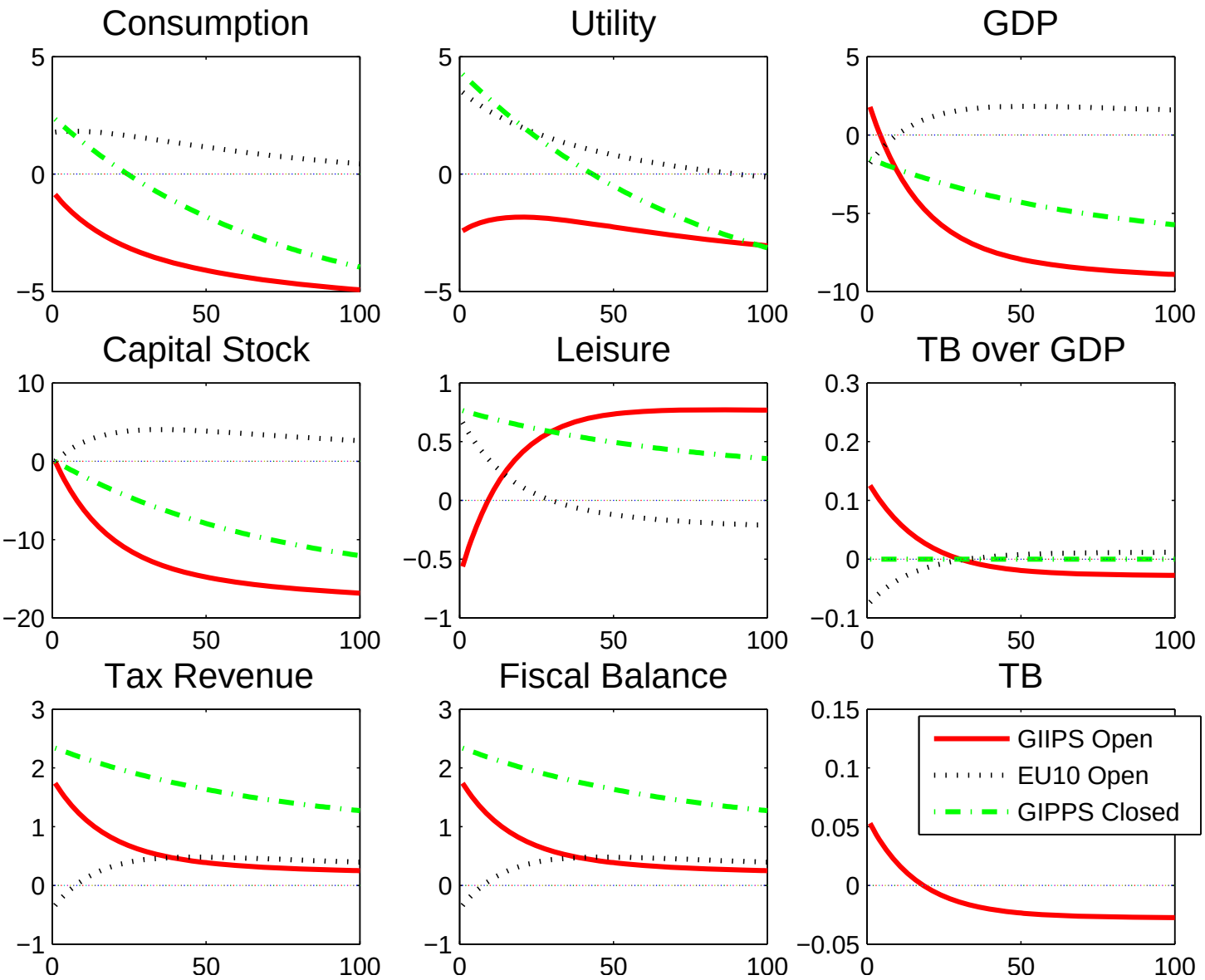
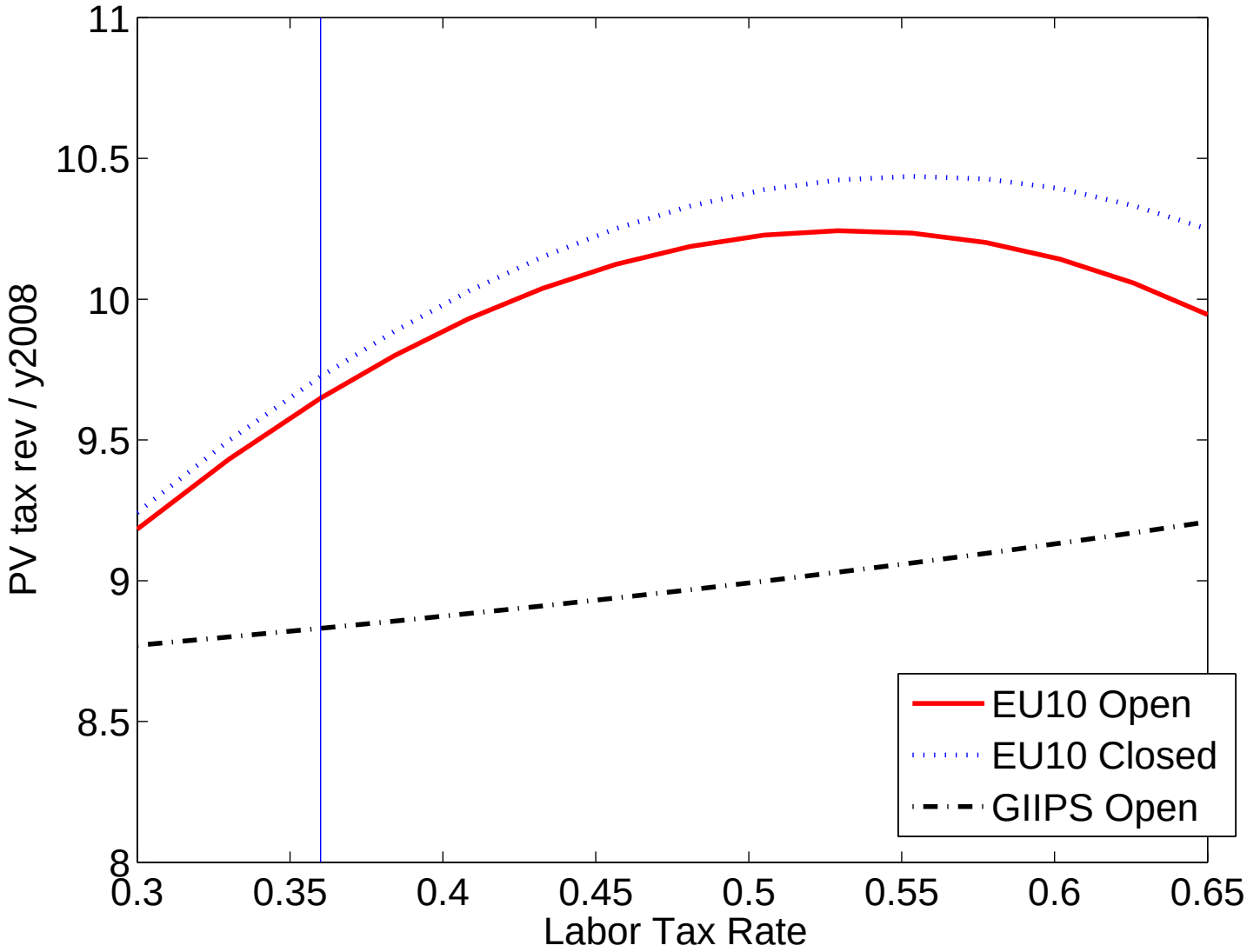


Macroeconomic Effects of an Increase in the Capital Tax Rate, GIIPS

	Open Economy				Closed Economy	
	GIIPS		EU10		GIIPS	
Tax rates	Old	New	Old	New	Old	New
τ_C	0.14	0.14	0.18	0.18	0.14	0.14
τ_L	0.33	0.33	0.36	0.36	0.33	0.33
τ_K	0.21	0.35	0.20	0.20	0.21	0.35
Change in PV of tax rev as % of initial GDP		0.24		0.10		0.43
Welfare effects (percent)						
Transitional cost		1.06		1.54		4.00
+ steady-state gain		-3.75		-0.99		-5.60
= net change		-2.69		0.55		-1.60
Percentage changes	Impact Effect	Long-Run Effect	Impact Effect	Long-Run Effect	Impact Effect	Long-Run Effect
y	1.79	-9.47	-1.79	1.19	-1.53	-7.19
c	-0.87	-5.64	1.79	-0.27	2.34	-6.14
k	0.00	-18.28	0.00	1.19	0.00	-16.23
Percentage point changes						
tb/y	12.55	-2.43	-7.32	1.04		
x/y	-11.08	-2.21	5.14	0.00	-2.57	-2.21
r	-0.00	0.00	-0.00	0.00	-0.00	-0.00
$1 - l$	-0.46	0.61	0.54	-0.22	0.62	0.17

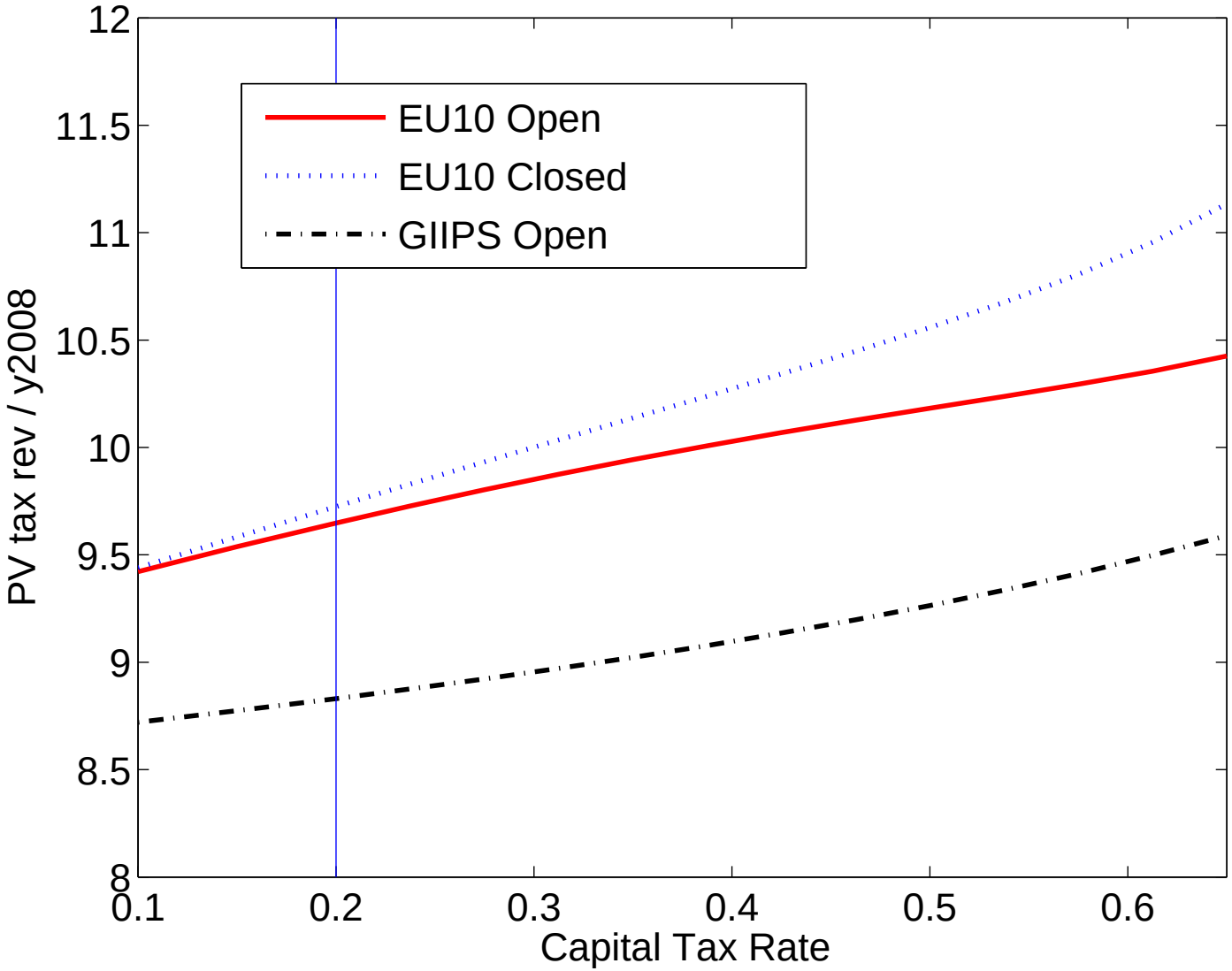
Figure: Laffer Curves for the EU10 Labor Tax Rate



Macroeconomic Effects of an Increase in the EU10 Labor Tax Rate

	Open Economy				Closed Economy	
	GIIPS		EU10		EU10	
Tax rates	Old	New	Old	New	Old	New
τ_C	0.14	0.14	0.18	0.18	0.14	0.18
τ_L	0.33	0.33	0.36	0.39	0.33	0.33
τ_K	0.21	0.21	0.20	0.20	0.21	0.21
Change in PV of tax rev as % of initial GDP		0.03		0.17		0.18
Welfare effects (percent)						
Transitional cost		0.42		0.35		0.60
+ steady-state gain		-2.00		-0.99		-2.18
= net change		0.08		-1.65		-1.58
Percentage changes	Impact Effect	Long-Run Effect	Impact Effect	Long-Run Effect	Impact Effect	Long-Run Effect
y	-0.46	0.41	-1.59	-2.88	-1.91	-2.73
c	0.46	-0.09	-2.74	-3.69	-2.45	-3.74
k	0.00	0.41	0.00	-2.88	0.00	-2.73
Percentage point changes						
tb/y	-2.01	0.38	1.17	-0.17		
x/y	1.43	0.00	-0.90	-0.00	-0.09	-0.00
r	-0.00	0.00	-0.00	0.00	-0.00	0.00
$1 - l$	0.14	-0.08	0.48	0.53	0.57	0.49

Figure: Laffer Curves for the EU10 Capital Tax Rate



Macroeconomic Effects of an Increase in the EU10 Capital Tax Rate

	Open Economy				Closed Economy	
	GIIPS		EU10		EU10	
Tax rates	Old	New	Old	New	Old	New
τ_C	0.14	0.14	0.18	0.18	0.14	0.18
τ_L	0.33	0.33	0.36	0.36	0.33	0.33
τ_K	0.21	0.21	0.20	0.28	0.21	0.21
Change in PV of tax rev as % of initial GDP		0.10		0.17		0.23
Welfare effects (percent)						
Transitional cost		1.50		1.25		2.13
+ steady-state gain		-1.19		-2.43		-3.07
= net change		0.31		-1.18		-0.94
Percentage changes	Impact Effect	Long-Run Effect	Impact Effect	Long-Run Effect	Impact Effect	Long-Run Effect
y	-1.65	1.45	0.00	-4.71	-1.00	-3.97
c	1.64	-0.32	0.25	-3.19	1.22	-3.60
k	0.00	1.45	0.00	-9.83	0.00	-9.13
Percentage point changes						
tb/y	-7.22	1.34	3.95	-0.69		
x/y	5.10	0.00	-4.22	-1.23	-1.48	-1.23
r	-0.00	0.00	-0.00	0.00	-0.00	0.00
$1 - l$	0.49	-0.27	0.03	0.24	0.34	0.09

Summary of Open-Economy Laffer curve results:

Labor tax:

- Can meet the revenue target before hitting peak of Curve
- about 30% less revenue relative to the closed economy
- home welfare declines about 3%, foreign welfare increases
- foreign revenue increases 0.02 toward target - with a utility gain

Capital tax:

- Can meet revenue target, but requires large change in τ_K and large losses in output and welfare
- Much greater spillover effect due to capital mobility (closed economy revenue higher)
- home welfare decline of -3%, foreign welfare increase of 0.55%
- foreign revenue increases by 0.10 — 2/3 of their revenue target

This analysis understates the cost of unilateral austerity:

Three reasons:

1. In our model, capital adjusts slowly; most of the revenue gain is from the "surprise" tax on capital during the transition. Explains why steady-state/static Laffer curves peak earlier.
2. We assume growth rates are invariant to taxes.
3. We assume that all countries in a region act in unison.

Peak Increase in Tax Revenues in GIIPS Countries

	Country Size	ΔDebt/y2008	Max Rev Increase/y2008 of Capital Tax	Labor Tax
Greece	0.026	0.40	0.145	0.517
Ireland	0.020	0.50	0.143	0.515
Italy	0.206	0.15	0.232	0.572
Portugal	0.019	0.36	0.142	0.514
Spain	0.134	0.27	0.199	0.552

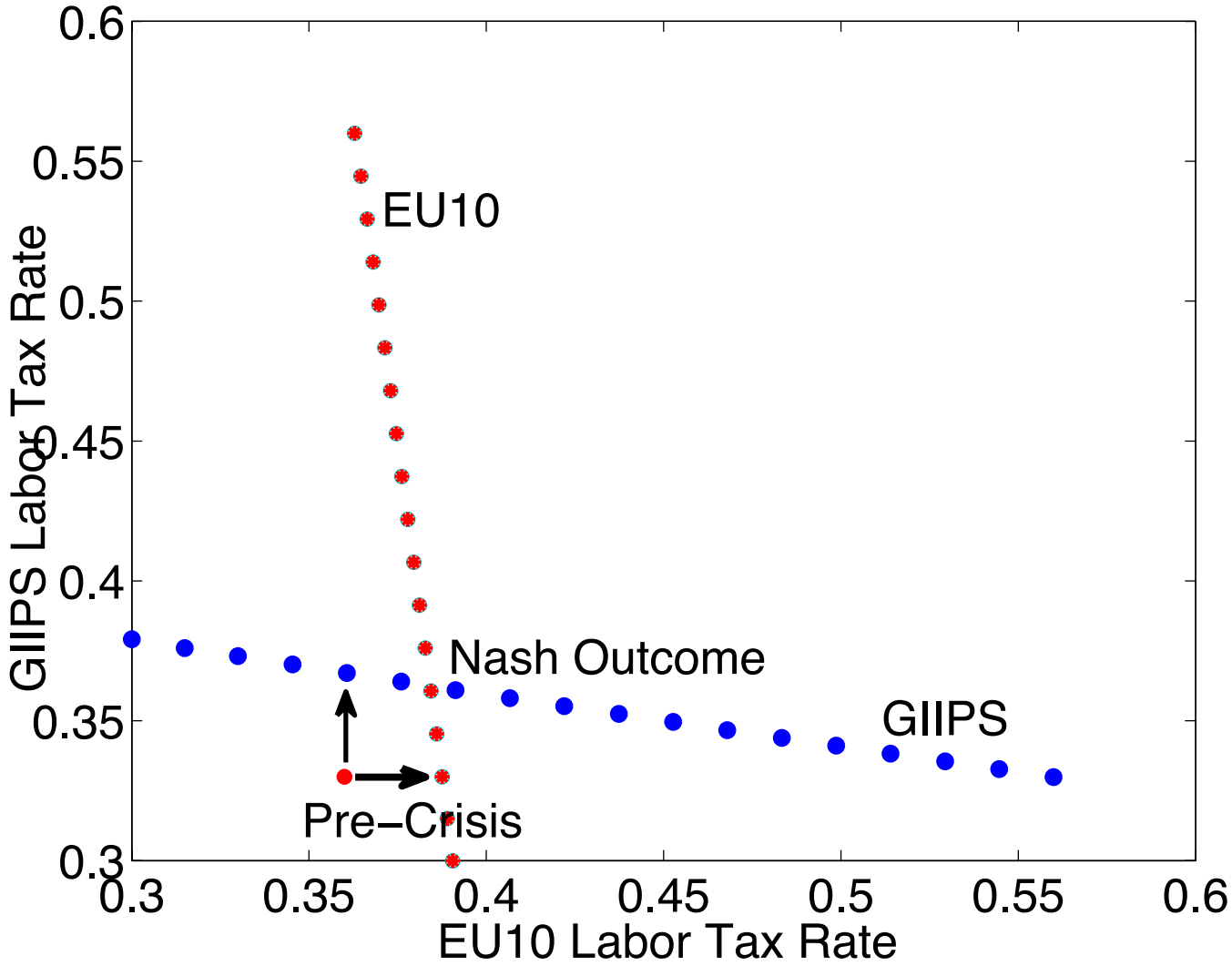
Strategic interations:

Stage 1: Nash game over a single tax instrument: given the other region's tax rate, choose a tax rate such that

1. all equilibrium conditions are satisfied
2. region meets revenue target
3. region incurs lowest utility cost

Nash Equilibrium

Figure: Best Responses over Labor Tax Rates



Conclusions

- Large magnitude of spillover effects from national tax policy changes, both in terms of revenue creation and welfare
- Failure to internalize the effects of tax base erosion will lead to overestimates of revenue
- Austerity together is less painful than austerity alone
- Expenditures (not explicitly modeled here):
  - if G is nonproductive, cut in G is equivalent to an increase in lump sum taxes (similar to an increase in τ_C)
  - if G is productive, cut in G is analogous to an increase in τ_L
  - how big these effects are depends on the role of G in the economy
- Haircut (also not explicitly modeled here):
  - its effect is similar to a lower (higher) revenue target for GIIPS (EU10)