Heun Review of old Chapter 2 now 3

IN your list of symbols R and S are given as mass but often used (I think) as energy flow ..please make sure OK

P. 22 In Chapter 1, we put forward the idea that economies are like organisms, using energy derived from outside the system to construct, maintain and grow the system itself. This chapter…

Building, as we introduced in chapter one and use in other chapters, from a one-sector economy up to examples of both two- and three-sector economies.

??add at end of first para in 2.1 “..throughout this book.” On a more philosophical front, a biophysical theory is desirable because it starts from an energetics basis and unites economics with the natural sciences.

2.11

and the time derivative d/dt , or the dot over a)

as waste (in the apple core or garbage)

where are green lines in figure 2.1 OR ITS LEGEND??? Maybe black lines??? No that is capital goods.

Maybe you need to say that energy is not represented but accompanies all flows or something??

What us stored in birdcage symbol? Explain in legend OK iguess in next paragraph. Green ine is confusing in legend)

P 26 the resource inflow (crude oil) is literally embodied<< no,except for processing energy, it is contained in the chemical bonds …. within the out-flowing

Likewise as coal – it is indeed embodied in electricity but not contained --embodied means used in past to build, as Marx’s embodied labor in a chair

P 27 the resource inflow (crude oil) is literally embodied CONTAINED within the out-flowing IT IS EMBODIED

since the coal is not physically contained [NO >> embodied] in the electricity and leaves the economy (in the form of carbon dioxide

and ash) as part of flow S˙ 10. Some of the coal is destined for metallurgical processes

because the carbon in the coal ends up physically [NO ….Yes>>] embodied within the steel in flow ˙P1

\*\*\*\*\*\*\*\*2.26 I Like this kind of explanation of final equations as you do here: GOOD!!!! Do more of???

“ Equation 2.26 tells us that depletion of natural resources

\_

􀀀

dR0

dt

\_

are used within society in order to:

\_ build up societal capital stock

\_ dK1

dt

\_

,

\_ provide short-lived goods and energy to run society (S˙ 11), and

\_ overcome depreciation (K1K1). “

p. 32 I assume you got all your math/subscripts right

Fig 2.4 As I have said before I like the energy symbol to the left most, but probably too late for that…;

2.5 Materials in the US auto industry

“ Throughout the book, we shall be applying the methodology that has been outlined

through the examples to the real-world case of the US auto industry.” AGAIN PLEASE MAKE THE CASE, (IF TRUE THAT YOU ARE USING THE AUTO INDUSTRY FOR AN EXAMPLE BECAUSE YOU HAVE THE (approximate) DATA FOR IT. DO YOU? DO YOU HAVE I-O DATA WHY DO YOU HAVE THE DATA FOR THAT INDUSTRY? IF NOT WHY DO YOU USE THIS INDUSTRY?

I GUES S YOU TRY TO ANSWER THAT QUESTION IN THE NEXT FEW PARAGRAPHS BUT IT SEEMS TO ME THAT YOU DANCE AROUND IT – CAN YOU/DID YOU DERIVE THEM ATERIAL FLOWS FROM MONETARY FLOWS OR NOT? WHAT DID YOU DO WITH THE EUROPEAN DATA? Or ARE YOU TALKING BOUT WHAT MIGHT BE DONE. VERY FRUSTRATING.

“We categorized the types of materials used to produce

automobiles, but found that industry-level data are difficult to obtain.” So did you in chapters three and four? Can you say that despite these difficulties we made a first approximation in chapters three and four? Or what? This would help to tie the book together very much. We need less ass covering and more directional charge.

“

HEUN Review of chapters 3-9

Need to reset chapter numbers….

p.n48 We begin by noting that direct energy travels with material through an economy (and opposite to money flow).

XX Fig. 3.1 Energy content (˙E ) of material flows (˙R, ˙ S , and ˙K) from Figure 2.1. Where is energy itself? No green lines. Tht has to be most of these flows. And the rest? So the direct energy in capital goods might be the combustable energy in , say, a wooden desk (a piece of capital equipment)? I think you need to make it very clear what you mean with examples. Would this be the energy in the input of e.g. forest products?

Xx Maybe say direct energy flows ignored for moment? But that does not make sense either. Figure 3.2 clarifies things a little maybe,

Fig. 3.1 Energy content (˙E ) of material flows (˙R, ˙ S , and ˙K) from Figure 2.1.

Add (Energy flow symbols from Howard Odum).

49 the direct energy associated WITH flows of steel

xxFig 3,3 Green line barely shows up. Can you make it thicker??

EQU. 3.4 WHERE IS FLOW 01 ON DIAGRAM?

LIKEWISE e1 FROM BIOSPERE???

Note that ˙E 1 is the gross direct energy production rate of society. For example,

firms extract crude oil (a component of ˙E01) and refine it into petroleum products (a

component of ˙E1) that are consumed by society. The direct energy consumption of

extraction and refining firms is a component of ˙E11 ??All this needs to be made clearer relative to diagram

Eq 3.11 ref 3 EROI should not be attributed to Ayers but Hall (e.g.1986)

Fig 3.5 Energy module should be moved to LEFT of goods and services as it must come first

(OK chicken and egg, but conceptually)

The First Law of Thermodynamics around APPLIED TO ? the biosphere (0)

The First Law around APPLIED TO the goods and services sector (3) i

Table 3.1 Can you add in KJ for each component??? As a separate column?

Chpt 4

xx Chapter 4

Embodied energy flows I think this should be:

Chapter 4

Embodied anhd total energy flows I was confused by the T in e.g. figure 4.2 & 4.3

In Chapter 3, the First Law of Thermodynamics accounted direct energy (˙E ) flowing

among sectors of an economy. In this chapter, we will adapt the First Law to account

FOR THE embodied energy in the material flows of an economy.1

p. 58 Total energy (T) is defined as the sum of direct energy (E, see Chapter 3) and embodied

energy (B).DEFINE EMBODIED ENERGY

xx again energy flow is defined as a green line here but you do not use it, confuisng me considerably

59 bottom: waste heat is ignored when accounting for total energy ????? It is in equations

60

The final term ( ˙Qout) is a proxy for all direct energy (˙E) consumed (i.e. turned into heat)

within the sector.

Fig. 4.2 Total energy flows (T˙ ) in a one-sector economy.(see fig 3.3 ).

dBK;1

dt = ˙B11 􀀀 ˙B1 􀀀 ˙B10 + ˙Q10: (4.21)

>>>>>Add In words this say that the change in the embodied energy etc etcc I think o be perf3ectly clear you should give the final equation in words each time !!!!!!!!!!!!!!

p. 64 The term ˙B10 in Equation 4.21 represents the disposal rate of embodied energy from

Society (1) to the Biosphere (0). (i.e. dumps etc). …depreciated physical <<<<assets.

Fig 4.4 see comment fig 3.5

Chpt 5

Could say “The monetary flow is an easy and logical (if hardly perfect ) l proxy for the value of the material and energy flows. At least most ordinary humans accept that as fo we for this chapter”

Fig. 5.1 Flows of value (˙X ) for a single sector. The value flows are associated with each of the

dfferent material and energy flows outlined in previous chapters. ----------I do not see a green flow

Why are the/re not dashed lines indicating money (value) ??? How are we connecting to title of chapter???

Fig. 5.1 Flows of value (˙X ) for a single sector. The value flows are associated with each of the

diferent material and energy flows outlined in previous chapters. ??? is value flowing in opposite direction?? Maybe say : in fact the money flows in the opposite direction as the material/energy.

xxFig. 5.2 Aggregated flows of value (˙X ) for a single sector. Distinction is made between value

flows that enter the sector and are accumulated (i.e. capital goods) and value flows that are not

accumulated. Within the sector there is destruction of value ˙Xdest, represented by the downward

arrow flowing into the black sink and generation of value, represented by the arrow flowing out of

a source. >>>>In general the value is increased by processing within each sector of the economy as work is done on raw materials and intermediate goods .

The contrast between THE BIOPHYSICAL REAL) FLOWS OF Figures 2.2 and 3.3, on the one hand, and THE USUAL ECONOMIST’S DEPICTION OF Figure 5.3, on the other, is striking <<<<<<<NOTE HOW I AM TRYING TO HIT THE READER OVER THE HEAD …

Fig. 5.3 Flows of value (˙X) for a one-sector economy. <<<NOW IS ThIS THE ECONOMISTS VIEW?? (yes) Or what? Link with what comes before

The next 2? sections are representing the economists’ view of value. Be explicit when you are representing economists when your biophysical perspective

5.2.2 Value generation INCLUDING BIOPHYSICAL INPUTS (˙Xgen) <<TELL THE READER YOU ARE SHIFTING PERSPECTIVES…

Fig. 5.4 Flows of ??BIOPHYSICAL?? value (˙X) within a two-sector economy. AGAIN I AM CONFUSED. THE RROWS ARE SHOWING THE FLOW OF BIOPHYSICAL VALUE (UPGRADED STUFF) BUT THE FLOW OF M0NEY IS OPPOSITE. (DOTTED LINES). YET YOU SAID YOU WERE VALUING VALUE IN MONEY, WHICH YOU ASRE NOT SHOWING FLOWING. MAYBE IT’S THE FLOW OF BIOPHYSICAL VALUE….ALSO FIG 5.5

5.5 Value in the US auto industry

To estimate value flows through the automobile industry (ONE OF THE FEW SECTORS OF THE US ECONOMY WITH N ADEQUATE DATA BASE) , we use publicly..

Xx Page 82 “To estimate value flows through the automobile industry, we use publicly available

data from the US Bureau of Economic Analysis (BEA).3 The tables needed

to estimate dynamic value flows and capital accumulation within the economy are

primarily the KLEMS4 Intermediate Use tables and the Fixed Asset, non-residential

detail, table. The KLEMS data tables are based on the Input-Output Tables (I-O),

but are at a lower level of aggregation and the inputs are categorized into three broad

types: Energy, Materials, and Services.” <<< I have been looking for something like this in ev3ry chpter …it should come much sooner ..

It would be interesting to have all flows as (embodied, direct) energies too. Could use 7 MJ/$ (national average ) for a real quick and dirty assessment

p. 92

xx6.5 Energy intensity of the US auto industry <<isn’t it value flow in US auto industry??

Define KLEMS and PERKS

From fig 5.6 I see you are using dollars to represent the biophysical flows…. You are measuring the value of the biophysical flow in dollars

Chapter 6

such that for sector j, (such as tires??)

Define R, S and K after eq. 6.4 as some readers will have forgotten

T jk = "jajk˙Xk: (6.5) : likewise, please define terms first time used in chapter

I guess you Can find each .. I stlill like lots of definitions….

WE ASSUME all goods produced by a sector are produced at the

average energy intensity of that sector.

T jk = "jajk˙Xk: (6.5)

Now give as words

Likewise give eq, 6.11 and 6. 12 in words … I don’t know if you agree but I much prefer to give final equations in words as well as symbols …then you know you are conveying correct info to everyone

Equations 6.15 and 6.16 can be rewritten in vector notation as

8>>><>>>: <<<<Explain why we want to do this and what it means …

Is B embodied anery as before? I assume so . We (you) really need a glossary at beginning of book

with the “Kronecker delta” …explain

YOU ARE WRITING FOR ENGINEERS, NOT MORTALS!!!!!!!!!!! I ASSUME ALL YOUR MATH/NOTATION IS CORRECT !

extension of the algebraic form of the energy intensity equation.

Equation 6.37 provides a means to estimate energy intensity (") of the sectors of

the economy, under the assumption that final consumption (Sector 1) is exogenous

to the economy (Sectors 2: : :n).

BUT WE DO NOT HAVE THE DATA SINCE 1977……….????????? Are you saying that you have th I-O data for the auto industry???

Chapter7

I think you need more of an introduction:

Something like “ In economics the Leontief Input-Output (I-O) method is an approach that allows for the investigation of the economic interdependency o the economy, that is how much economic activity in each main sector of the economy is used to generate a “final demand” product. Energy analysts have extended the method for energy analysis to estimate the energy intensity of economic products,including the energy required “upstream” in the whole economy for their manufacture . “

I think you need to explain why these two different approaches exist: not just how you deal with them .

Let me try:

Two different approaches exist for calculating the energy intensity of ?intermediate and final demand? Economic products: “product based” and “physical accounting”. The first was developed by xxxx Hannon??? in order to yyyy and the second later by ……… frameworks, whether capital stock is included in the

accounting framework, and whether energy input from society to the economy is

included. (See Figure 7.1.)We will end with our suggestion for how best to estimate

" within a materials, energy, and value accounting system.

99

I think then it will all seem less arbitrary

P 101 “because

product-focused accounting systems assign energy embodied in wastes to products ” ???IN fact the diference in method makes relatively little difference in he energy inensity of products. “ ???

p. 102 Bullard and Herendeen [4], following Kirkpatrick [3], added flows of capital

as inputs to each sector [4, Figure 5], and, in so doing, changed Equation 7.5 to

Equation 7.6:103 They assumed INSTEAD that half of the incoming capital went toward replacement

103 -106 I am impressed at how sophisticated the math is compared to the available data! Will we ever get there?

Hence:

redefinition of A and " to include embodied energy on inflows of material, and

\_ use of Equation 7.20 instead of Equations 7.5 or 7.6 for estimating energy intensity

(") of economic sectors within an economy. ADD>>>of course the inclusion or exclusion of any of these flows into our analysis is much less important than the implementation of any such method, which requires an understanding of the importance of undertaking such analyses for good future economic and energy analysis. [Since we are undertaking no such analyses now, at least in US, seems like you need to make a case for doing it…..]

p. 108

Viewing these dimensions through the lens of our framework illustrates

some important points about measures of economic growth and well-being. Which are 1) 2)

7.3 Implications for recycling, reuse, and dematerialization

All of this seems good to try to show the importance of the analyses, should we ever be able to really implement them!

Good to touch on population growth, distribution.

Conclusions seem to be sort of obvious at least based on others who have come to the same conclusions (e.g. Brian Czeck) from a far less sophisticated analysis. You might at least point out that your very sophisticated analysis is consistent with other such analyses.

We found that there are many potential definitions of a

steady-state economy, none of which are fully satisfying when compared against the

ideal of sustainability. -----🡪 so? Can your approach resolve this? You leave us hanging.

Chapter 8

Unfinished Business: Practical, Methodological,

and Theoretical Issues -- This title seems like such a hodge podge to me: Can we find a title that ties it together: “From the base model to encompass additional considerations”? hmmm, probably not.

>>>>>>>: I added these five paragraphs after I finished chapter 8

This chapter confused me, probably because I thought it was a final discussion. Instead it s a hodge podge that I had a hard time fitting in with rest of book or itself.

There is a lot of methods that seem to me to belong in an earlier methods chapter. If Not it need its own methods “ section

You unmoor me because you just gave 6-7 chapters of detailed methods, “this is how you do it” and then you add ” this is how you do it, when I thought I knew because you had laid it out.

I suggest you say ” I have showed you how to do it, now IF you want to include some bells and whistles not usually included (environmental, consumption) here is how you do that. If you do not do that then I am left with the idea that what you told me before was not correct.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

OK from first pass:

“This chapter discusses several practical, methodological,

and theoretical issues that should be addressed in the future. On a practical

level, additional data are needed to fully utilize the framework developed herein. In

terms of methodological issues, we encourage economists of all types to embrace

material, energy, embodied energy, and economic value counting as a valid method

of inquiry for modern economics. Additionally, there are issues of co-products and

the choice of the energy input vector that need to be addressed. Finally, several theoretical

issues, including a return to the theme of metaphors and models, theories

of value, the need for data, material and energy quality, boundaries, and the Sun are

addressed. We begin with metaphors and models.”

To me this is failing to see the forest for the trees. Here you are talking about the various things that you cannot do when in fact you have just written an entire book with great conceptual and mathematical detail about how to do all these things when in fact you did not and can not do ANY of them – even for the auto industry let alone the economy more generally. So it seems to me that you want to start this list with a cry for Federal collection of data (as was once done ) on the energy intensity of the various parts of the economy -- and then the reconstruction of I-O analyses, first in $ and then in energy a la Bullard. ONLY then should you think about these other things. You say “needed to fully utilize” but its to utilize at all.

Maybe move section 8.3 up here and make it more important ….

“In fact, much of mathematical economic modeling today relies upon

mechanistic conceptual foundations whose roots are in Newtonian physics and The

Enlightenment. ADD >>In fact it is only a poor reflection of Newtonian physics, since the mathematical form was used but without the thermodynamic and dynamic underpinning that adds reality and rigor to the physical analogy.

such equations often assume a machine that operates independently from the biosphere (and often reality).

And, we encourage continual assessment OF our models and metaphors.

8.2 We use market prices (subjective theory of value) for pragmatic, rather than

philosophical, reasons because more people accept this and other, probably better indices re very difficult to implement.

e.g., oil extracted from the Texas panhandle ) are used up and more di\_cult locations must be tapped (e.g., Alaskan north slope or deep Gulf of Mexico )

This drawdown of capital is mis-measured in GDP as AN INCREASE IN income.

8.3 “For example, the latest version of the ecoinvent database (v3) contains

detailed analysis of over 10,000 processes.[8] This is a fantastic report, but more

needs to be done to bring this crucial information into the public arena. ” <<<Maybe discuss this more..is it I-O? Energy? US ? how does it relate to old Hannon work? How might it?

The BEA developed the Integrated Environmental and Economic Satellite Accounts to complement the

<<<What is the impetus for this? Any laws???

Several alternative valuation methods were used to provide a range of estimates. It was a great firat approach. <<OK???

8.4 Hybrids of I-O and process-based methods 🡪>>??? 8.4 I-O vs. process-based methods????

8.4 whole section seems like methods, in a methods book. It seems more methods than discussion…

Seems like fig 8.3 could come earlier

Likewise 8.51 -8.53 seems like it should come earlier, in an earlier chapter, maybe its own short chapter 3??? Why is it way back here, where you should be discussing , not giving (good) basics?

However, the EI-O method has been extended in the literature to include co-products for each economic sector.[27, 28], where energy costs are apportioned to different sectors in proportion to the quzntity of the outputs. ……. To do so, both make and use data are employed.

meaning that the embodied energy of food may actually be several times larger than the actual energy content of the food itself. Here is a reference for embodied energy, about three times chemical energy. Also about 3 times even that for distributing , cooking and so on. (Pimentel personal communication).

. Hamilton A , Balogh SB, Maxwell A, Hall CAS. 2013. Efficiency of edible agriculture in

Canada and the U.S. over the past 3 and 4 decades. Energies 6:1764-1793.

The transitions from 8.3 to 8. 4 to 8.5 to 8.6 seem almost non existent

“Within our framework, we do not account for either the material or energetic

quality of resources that pass through the economy nor the irreversibility of economic

processes “ who is OUR? NCE? Heun yet l.? I thought that is what you did do???

In industrialized societies, it may be negligible, It IS negligible

How about energy cost of education etc> The quality per Joule is high, but the energy cot is high.

8.8 Sun In industrialized societies, it may be negligible, H0ward Odum and Mark Brown have developed and assessment called emergy analysis whiich includes an assessment of the embodied solr energy in all resources. <<add, maybe a few paragraphs later OK yy have it, Good.

8.9 What is endogenous? << now this is discussion

But …. It seems that starting at “The key energy intensity equation in this book (Equation 6.37) was derived under the assumption that “final consumption” is exogenous to energy intensity calcula…”

You are trying to make a complete synthesis.. It seems like you need to make a final section

“Putting it all together” or something like that … at this point you need to have made a basic plan/methodology, and then in the discussion: (optionally) expanding the boundaries of analysis and then discuss things like adding in environment final consumption etc. . Then some of these sections would make more sense to me….

8.10

I and II sounds like double counting to me ….

We believe that the DIRECT approach is correct and that the DEC method is unwarranted. BECAUSE???? make it really clear.

Again this sounds like METHODS in the discussion.

Chapter 9.

First paragraph very good…

We found that the waste heat from each sector is additive to the embodied energy..

You found it? Hmmm you decided to approach it that way

Bot p 137 n lives. Our use of the metabolic metaphor is anathema to many mainstream economists but embraced by many ecological  ***AND BIOPHYSICAL*** economists.

I did not review appendices….

OK you have a good book here but it needs some organization Chpt 8 seems especially fractured…