



CENTRE
INTERNATIONAL
DE RECHERCHE
SUR L'ENVIRONNEMENT
ET LE DÉVELOPPEMENT

The cost of climate policies in a second best world with labour market imperfections

(forthcoming in Climate Policy)

Céline Guivarch, Renaud Crassous, Olivier Sassi and Stéphane Hallegatte

guivarch@centre-cired.fr

WCERE, Montreal, 1 July 2010



Chaire Modélisation prospective
au service du développement durable

ParisTech
INSTITUT DES SCIENCES ET TECHNOLOGIES
PARIS INSTITUTE OF TECHNOLOGY

Climate Change mitigation: challenging physics but good economic news?

Global macroeconomic cost of stabilization – in 2030

Stabilization levels (ppm CO ₂ -eq)	Median GDP reduction ^{d)} (%)	Range of GDP reduction ^{d), e)} (%)	Reduction of average annual GDP growth rates ^{d), f)} (percentage points)
590-710	0.2	-0.6-1.2	<0.06
535-590	0.6	0.2-2.5	<0.1
445-535 ^{g)}	not available	<3	<0.12

Global macroeconomic cost of stabilization – in 2050

Stabilization levels (ppm CO ₂ -eq)	Median GDP reduction ^{b)} (%)	Range of GDP reduction ^{b), c)} (%)	Reduction of average annual GDP growth rates ^{b), d)} (percentage points)
590-710	0.5	-1 - 2	<0.05
535-590	1.3	slightly negative - 4	<0.1
445-535 ^{e)}	not available	<5.5	<0.12

Macroeconomic cost measured as the variation of global GDP between a stabilization scenario and a reference scenario.

IPCC, 2007

A caveat: « first best » assumptions

- IPCC Summary for Policy Makers Box 3:

*“Most models use a global **least cost** approach to mitigation portfolios and with universal emissions trading, assuming **transparent markets, no transaction cost**, and thus **perfect implementation** of mitigation measures throughout the 21st century.”*

- *Focus on imperfections in markets for energy efficiency: ‘efficiency gap’...*
- *Less attention of imperfections outside the energy sphere: non-energy markets, capital, labour...*
- *‘Double dividend’ and labour market dynamics (Bovenberg and van der Ploeg, 1996), (Welsch, 1996), (Carraro et al., 1996)*
- *Issue of labour market imperfections neglected since then*
- *Models based on full utilization of labour and capital along stabilized growth pathways*

Re-opening the issue of labour markets imperfections and climate mitigation

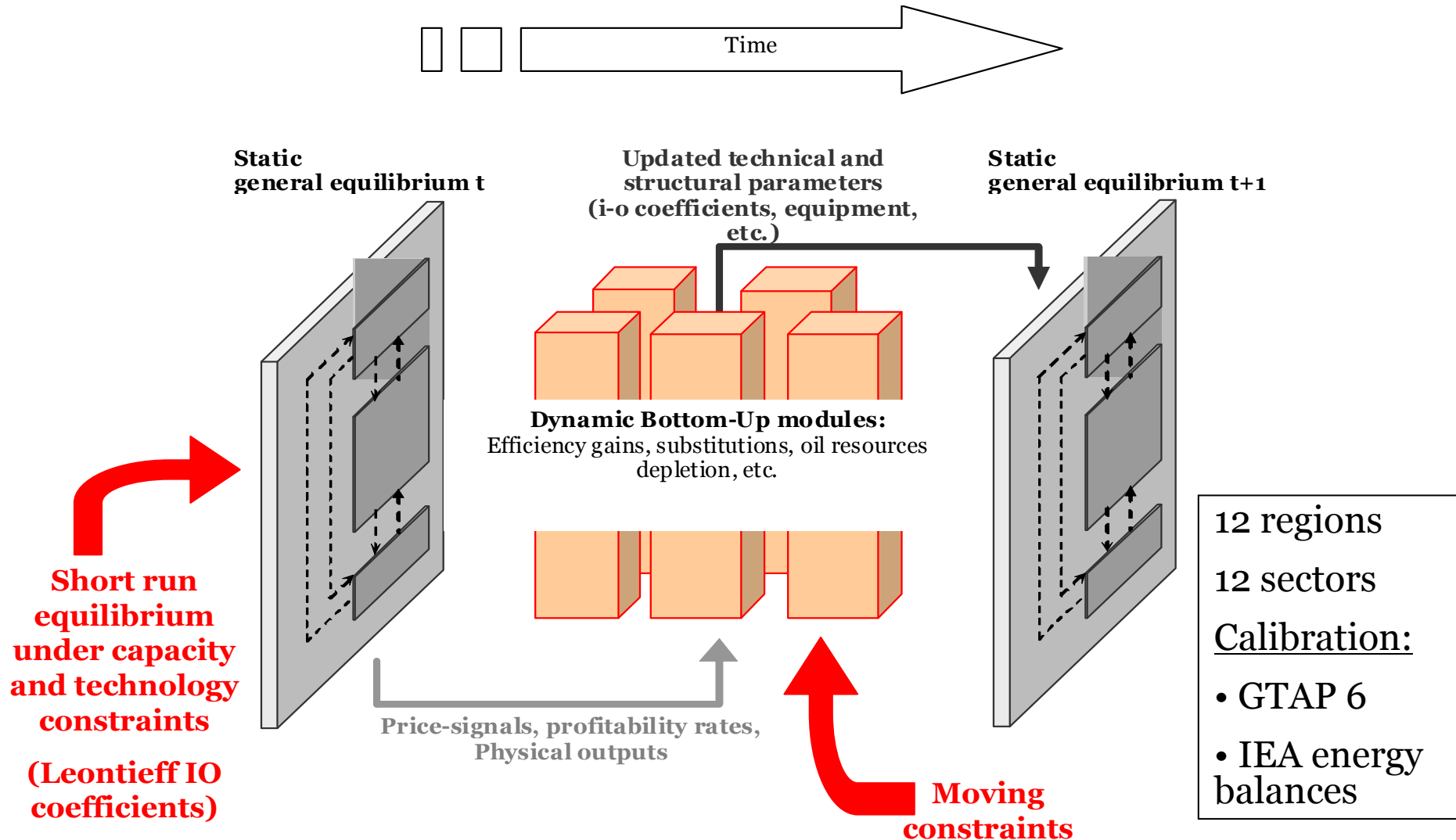
- Almost all numerical models used for mitigation costs evaluation assume perfect labour markets
- Contrast with real world labour markets:
 - **Rigidities in labour mobility:** geographic immobility, time-consuming job search process, skills required;
 - **Rigidities in wages:** bargaining power, work contracts, laws on minimum wages...

Re-opening the issue of labour markets imperfections and climate mitigation

- Almost all numerical models used for mitigation costs evaluation assume perfect labour markets
 - Contrast with real world labour markets:
 - **Rigidities in labour mobility:** geographic immobility, time-consuming job search process, skills required;
 - **Rigidities in wages:** bargaining power, work contracts, laws on minimum wages...
- Risk of missing to identify policies to reconcile employment and climate
- Risk of under-estimating the costs of mitigation?

IMACLIM-R

A hybrid recursive dynamic approach to disentangle short run constraints/adjustments and long run dynamics



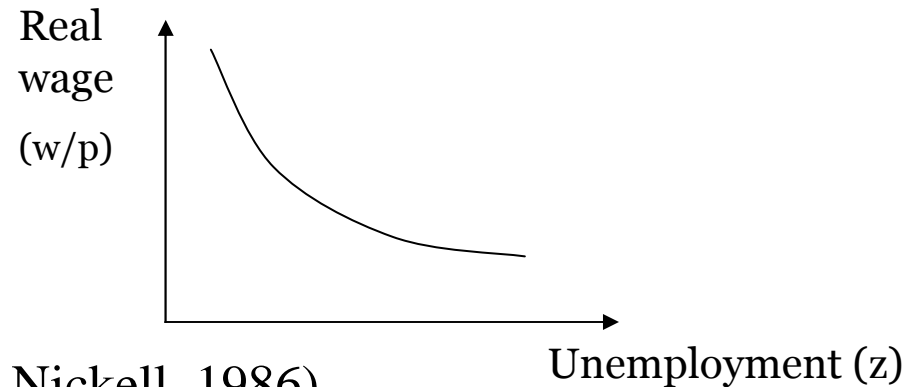
Representing unemployment

- No substitution on the short-run: fixed coefficients $l_{k,i}$ for labour input per unit of output
- Installed productive capacities not mobile across sectors: limits the reallocation of production $Q_{k,i}$, hence jobs, between sectors
- Unemployment z_k (under-utilization of the labour force L_k)

$$z_k = 1 - \frac{\sum_i l_{k,i} \cdot Q_{k,i}}{L_k}$$

Representing real wages rigidities

- Wage curve (or wage setting curve): Phelps (1992), Lindbeck (1993), Layard et al. (2005)



- Interpretations:
 - Bargaining approach (Layard and Nickell, 1986)
 - Wage-efficiency approach (Shapiro and Stiglitz, 1984)
- Microeconomic evidences: Blanchflower and Oswald (1995)
- Regional wage curves

$$\frac{w_k}{pind_k} = aw \cdot \frac{wref_k}{pindref_k} \cdot \left(\frac{z_k}{zref_k} \right)^{-\alpha}$$

Exploring the influence of the wage curve elasticity

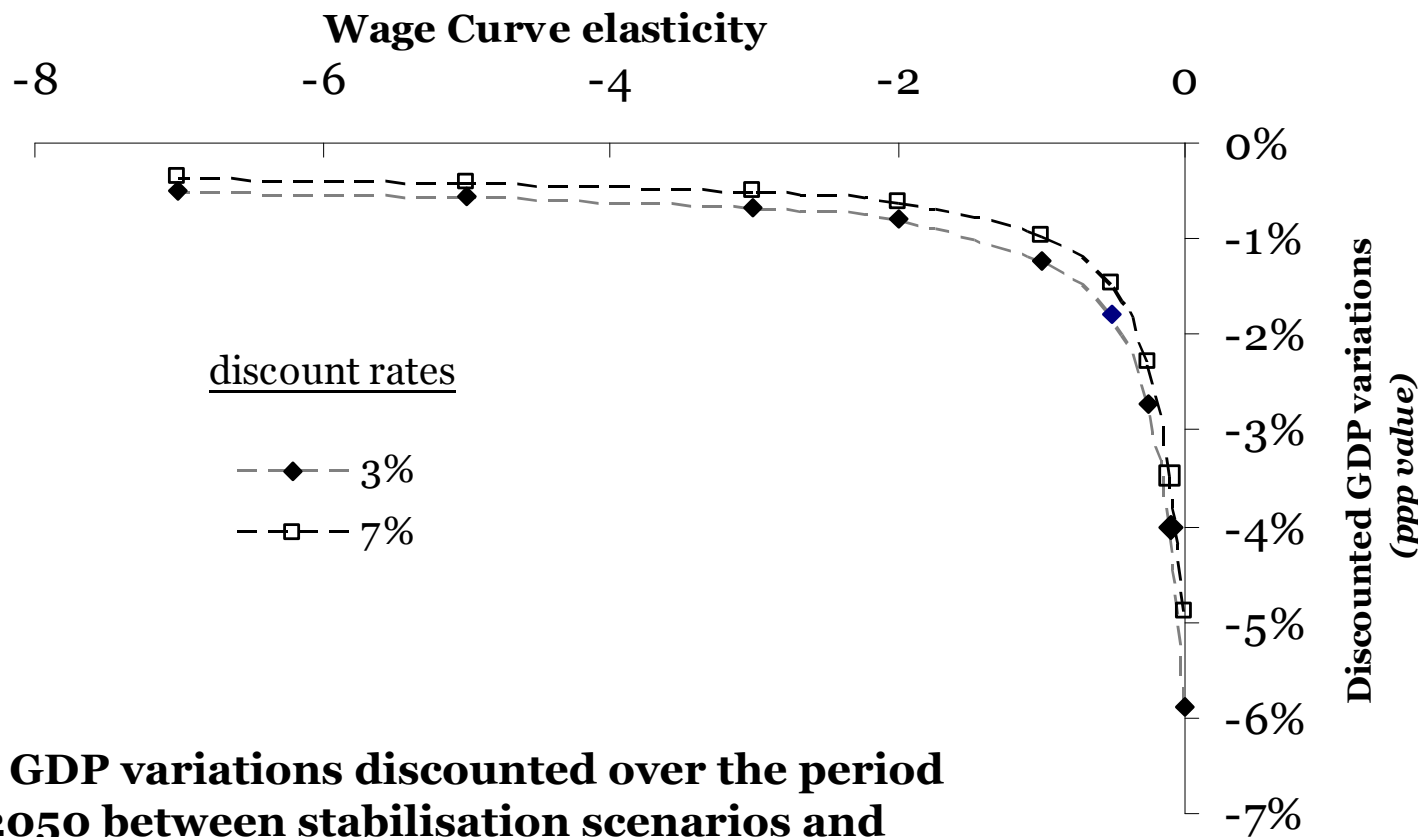
- Empirical studies:
 - Blanchflower and Oswald (1995, 2005): -0.1
 - Nijkamp et al. (2005): [-0.5 +0.1]
- Uncertain enough to justify a systematic sensitivity analysis

Exploring the influence of the wage curve elasticity

- Empirical studies:
 - Blanchflower and Oswald (1995, 2005): -0.1
 - Nijkamp et al. (2005): [-0.5 +0.1]
- Uncertain enough to justify a systematic sensitivity analysis
- Experimental protocol:
 - 2 sets of scenarios: ‘reference’ and ‘stabilization 550ppm CO₂eq’ (uniform carbon tax, revenues rebated to households in a lump-sum manner)
 - Alternative values for the wage curve elasticity [-7 -0.01]

Labour markets imperfections leads to high macroeconomic costs of mitigation

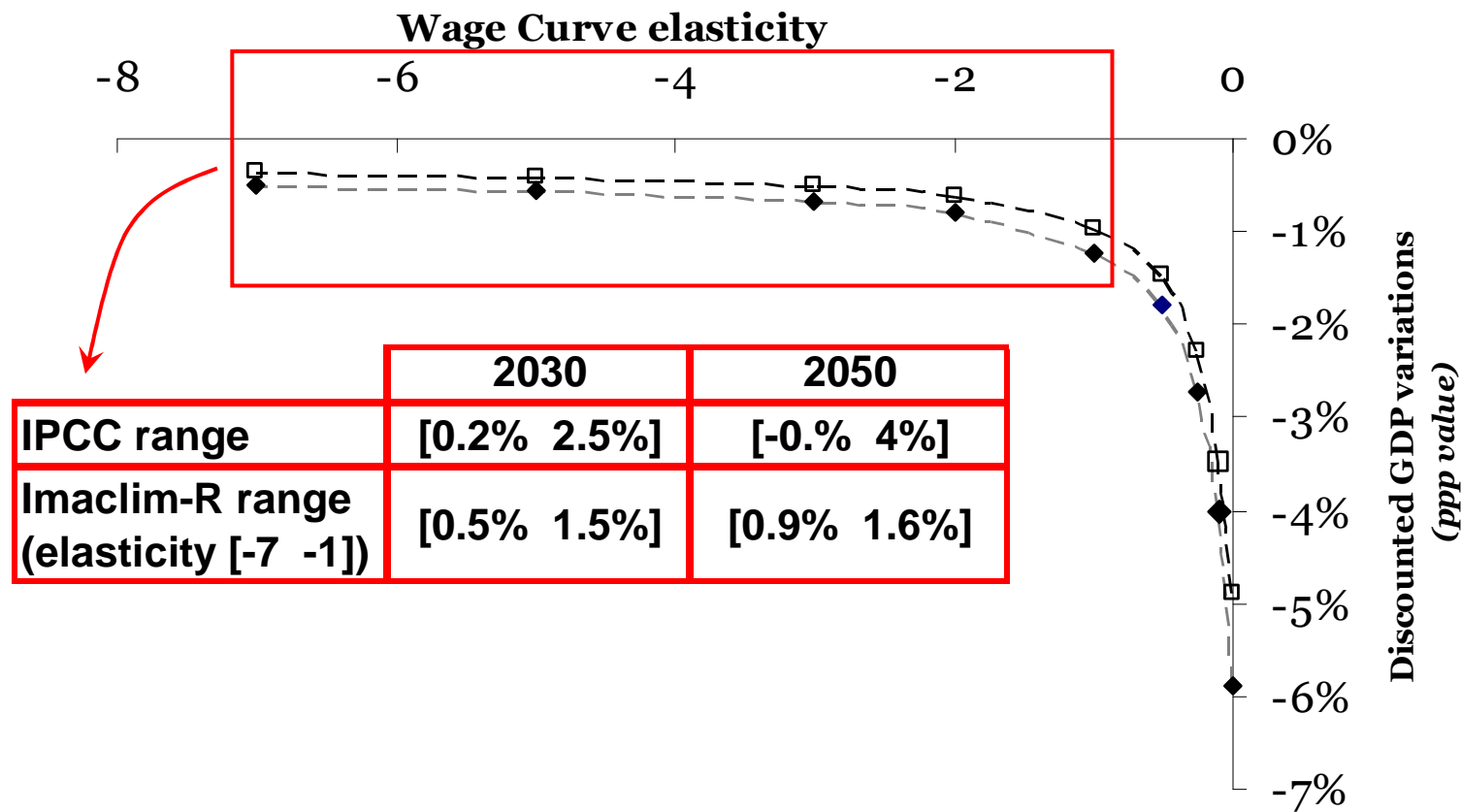
Global discounted GDP variations (% Reference scenarios)



Global GDP variations discounted over the period 2010-2050 between stabilisation scenarios and corresponding reference scenarios, depending on the wage curve elasticity

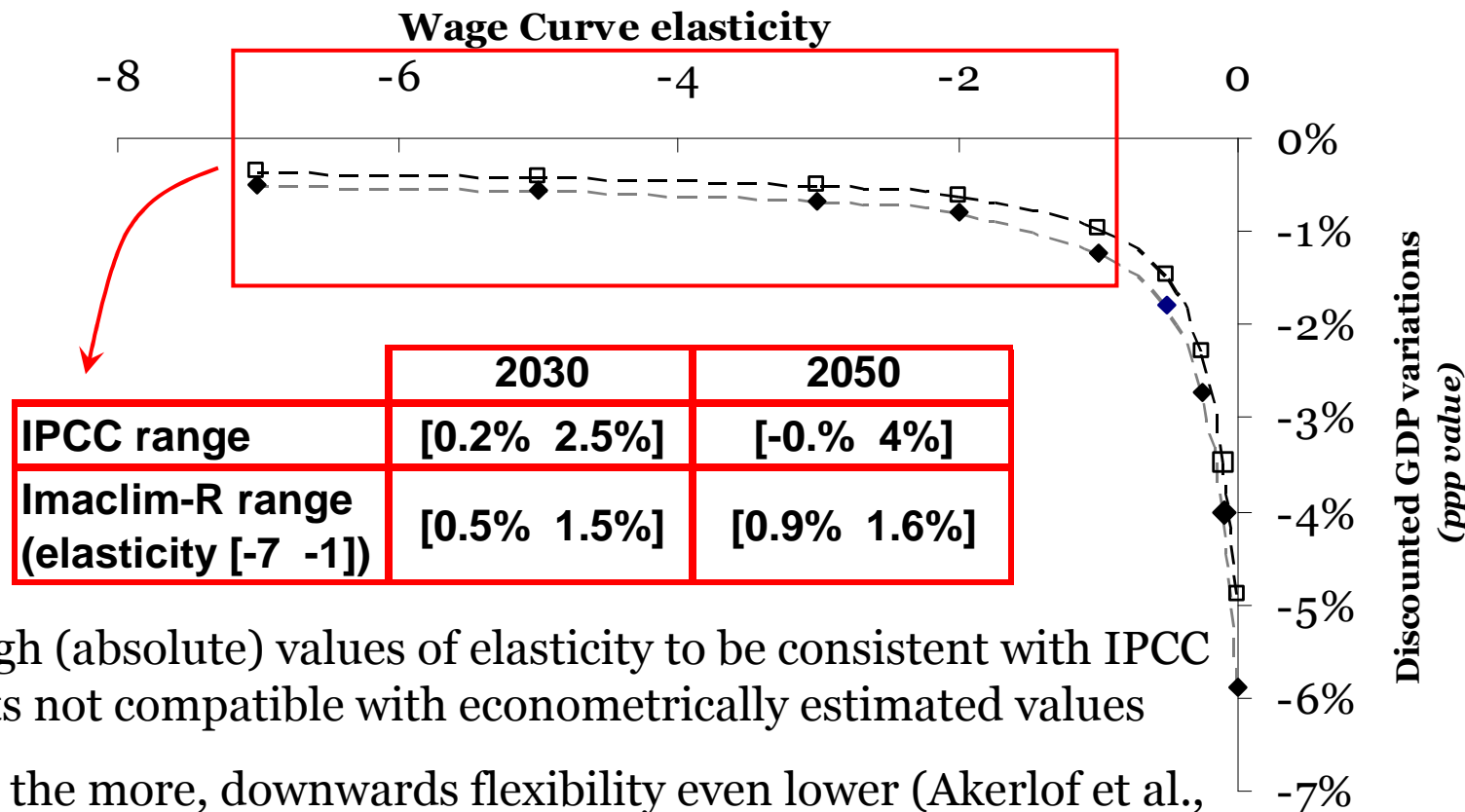
Labour markets imperfections leads to high macroeconomic costs of mitigation

**Global discounted GDP variations
(% Reference scenarios)**



Labour markets imperfections leads to high macroeconomic costs of mitigation

Global discounted GDP variations (% Reference scenarios)

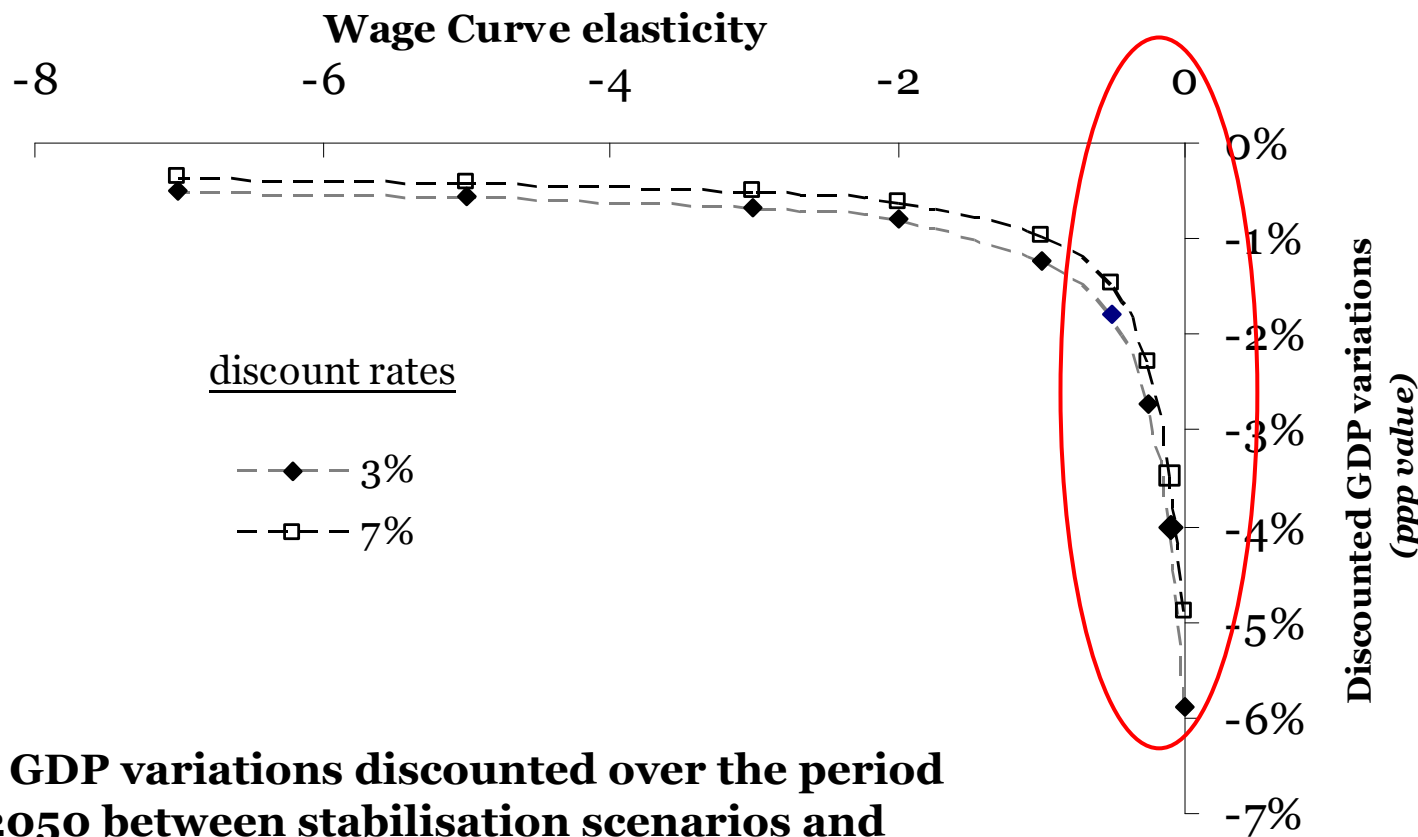


→ High (absolute) values of elasticity to be consistent with IPCC results not compatible with econometrically estimated values

→ All the more, downwards flexibility even lower (Akerlof et al., 1996; Kahn, 1997; Altonji and Devereux, 1999; Dickens et al., 2007...).

Labour markets imperfections leads to high macroeconomic costs of mitigation

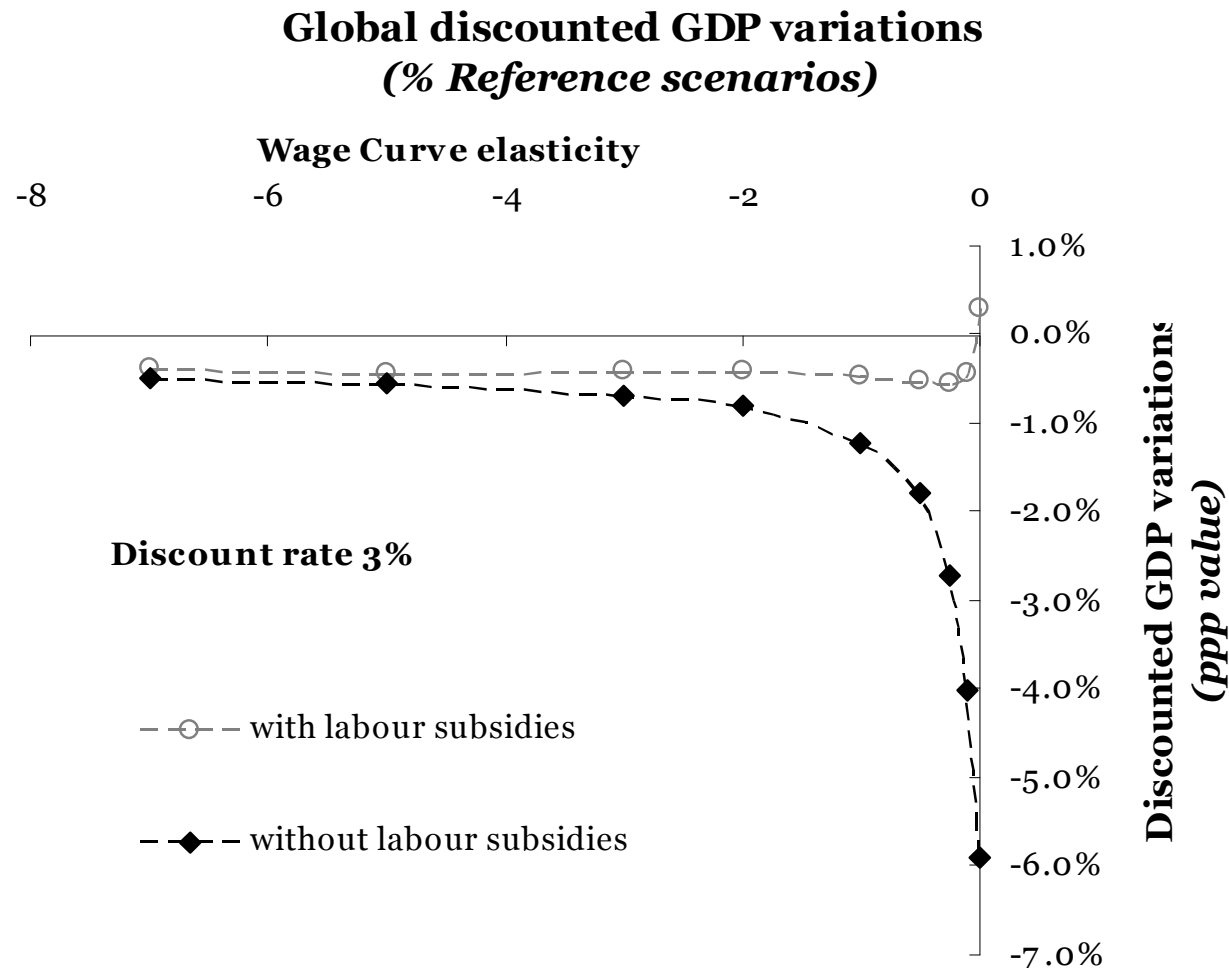
**Global discounted GDP variations
(% Reference scenarios)**



Global GDP variations discounted over the period 2010-2050 between stabilisation scenarios and corresponding reference scenarios, depending on the wage curve elasticity

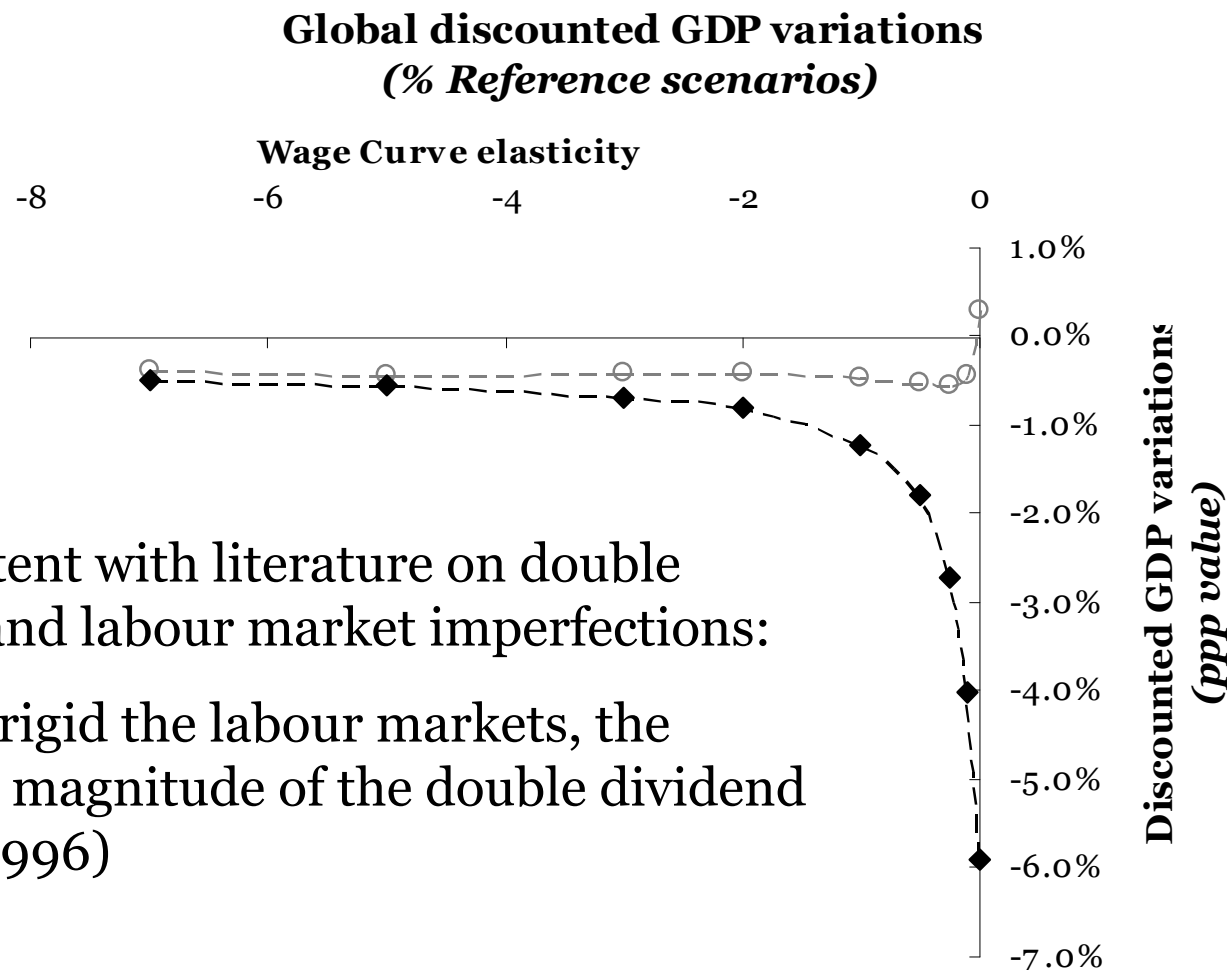
Complementary policy to guarantee against the risk of high mitigation costs

- Using carbon tax revenues to lower payroll taxes (or subsidize labour)



Complementary policy to guarantee against the risk of high mitigation costs

- Using carbon tax revenues to lower payroll taxes (or subsidize labour)

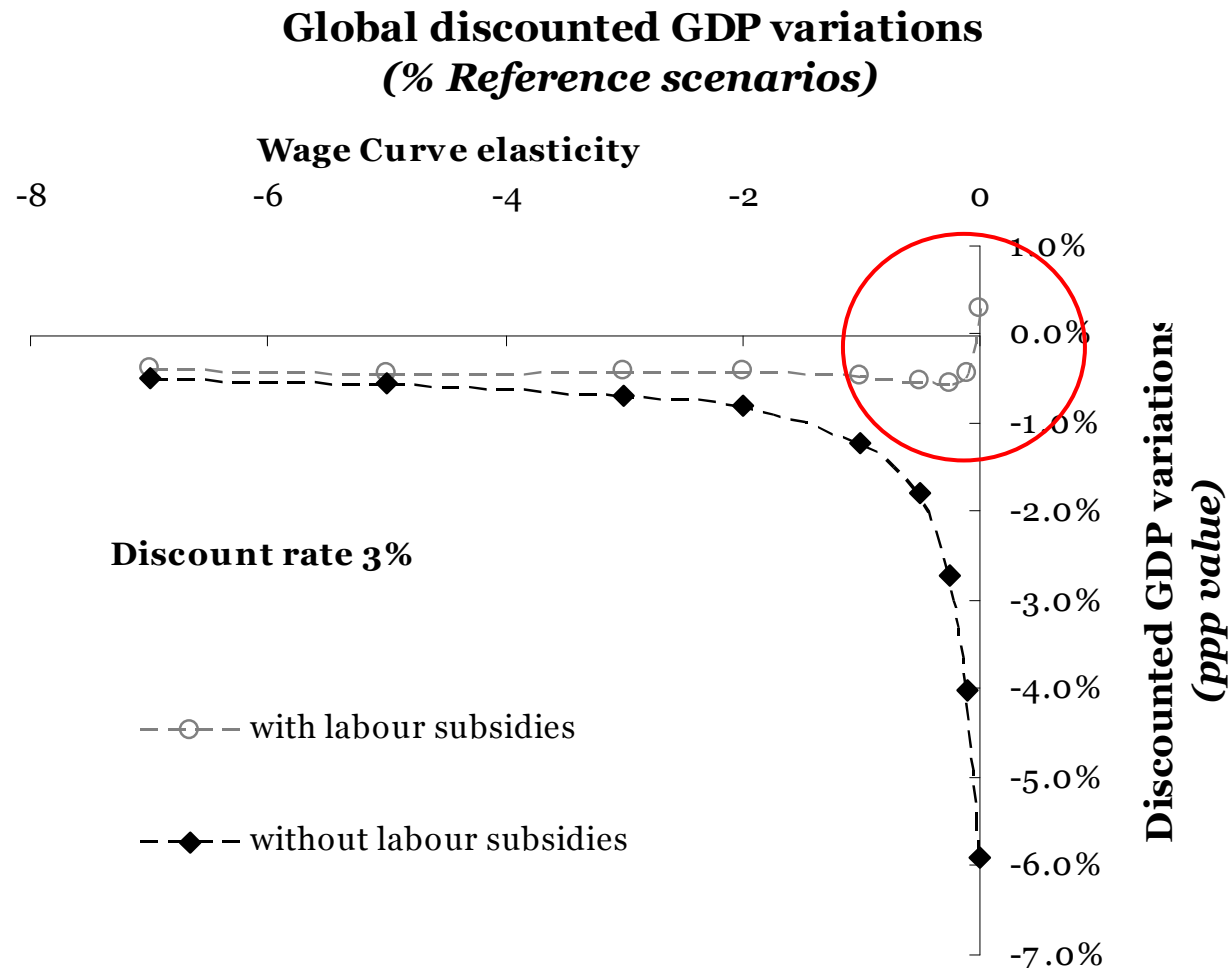


→ Consistent with literature on double dividend and labour market imperfections:

The more rigid the labour markets, the higher the magnitude of the double dividend (Welsch, 1996)

Complementary policy to guarantee against the risk of high mitigation costs

- Using carbon tax revenues to lower payroll taxes (or subsidize labour)



Conclusions

- **Methodological issue:**
Labour markets rigidities have important for the analysis of climate policies → to be taken into account in numerical models

Conclusions

- **Methodological issue:**
Labour markets rigidities have important for the analysis of climate policies → to be taken into account in numerical models
- Mitigation **not only long-term matter** depending on technology, innovation, investment and behavioural change, but also a **shorter-term issue** and a matter of **transition on the labour markets**

Conclusions

- **Methodological issue:**
Labour markets rigidities have important for the analysis of climate policies → to be taken into account in numerical models
- Mitigation **not only long-term matter** depending on technology, innovation, investment and behavioural change, but also a **shorter-term issue** and a matter of **transition on the labour markets**
- **Complementary policies:** reducing payroll taxes... and training offers, continuing education, etc.

Conclusions

- **Methodological issue:**
Labour markets rigidities have important for the analysis of climate policies → to be taken into account in numerical models
- Mitigation **not only long-term matter** depending on technology, innovation, investment and behavioural change, but also a **shorter-term issue** and a matter of **transition on the labour markets**
- **Complementary policies:** reducing payroll taxes... and training offers, continuing education, etc.
- **Limitations / Extensions:**
 - Wage curves are very stylized representation of labour markets imperfections
 - Regional differences in labour markets functioning (data requirement)
 - Cannot be used to analyze trade-offs posed by labour markets rigidity (does not include consequences of labour markets flexibility on inequalities and saving behaviours, with potentially significant macroeconomic impact...)

Thank you for your attention.

Questions?

guivarch@centre-cired.fr