

Macroeconomic extension of the TIMES model: TIMES-MACRO

Markus Blesl, Uwe Remme

Institute of Energy Economics and the Rationale Use of Energy (IER)
University of Stuttgart
www.ier.uni-stuttgart.de

**ETSAP semi-annual Workshop
November, 2005, Oxford**

Motivation for linking TIMES with MACRO

- **Energy demand in bottom-up models is inelastic regarding the costs for covering this demand.**
- **Bottom-up models tend to underestimate the overall costs related to CO₂ mitigation policies in the energy sector, since reactions in other economic sectors are ignored.**
- **Top-down models tend to overestimate the costs related to CO₂ mitigation policies, since a technological foundation of the mitigation options is missing.**

Basics for the methodology approach of the TIMES - MACRO model:

/Kypreos 1996/

Kypreos, S.: The MARKAL-MACRO model and the Climate Change. Paul Scherrer Institut, Department of General Energy, PSI Bericht 96-14, Villigen/Switzerland, 1996

/Loulou, et. al. 2004/

Loulou, R., Goldstein, G., Noble, K.: Documentation of the MARKAL family of models: Part II-MARKAL-MACRO, www.etsap.org, 2004

/Manne and Wene 1992/

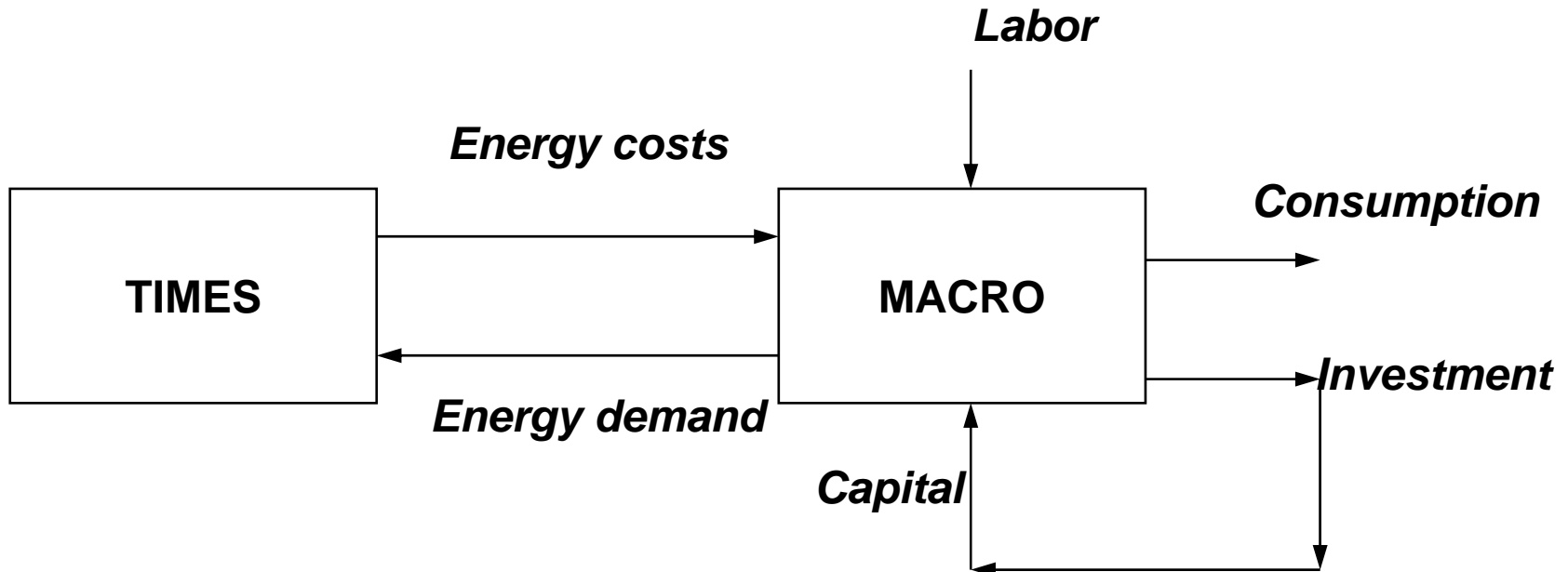
Manne, A. S., and Wene, C.-O.: MARKAL-MACRO: A Linked model for Energy-Economy Analysis, Bookhaven national Laboratory, BNL-47161, 1992

Concept of TIMES and MACRO

Characterization:

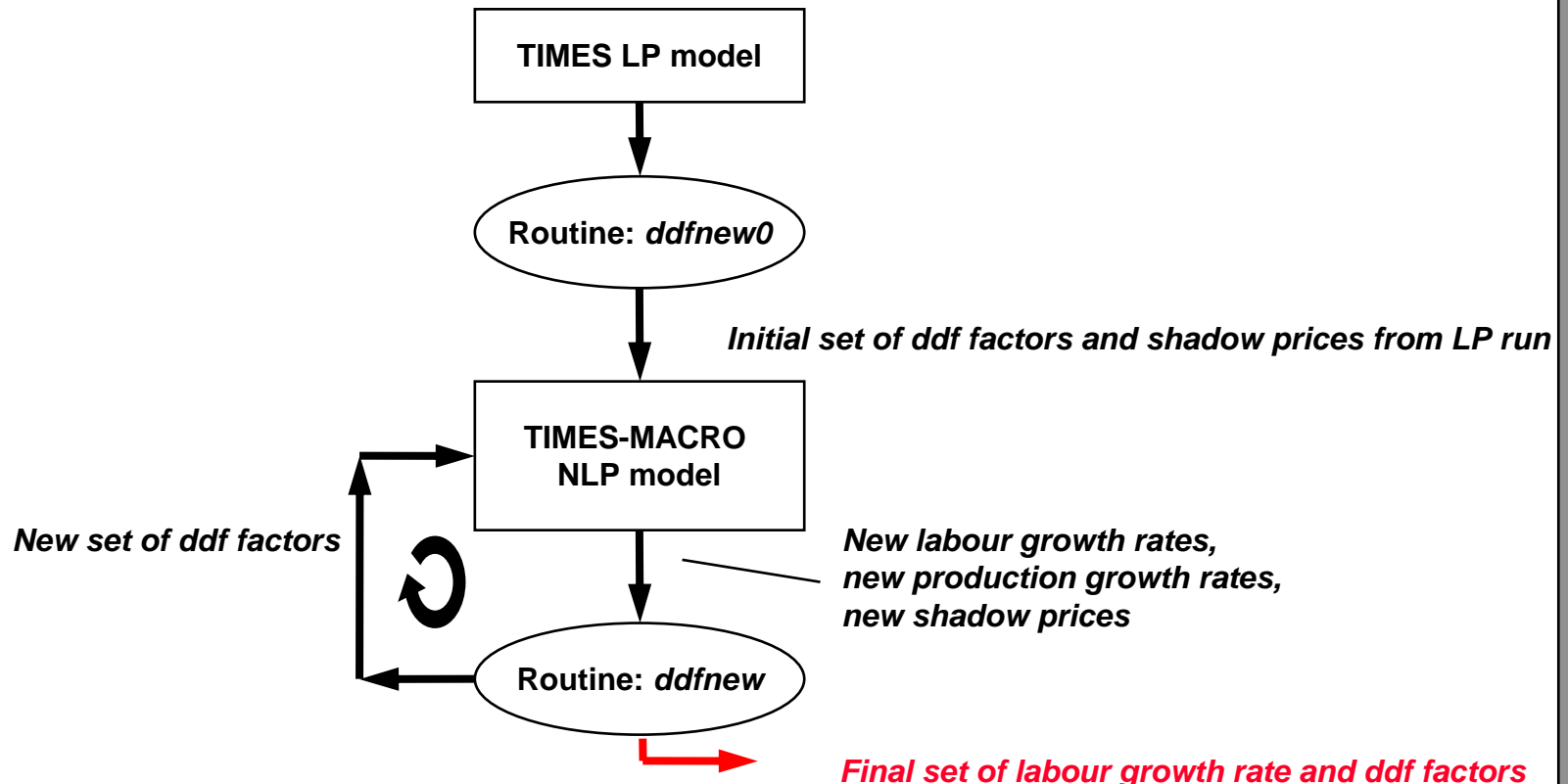
- **Single-sector**
- **Single region**
- **optimal growth dynamic**
- **Inter-temporal general equilibrium model**

Linkage concept:



Calibration routine

- Determining demand decoupling factors (ddf) linking MACRO energy demand (VAR_D) to TIMES exogenously specified demand (com_proj) in order to match the TIMES demand for the reference case
- Determining labour growth rate to match exogenously specified GDP growth rate
- Procedure of the Calibration routine:



Outline of the documentation

- 1. Introduction**
- 2. Concept of the TIMES-Macro model**
- 3. Parameters of the TIMES Macro model**
- 4. Variables of the TIMES Macro model**
- 5. Precalculations**
- 6. Variables bound and starting values**
- 7. TIMES Macro specific reporting parameters**
- 8. Calibration a TIMES Macro model**
- 9. Running a TIMES Macro model**
- 10. Solution issues**

Summary and Outlook

- **MACRO model has been implemented in TIMES.**
- **First scenario analysis shows reasonable behavior of the linked model TIMES-MACRO.**
- **A draft of Documentation has been circulated and the comments will be taking into account in the revision version.**
- **The compatibility of the TIMES code will be checked by Antti,**

