# *Labor Markets in Computable General Equilibrium Models*

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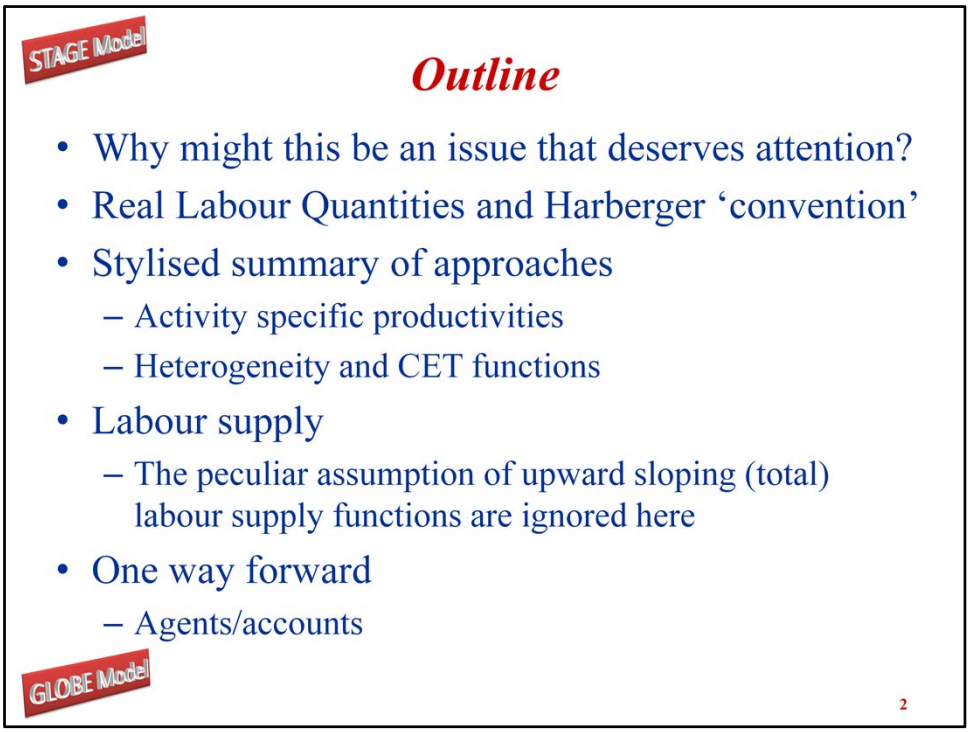
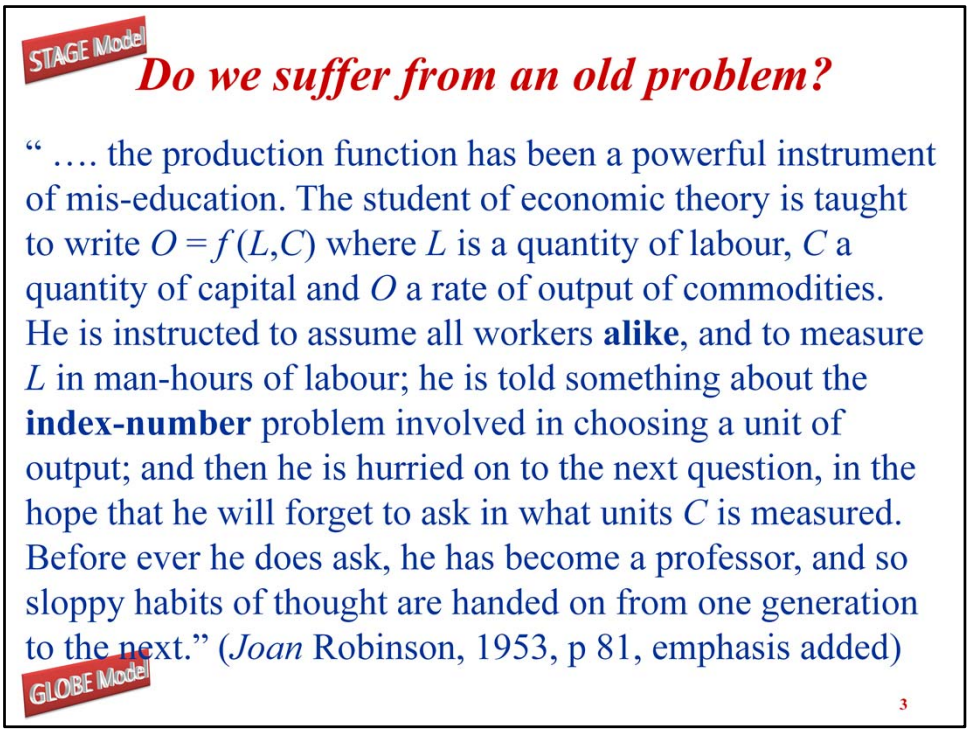
This presentation and the later one by Dorothee Flaig can be viewed as parts 1 and 2 of a combined presentation.
In this part (1) the issues of concern with the modelling of labour markets are defined and explained, while in part 2 one approach to resolving the concerns is presented.

Starting with the conclusion: it is MY (and none of my collaborators should be blamed for this) conclusion that the modelling of labour markets in CGE models suffers from a series of problems that, in economic theoretic terms, non trivial and may be quite serious in empirical terms.



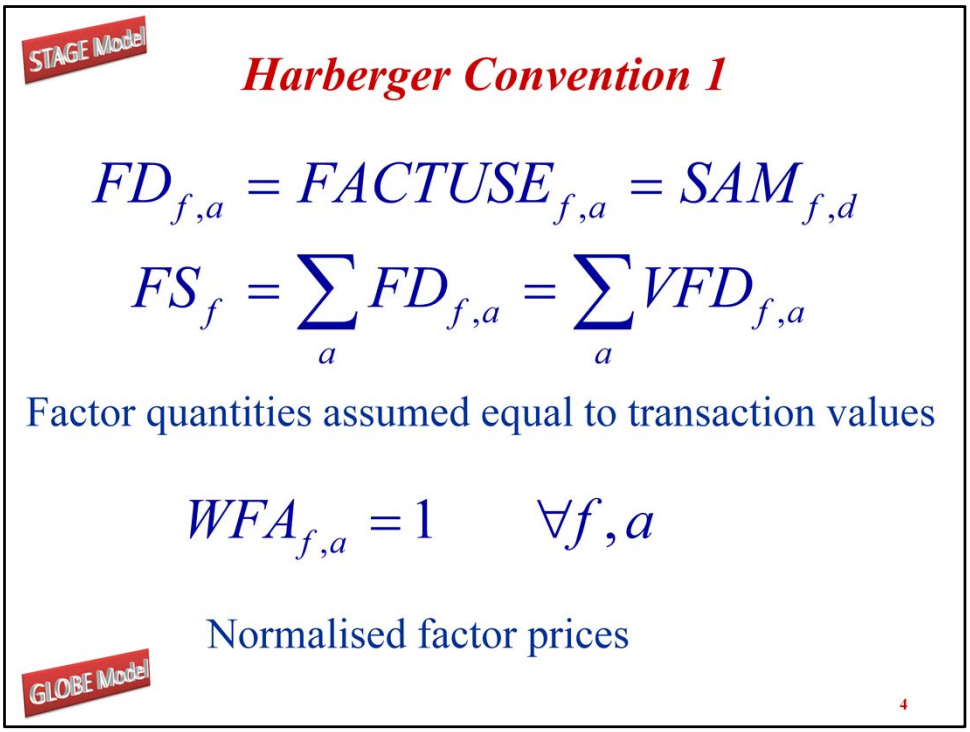

Studies of global policy shocks, such as the Doha Development Agenda, typically produce results that demonstrate very large differences in the proportions of labour (and other factors) that are reallocated in lesser developed countries compared to the DMEs.

Moreover studies of DDA proposals typically indicate that the welfare effects are much larger in absolute terms for DMEs than LDCs and that the sectors experiencing increases in labour demand are often those with lower marginal productivities of labour. If we do not do a good job of modelling labour markets we run the risk of producing unreliable results.



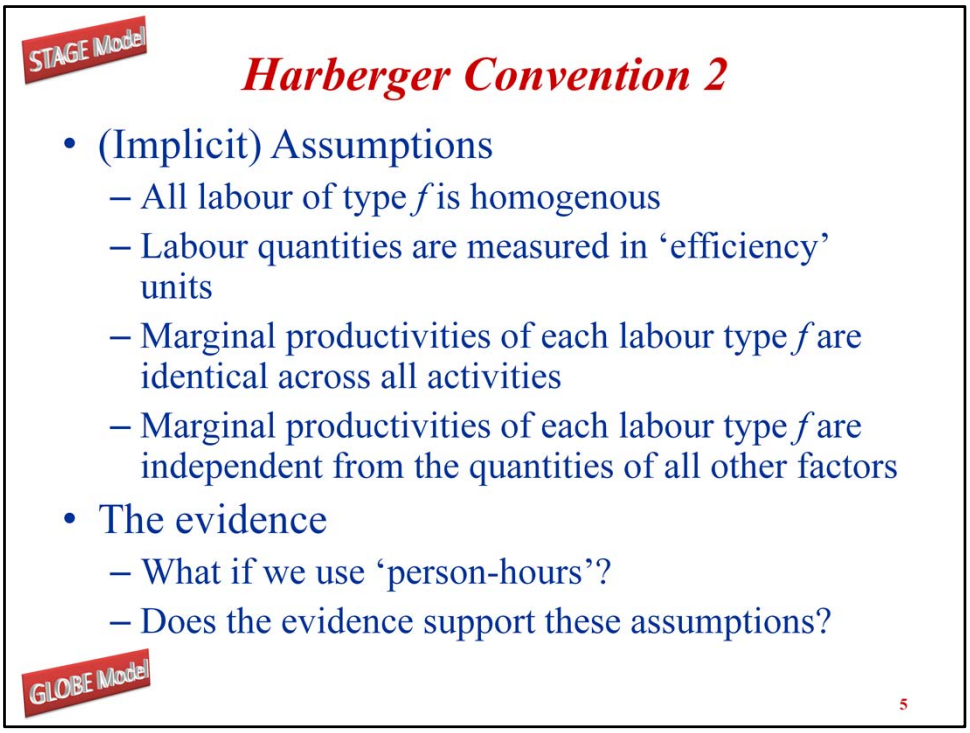

Robinson abstracts from land in this paper.

It is suggested that CGE modellers, including myself, have taken the assumption that "all workers [are] alike" too far, and that while this assumption may be empirically convenient, i.e., it saves us work and/or effort, it is theoretically problematic.



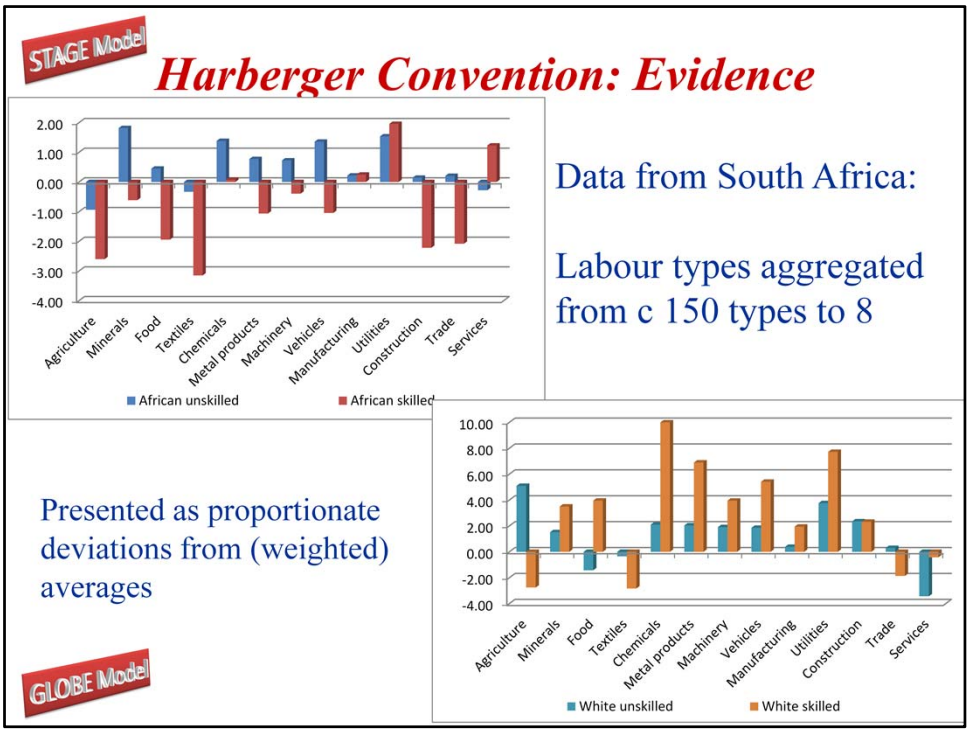

Some notation:
FD – demand for factor f by activity a
VFD – transactions value of demand for factor f by activity a
SAM – transaction values for factor f by activity a
FACTUSE – quantity of factor f used by activity a
FS – total supply of factor f
WFA – price of factor f used by activity a

This is written in terms used in models in GAMS of which I am a co author. I will concentrate on GAMS type presentation of the issues since it is essentially a calibration issue, which is explicit in GAMS based models, but as far as I can ascertain the GEMPACK models whose code I am familiar with – largely GTAP models – adopt the same IMPLICIT calibration.




The implicit assumptions are required so that the FS = SUM(FD) condition can be specified since unless all factors are homogenous then a summation in quantities, i.e., across a row of a SAM or the counterpart satellite account of factor quantities (FACTUSE), is not legitimate.

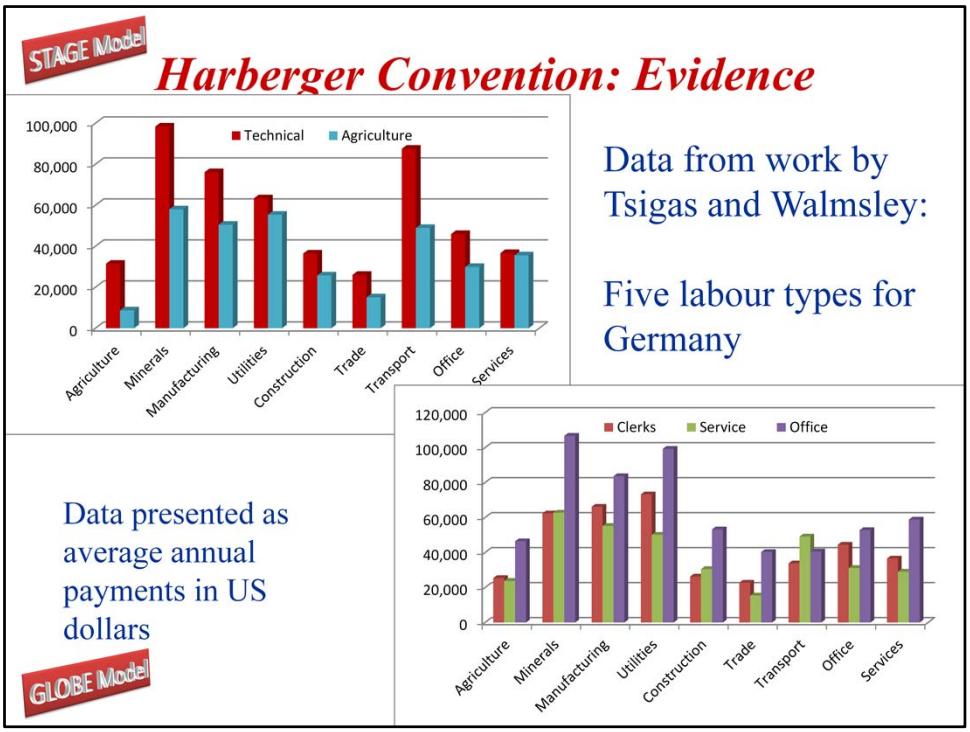
If it is asserted that there is some heterogeneity within the category of factor type f, i.e., it is not homogenous, then the factor market clearing terms (FS = SUM(FD)) cannot be specified in terms of 'natural' units.




Thanks to Cecilia Punt: these values for WFA are derived from a SAM database and labour quantity satellite account for South Africa.

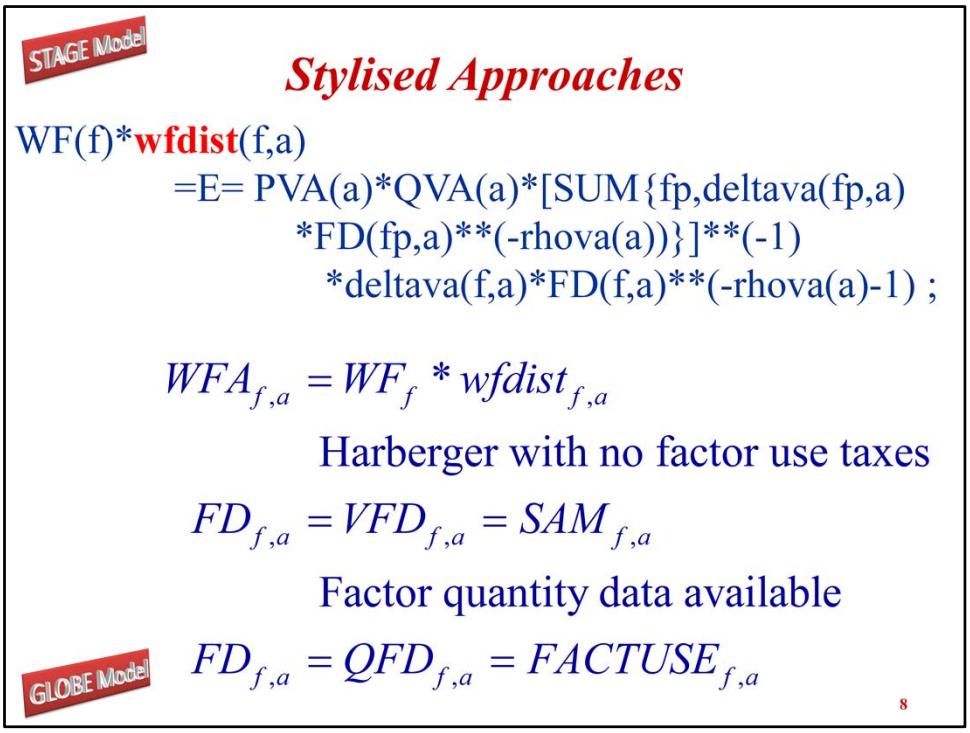
The factor accounts are heavily aggregated, which tends to increase the diversity in wage rates, but wide diversity exists even in the most disaggregated data.

A feature of the data is that wage rates for the same factor type vary much less across activities in broad groups of activities, e.g., agriculture, mining, manufacturing, services etc.




Thanks to Terrie Walmsley and Marinos Tsigas: these data are derived from quantity data for the five labour types in the GTAP database v 8.1 developed by TLW and MT.

They are derived from ILO data based on occupations and are a first attempt at developing labour quantity data for GTAP.



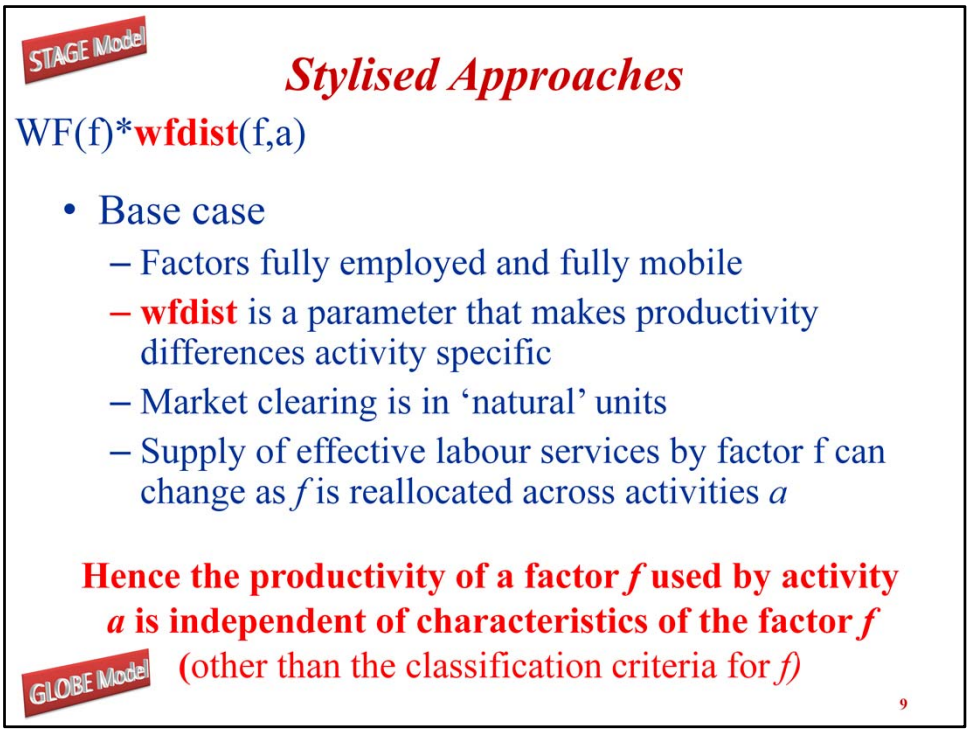

Simple version of standard FOC that defines factor prices, by applying Eulers theorem, to the primal function for the quantity of value added, i.e., value added function.

Lower case indicate a parameter; upper case a variable

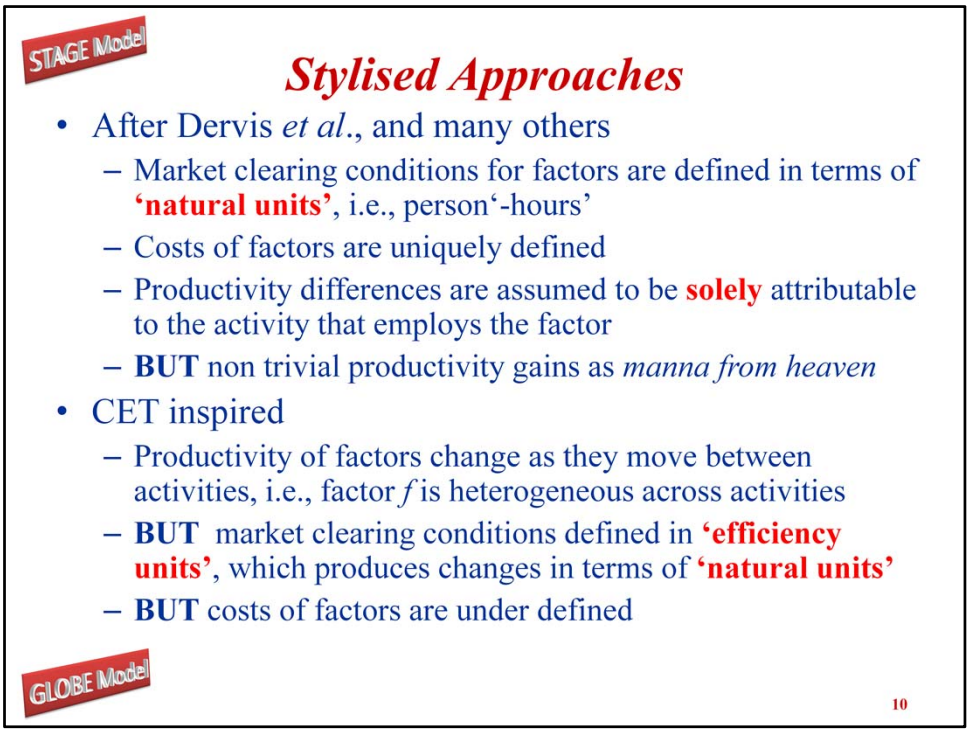
Wfdist is a parameter when there is full employment and the factor is mobile. If the factor is immobile, e.g., as with capital in a short run scenario, then WFDIST('capital',a) is made a variable which allows different returns across activities.

Zero profit condition approach produces the same effective set of relationships.

This method is basically the same as produced using the GTAP model and other similar GEMPACK implemented models




Hence the presumed values of marginal products are dependent solely on the employing activity without reference to the factor ratios or any heterogeneity of the labour types.




Assuming quantity data in terms of 'natural' units are available.

Then method after Dervis et al., after satisfies the market clearing condition but can produce largish productivity effects. While reallocations may do actually produce such effects the presumption 'productivity differences are **solely** attributable to the activity that employs the factor' is arguably overly strong. However this method does, in theory, allow the modeller to disentangle the endowment enhancing effects from the other causes of changes in model variables.

The CET inspired method defines market clearing condition in terms of 'efficiency' units but that means that the quantity of 'natural' units can increase or decrease (or stay constant). If 'natural' units quantity data exist the modeller may be able to disentangle the endowment enhancing effects from the other causes of changes in model variables, but there is no obvious way to me of keeping the number of 'natural' units constant..


This highlights the issue of the extent to which we BELIEVE the assumptions underlying the Harberger convention. The evidence I have seen does not support the Harberger convention and hence I do not believe the assumption accurately reflects reality.

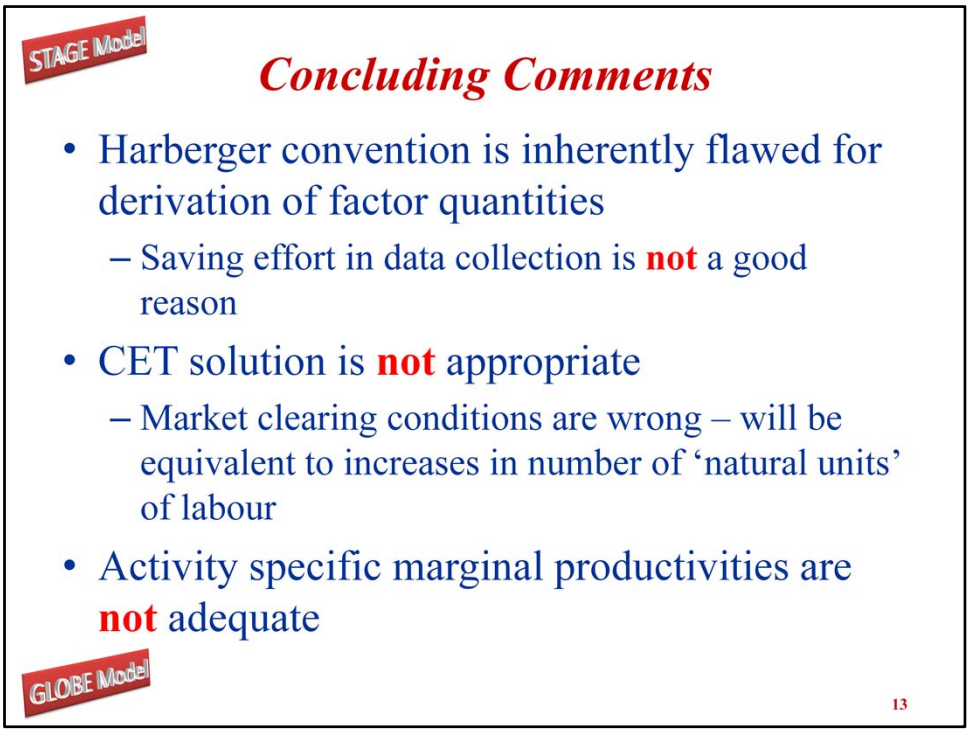
Thus if we accept heterogeneity with 'broad' factor/labour categories several important issues arise:

1. How much of the differences in marginal productivities derive from ACTIVITY specific characteristics
    a. Factor ratios, e.g., capital labour ratios, skilled unskilled labour ratios, etc
    b. Intermediate input intensities
    c. Activity specific technology considerations
2. How much of the differences in marginal productivities derive from FACTOR specific characteristics
    a. Human capital – broadly defined
    b. Learning-by-doing


This approach avoids adopting the Harberger convention.

It thereby avoids making one or other of the 'typical' strong assumptions:

1. All marginal productivity differences are activity specific, which
    a. Is easily shown to generate large endowment effects
    b. Is implausible and arguably atheoretical
2. That a factor is heterogeneous (CET approach), which
    a. means violating market clearing conditions in 'natural' units
    b. Depends on underdefined price definitions and hence passes the issue down to and distorts the functional distribution




These conclusions cause me to have non trivial concerns about the modelling of labour markets in CGE models.

If you use the Harberger convention it seems to me that the activity specific productivities assumptions is the least bad – at least market clearing conditions appear to be correctly specified and the price system is not under identified but *de facto* the quantities are in 'efficiency' units and hence the market clearing condition is misspecified UNLESS additional restrictive assumptions are made and accepted.

The CET approach seems a pragmatic solution to apparent heterogeneity but the quantities in 'natural' units are not identified and the price system and hence income distribution is distorted.

If we accept heterogeneity and use factor quantities then we need to address the labour productivity effects. So be it.

STAGE Model

## *Factor Productivity Challenges*

- Distribution of labour productivities within a factor type across activities
  - Is the classification scheme adequate? (education/skills vv occupation)
  - Do we need to include information on the variation of 'skills' around the mean for each labour category?
- Labour productivities associated with reallocated labour
  - What productivity does the reallocated labour type have in its new activity? (The one from the activity it leaves or activity to which it goes or some 'mix')
  - How should we model reallocation?

GLOBE Model

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STAGE Model

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