ENVIRONMENTAL MACROECONOMICS:
NEW WAY OF THINKING TO DEAL WITH GLOBAL CRISES

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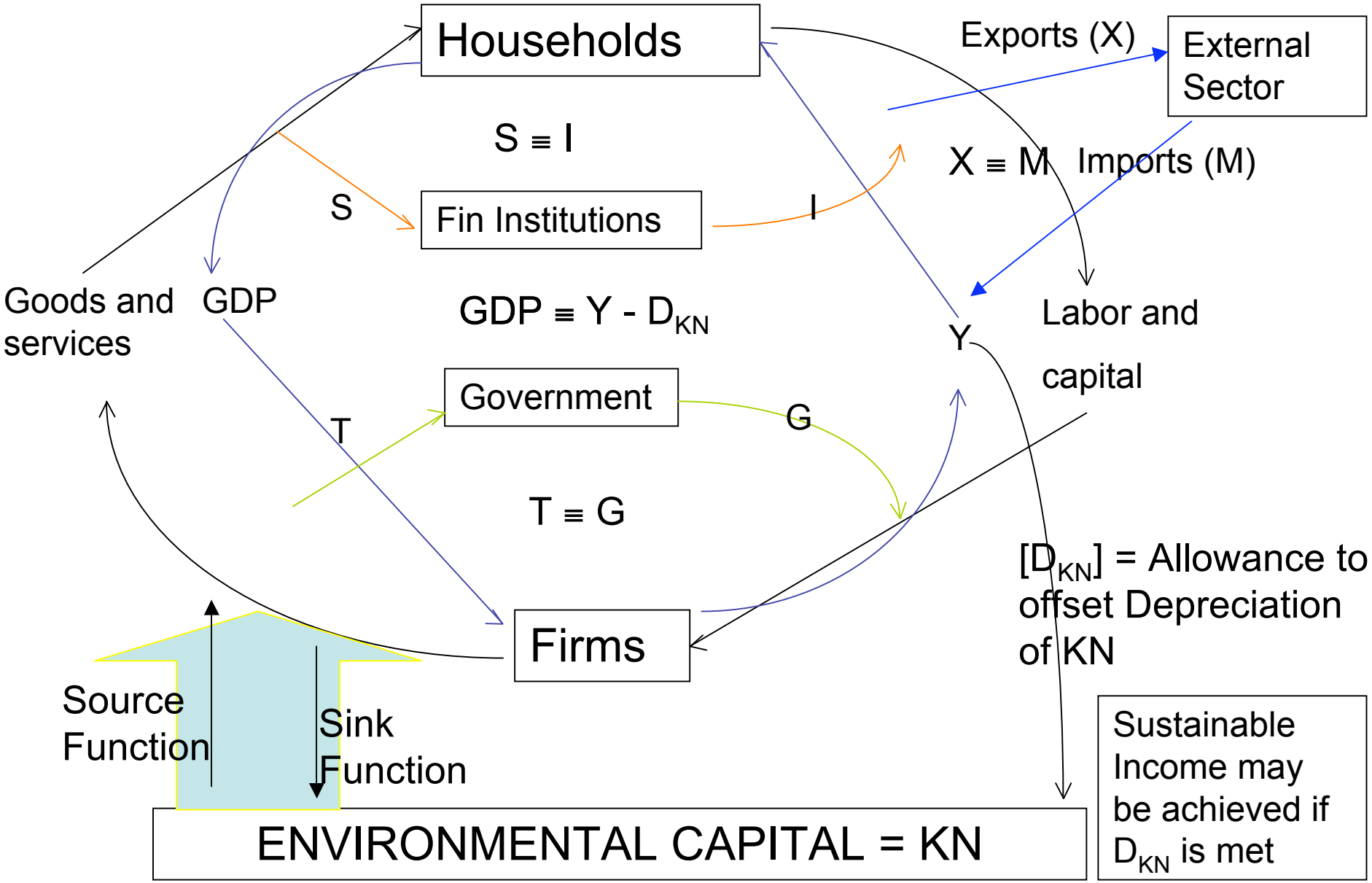
AIMS

- To Illustrate the distinction in policy approaches that stem from Environmental Macroeconomic Frameworks relative Standard Macroeconomic Frameworks
- To demonstrate the relevance and stringency of Environmental Capacity Constraints
- A mini case-study of the Global Financial Crisis (GFC) to illustrate the above

The main theme in Environmental Economics

- NATURE IS CAPITAL – Environmental Capital (KN) – an aggregate of all natural endowments at the disposal of an economy – an analogue manufactured capital stock (KM) in the national accounts
- An economy cannot exist without nature-capital because Nature acts as a SOURCE and a SINK
- This not a new theme for economics as such – A study of Economic History reveals that this was a central theme in economics (Marshall 1891, Fisher 1904)


Households
Exports (X)
External Sector
S ≡ I
X ≡ M
Imports (M)
S
Fin Institutions
I
Goods and services
GDP
GDP ≡ Y - D_{KN}
Y
Labor and capital
Government
T
G
T ≡ G
[D_{KN}] = Allowance to offset Depreciation of KN
Firms
Source Function
Sink Function
ENVIRONMENTAL CAPITAL = KN
Sustainable Income may be achieved if D_{KN} is met
Basis for the Environmental Macroeconomic Framework

Some Misconceptions

- D_{KN} through Environmental Taxes will correct market failure and hence we can progress towards sustainable income
- D_{KN} through Emissions Trading will lower pollution loads and hence we can progress towards sustainability

It is true that environmental taxes and emissions trading will reduce pollution loads – BUT what matters is CUMULATIVE POLLUTION LOADS

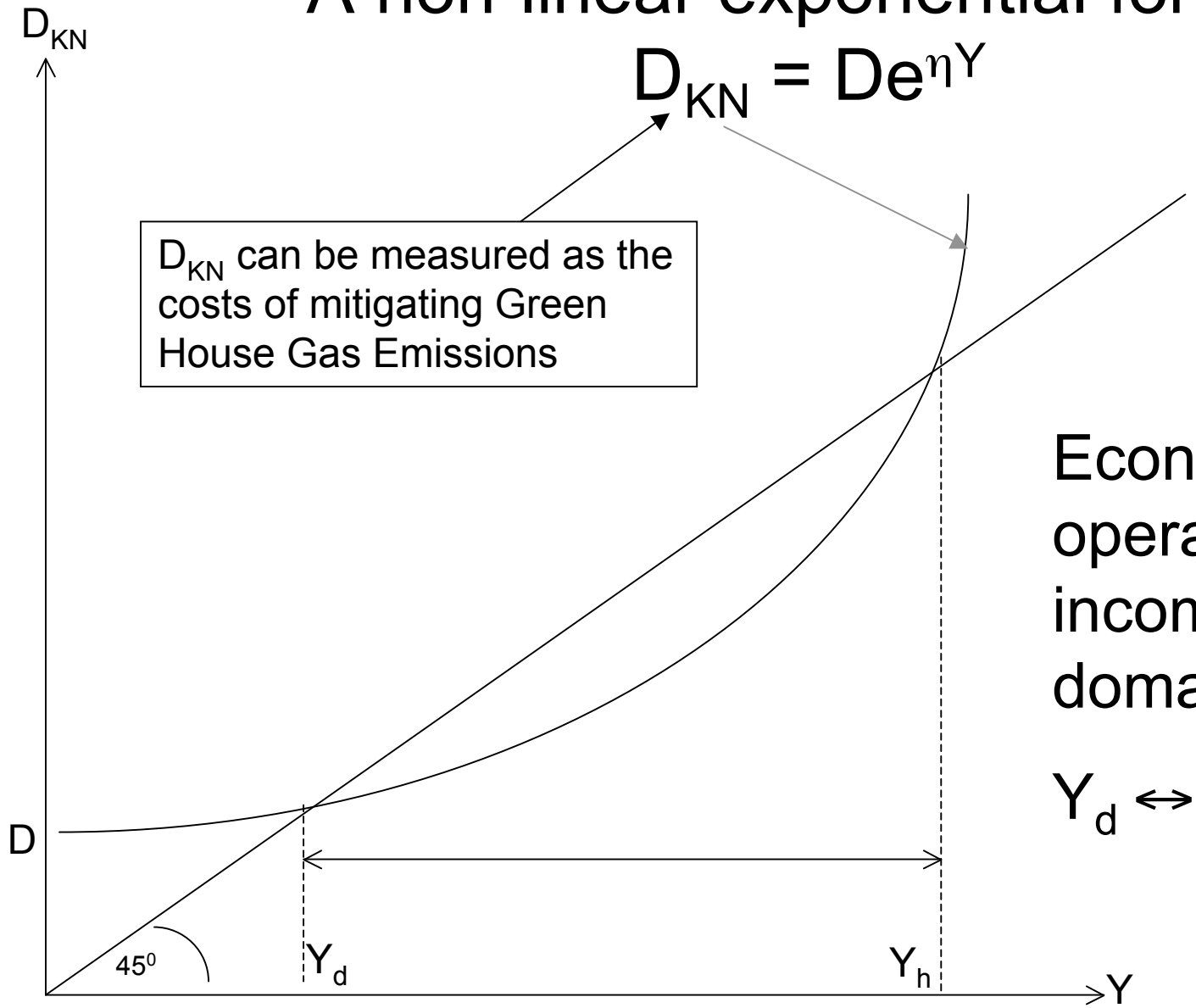
Cumulative pollution loads do matter

- A simple analogy: A prisoner in a torture chamber receives 100 lashes per day – If he were to now receive 50 lashes per day – will he get better?????
- The Infinity Assumption – Global Environmental Sinks are Finite
- Therefore Environmental Taxes need to be ploughed back into Environmental Sinks

Explaining Depreciation Cost of KN (D_{KN})

A non-linear exponential form

$$D_{KN} = De^{\eta Y}$$



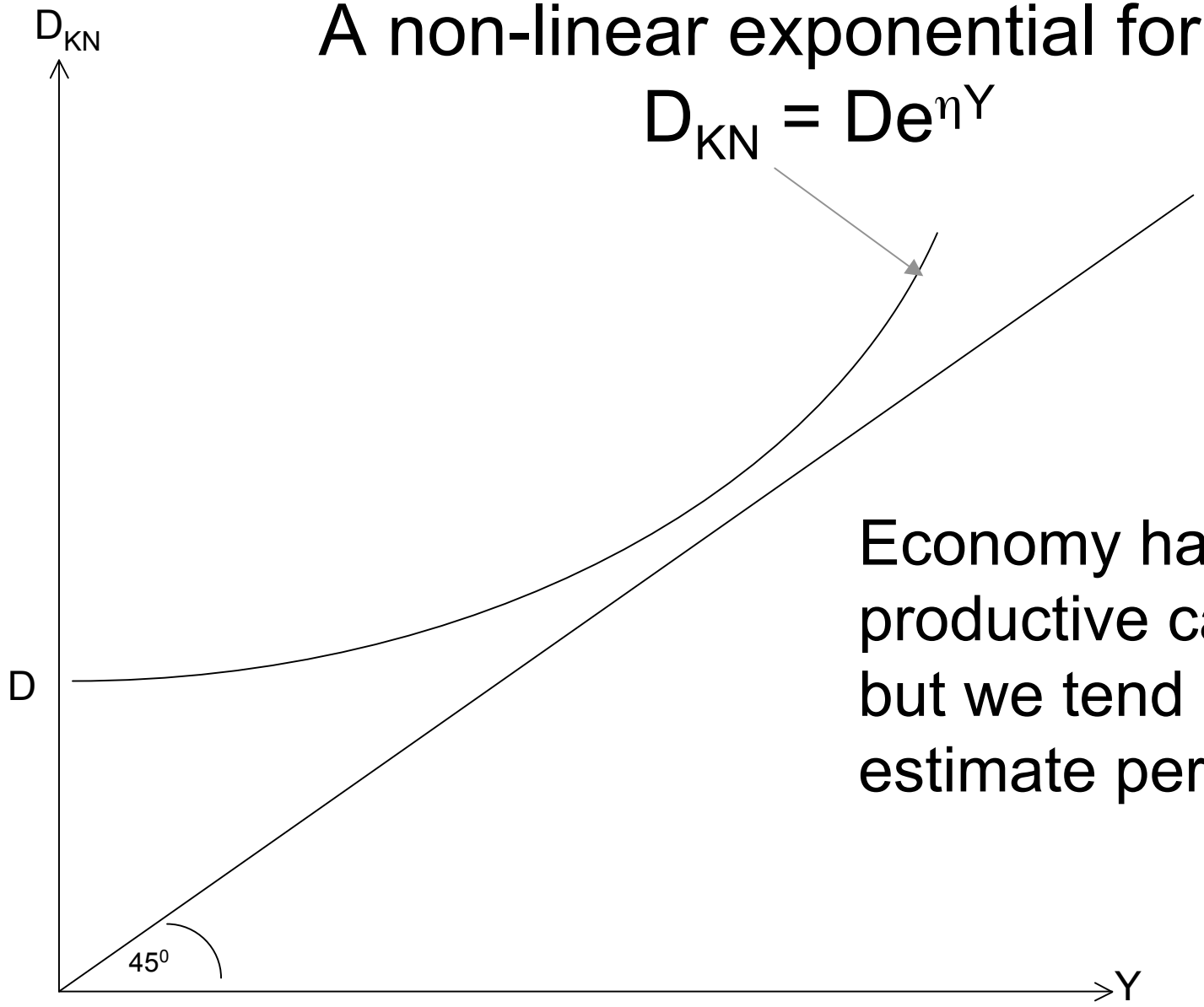
Economy can operate in the income domain:

$Y_d \leftrightarrow Y_h$

Ignoring Depreciation Cost of KN (D_{KN})

A non-linear exponential form

$$D_{KN} = De^{\eta Y}$$

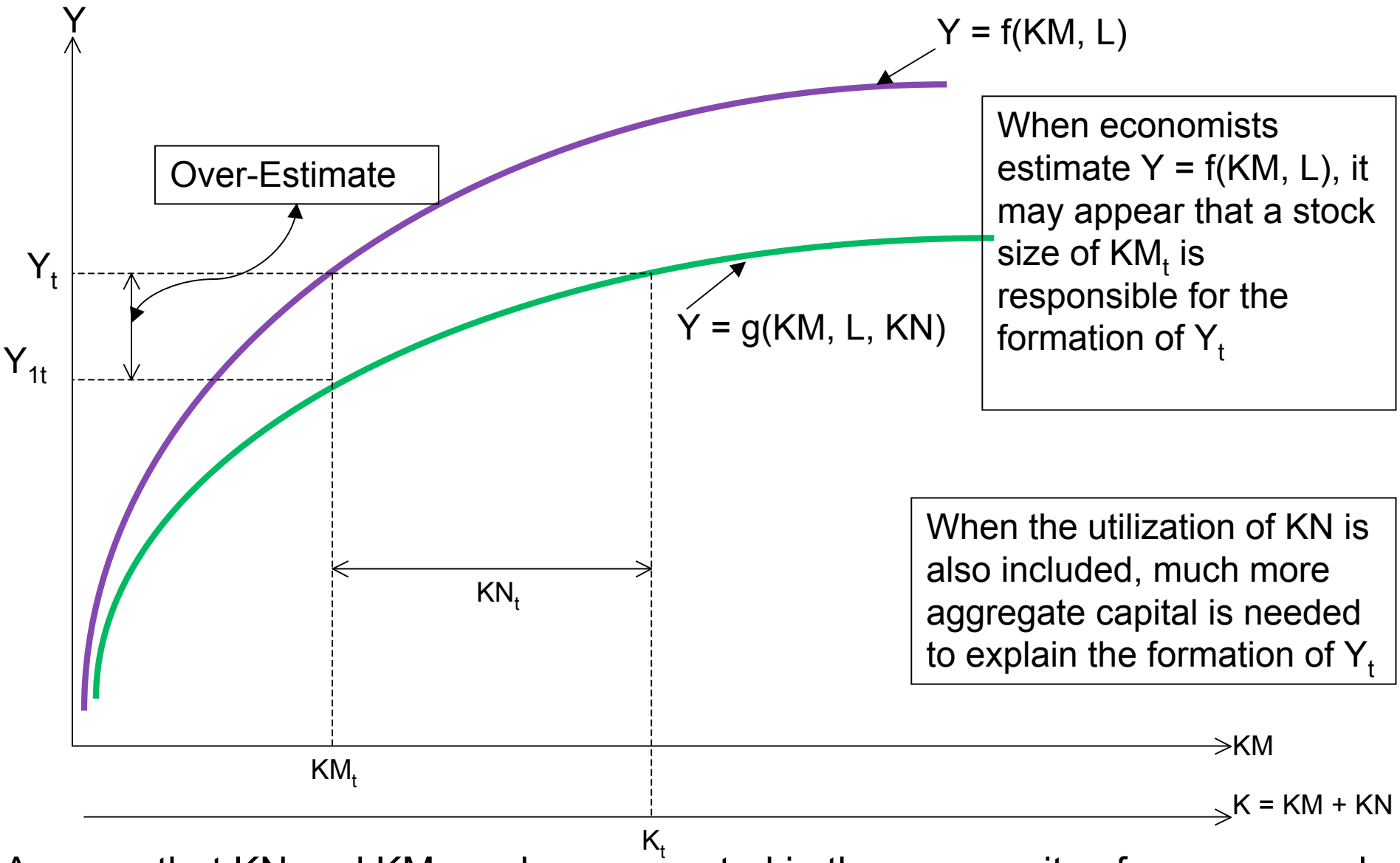


Economy has loses its productive capacity – but we tend over-estimate performance

INTERNALIZING THE DEPRECIATION COST OF KN INTO MACROECONOMIC POLICY FRAMEWORKS AND IMPLICATIONS FOR POLICY ANALYSIS

- The Production Function – explaining the distribution of national income between manufactured capital (KM), Labour (L) and KN
- Aggregate Demand (AD) – Aggregate Supply (AS) Framework

Ignoring KN overstates the role of KM



Assume that KN and KM can be aggregated in the same units of measure and denote the aggregate as K

The national accounts (statement of Incomes) provides information on how national income (Y) is distributed between KM and L

Y ≡ OPERATING SURPLUS (OS) + COMPENSATION OF EMPLOYEES (CE)

Payments accruing to KM

Payments accruing to L

Therefore the Income Accounts can be used to illustrate a standard equation for the distribution of national income between KM and L that is used in most texts

$$Y = \alpha(KM)^{\theta_t}(L)^{\lambda t}$$

θ_t= [OS/Y]

λ_t = [CE/Y]

$\theta_t + \lambda_t = 1$

The argument is that the Income Accounts contain payments that should accrue KN

These payments to KN are dispersed within OS and CE

Hence OS and CE as presented in the Income Accounts <u>over</u>-<u>state</u> the payments to KM and L

If we can <u>exogenously</u> determine the payments due to KN, then we can subtract these from OS and CE and demonstrate the valid descriptor of Y

$$Y = \alpha_t \, KM^{\bar{\grave{e}}\, t} \; L^{\bar{\ddot{e}}\, t} \; KN^{\eta_t}$$

The payments owing to KN assumed to be the **cost of air pollution abatement** and hence confine **KN to the Air-Shed of an economy**

The premised valid descriptor of Y

$$Y = \alpha_t \, KM^{\bar{è}_t} \, L^{\bar{ë}_t} \, KN^{\eta_t}$$

Cost of air pollution abatement

Estimated from World Development Indicators and the Stern Report

$$\eta = \left[\frac{D_{KN}(t)}{Y(t)} \right]$$

Once η is known, these two can be estimated by assuming that

$$\left(\bar{è}_t : \bar{ë}_t \right) = (P_{KMt} : P_{Lt})$$

Ratio of shadow prices of KM and L

We have two sets of coefficients for the factor shares of Y

(θ_t, λ_t) and $(\bar{\theta}_t, \bar{\lambda}_t, \eta_t)$

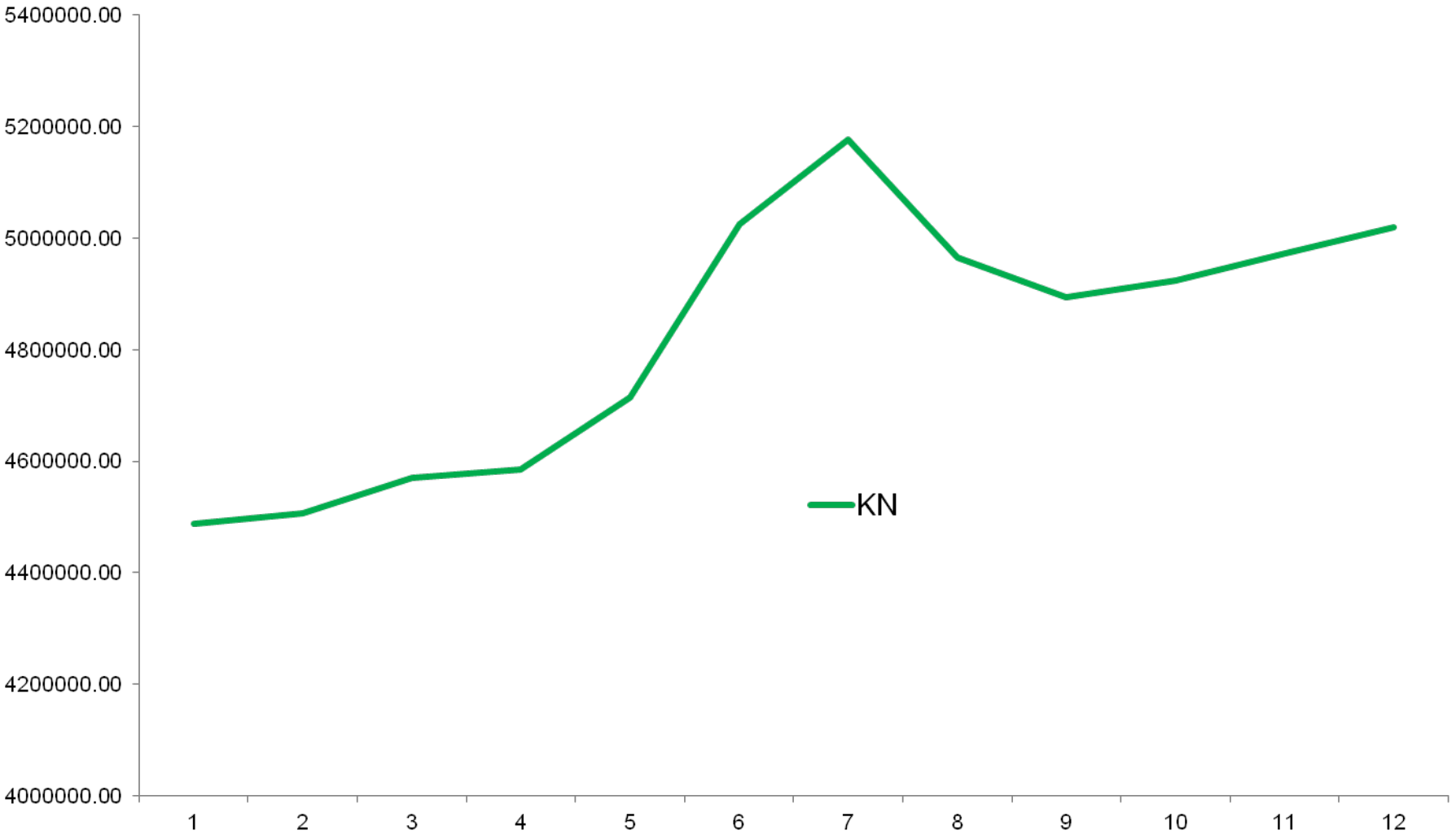
such that two accounting statements can be

$$Y_t = \alpha_t KM_t^{\theta_t} L_t^{\lambda_t} \text{ --------(1)}$$

$$Y_{tS} = (1-\gamma_t)\alpha_t KM^{\bar{\theta}_t} L^{\bar{\lambda}_t} KN^{\gamma_t} \quad \text{-------- (2)}$$

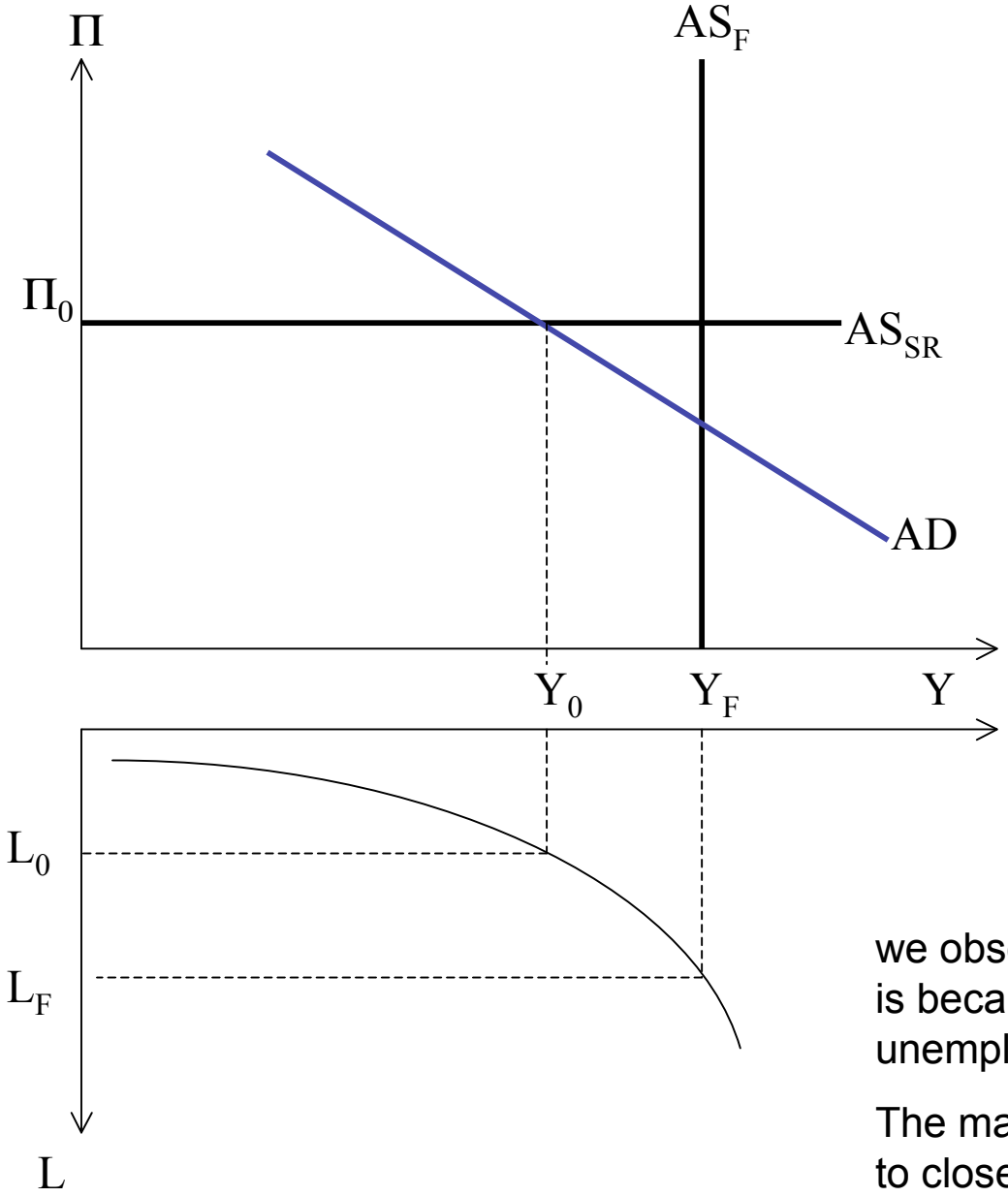
Dividing (1) by (2):

$$KN_t = KM_t^{\left(\frac{\theta_t - \bar{\theta}_t}{\gamma_t}\right)} L_t^{\left(\frac{\lambda_t - \bar{\lambda}_t}{\gamma_t}\right)}$$



Utilization of KN Q4-2007 to Q-2 2010

Standard Model – Introduce Income-Employment Relationship



AD explains relationship between Π and Real Expenditures

AS explains relationship between Π and Real Incomes

Π = Rate of Inflation

Y = National Product (Income or Expenditure)

L = Employment

L_0 = Observed Employment

L_F Full Employment

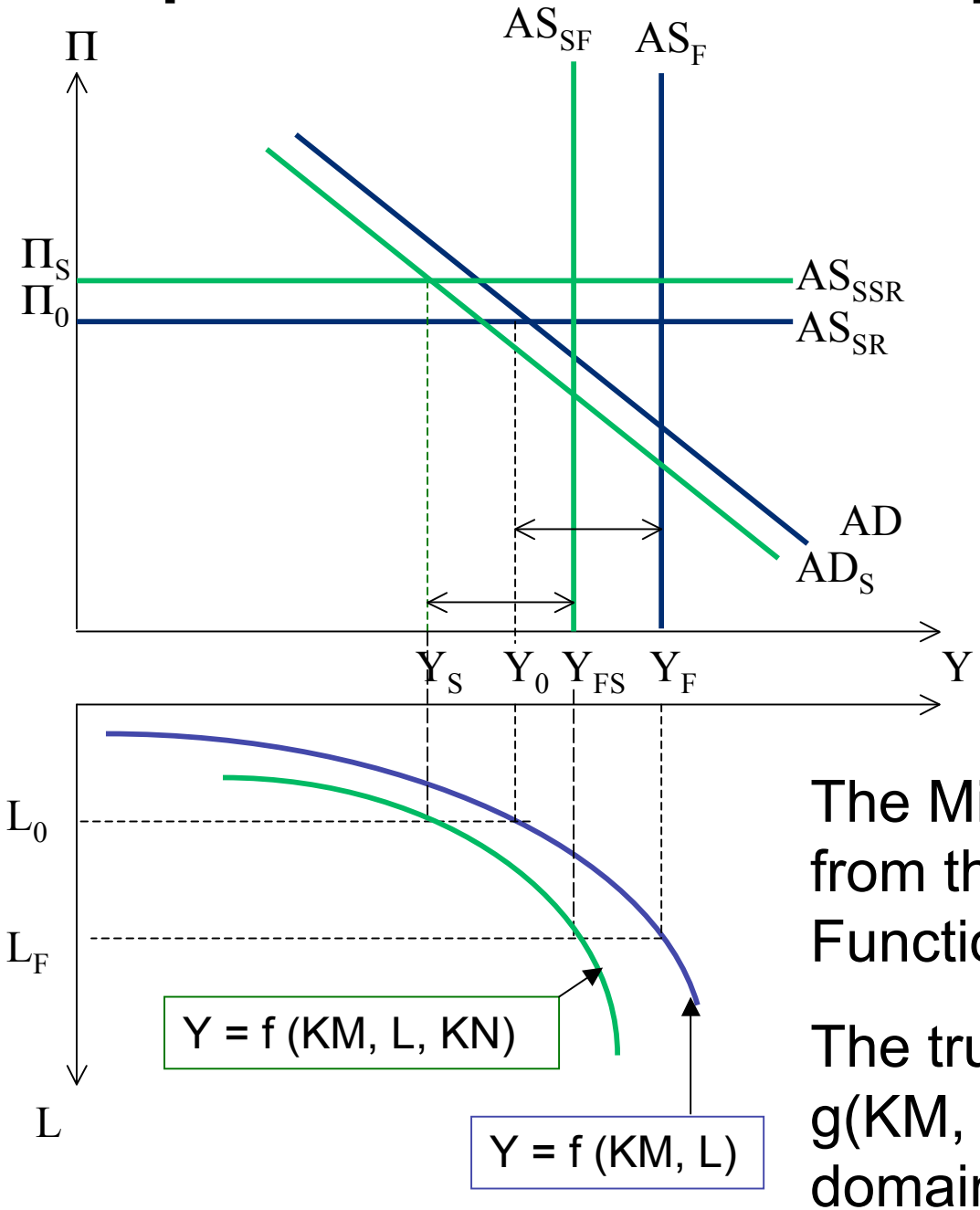
Y_0 = Observed Income;

Y_F = Full Employment Income

we observe a recessionary gap. This is because Y_0 corresponds with an unemployment level of L_F-L_0

The macroeconomic planner will strive to close the gap and reduce unemployment.

Simple Model – Introduce Depreciation of KN



Both Y_F and Y_0 are over-stated They need to be adjusted:

$Y_{FS} = Y_F - D_{KN}$

$Y_S = Y_0 - D_{KN}$

$Y_0 \leftrightarrow Y_F$: Mistaken Domain

True domain: $Y_S \leftrightarrow Y_{FS}$

The Mistaken Policy Domain arises from the Mistaken Production Function [Y = f(KM, L)]

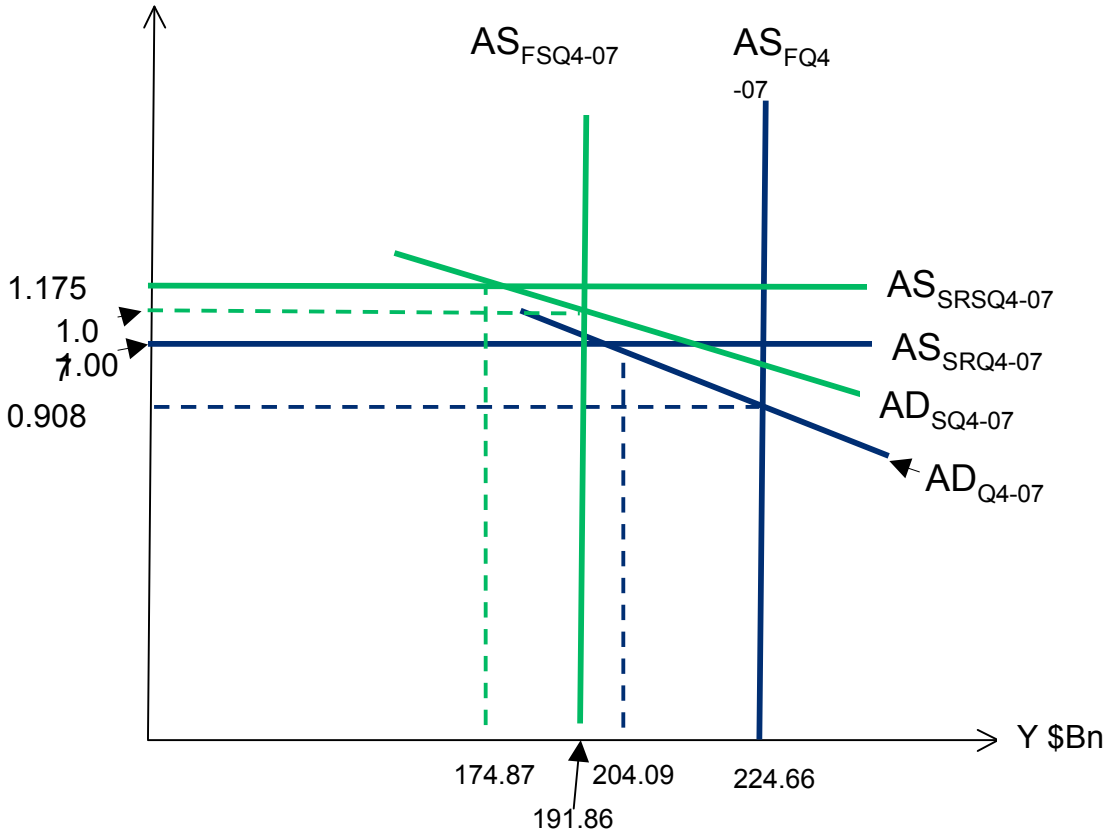
The true production function, [Y = g(KM, L, KN)] will correct the domain

Examine the period Q-4 2007 to Q-2 2010:
Raised r → Lowered r → Raised r again
Steadily increased G
Some relief in τ

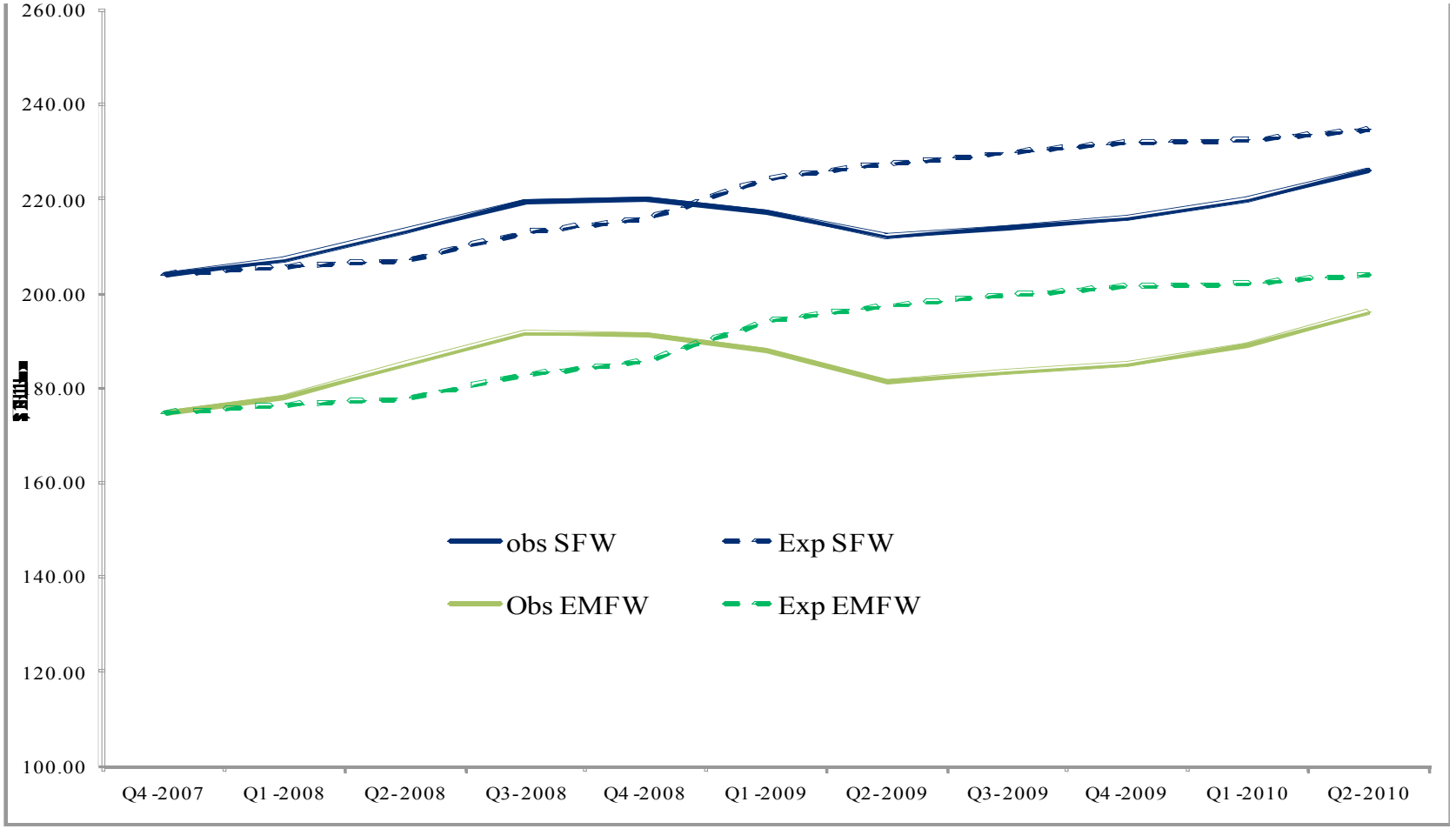
	Δr	G	τ
Q4-2007	0.25	39.02	0.12
Q1-2008	0.47	39.49	0.12
Q2-2008	0.03	40.44	0.11
Q3-2008	-0.23	40.83	0.11
Q4-2008	-2.67	41.53	0.11
Q1-2009	-1.10	41.76	0.11
Q2-2009	-0.25	42.05	0.11
Q3-2009	0.00	42.92	0.11
Q4-2009	0.74	43.67	0.11
Q1-2010	0.24	44.37	0.11
Q2-2010	0.52	45.17	0.11

Inflation outcomes were higher with EM Framework

Inflation unaffected by intervention regardless the nature of the intervention – Hence the presence of other Sources of Inflation



In Q-4 2007, Y_{FS} was less than Y_t – The rate increases were unwarranted –
What was needed was KN Capacity Expansion
Similar picture through out the period under consideration
Possible reason why inflation remained unchanged



During the GFC – Income levels did not fall to or below the sustainable levels
Rescue measures strove to take the economy back to unhealthy pre-crisis levels

Lost Opportunity was that Australia (like others) could have sought measures to raise the sustainable income paths

Wages - Policy Domain - and the Financial Crisis

- Across the board – wages are over-stated by about 5-6 percent – BUT
- In 2002, the richest 10% of the population commanded some 32% of the national income
- Richest 200 persons held 2% of national income
- The Upper tail of the wage distribution approaches $20-30 Million
- High Income Wage group have driven the AD into the mistaken domain → Exacerbating D_{KN}
- Rescue Efforts → Wages Policy based on True Social Opportunity Costs - not contrived opportunity costs
- Australia well poised to deliver a showcase effect in this context: Direct rescue efforts towards activities that reduce DKN
- Numerous Examples of Closed-Loop Production Systems

Examples of Closed-Loop Systems

Industrial Park – Kalundborg in Denmark

Montfort Boys Town in Suva Fiji – Brewery Wastes feeding into Mushroom farms, animal husbandry aquaculture and horticulture

Recycling “Used Cooking Oil” – Auscol in Sydney

Sewerage Treatment in Singapore

Capturing Heat Emissions from Air-Conditioners

Public Transport Infrastructure

We have lost Macroeconomics to the so called theoretical purists and the econometricians!

Paul Krugman (2009): Most macroeconomics of the past 30 years was “spectacularly useless at best, and positively harmful at worst”. (http://www.economist.com/node/14030288)

But Krugman has not heard of Environmental Macroeconomics!