

Trade and Migration in a World without Factor Price Equalisation

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Work in progress. Comments welcome, but not for quotation.

Background

Most trade modelling and policy analysis fpe.

Specialisation and fpe failures the norm.

Davis (1998), Schott (2003)

Not well understood. Dixit and Norman (1980)'s integrated equilibrium analysis the starting point. It is a “fairly nasty business” Krugman (1995) and we are “surprisingly ignorant” Deardorff (2001). Errors in standard texts.

Grossman (1990) 2 good 2 factor model.

Leamer (1987) 3 good n factor model with Leontieff technology.

Aims of Paper

Describe regions of specialisation outside the fpe set for a standard Heckscher-Ohlin world, correcting errors.

Consider patterns of goods and factor prices in different regions of specialisation.

Show how factor price divergences in the specialisation regions drive skilled and unskilled migration, and the effect of this migration on inequality (e.g. Mexico-US, Europe).

Show how the entry of a large unskilled labour intensive economy (e.g. China) affects patterns of specialisation and inequality.

Foundation for empirical and policy work.

Model Setup

Competitive model

Technology identical across the world

Tastes identical and homothetic

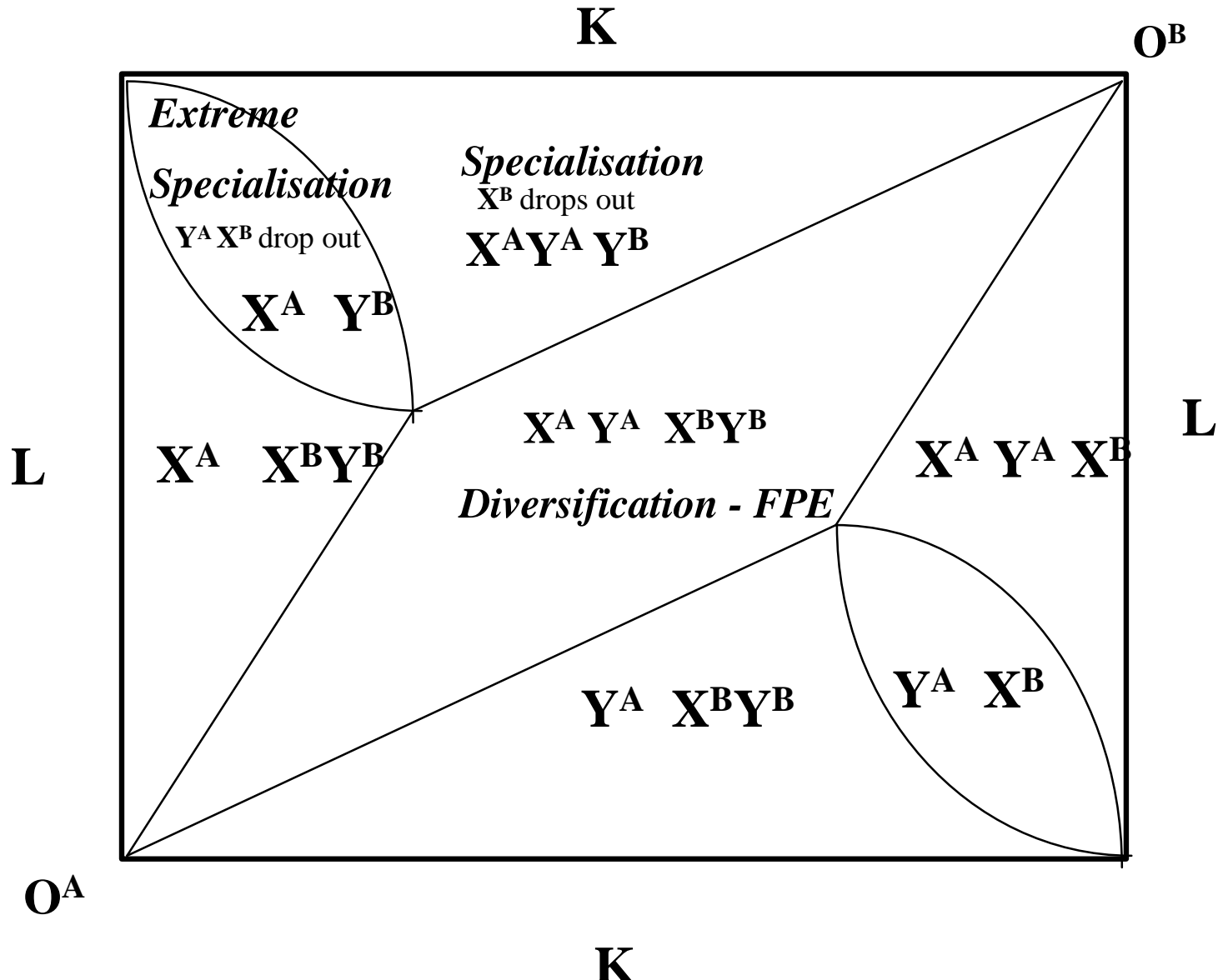
Two countries A and B

Two goods X and Y

Two factors K and L (skilled and unskilled labour)

X is L intensive.

Figure 3 – Regions of Specialisation and Diversification



Movements between regions

Begin in fpe region.

Increase A labour endowment, reducing B's

Rybczynski effect, and eventually X^B drops out.

Now in specialisation region

Increase B skill endowment, reducing A's.

Rybczynski effect, reducing Y^A

Goods and factor prices also changing. P^Y rising.

w/r falls and production more L intensive in A,

w/r rises and production more K intensive in B.

Eventually Y^A drops out.

Boundaries of regions

We have an expression for the boundary of the extreme specialisation region, but it is very ugly.

The region is convex.

Simulations using Matlab

Cobb-Douglas Production Functions

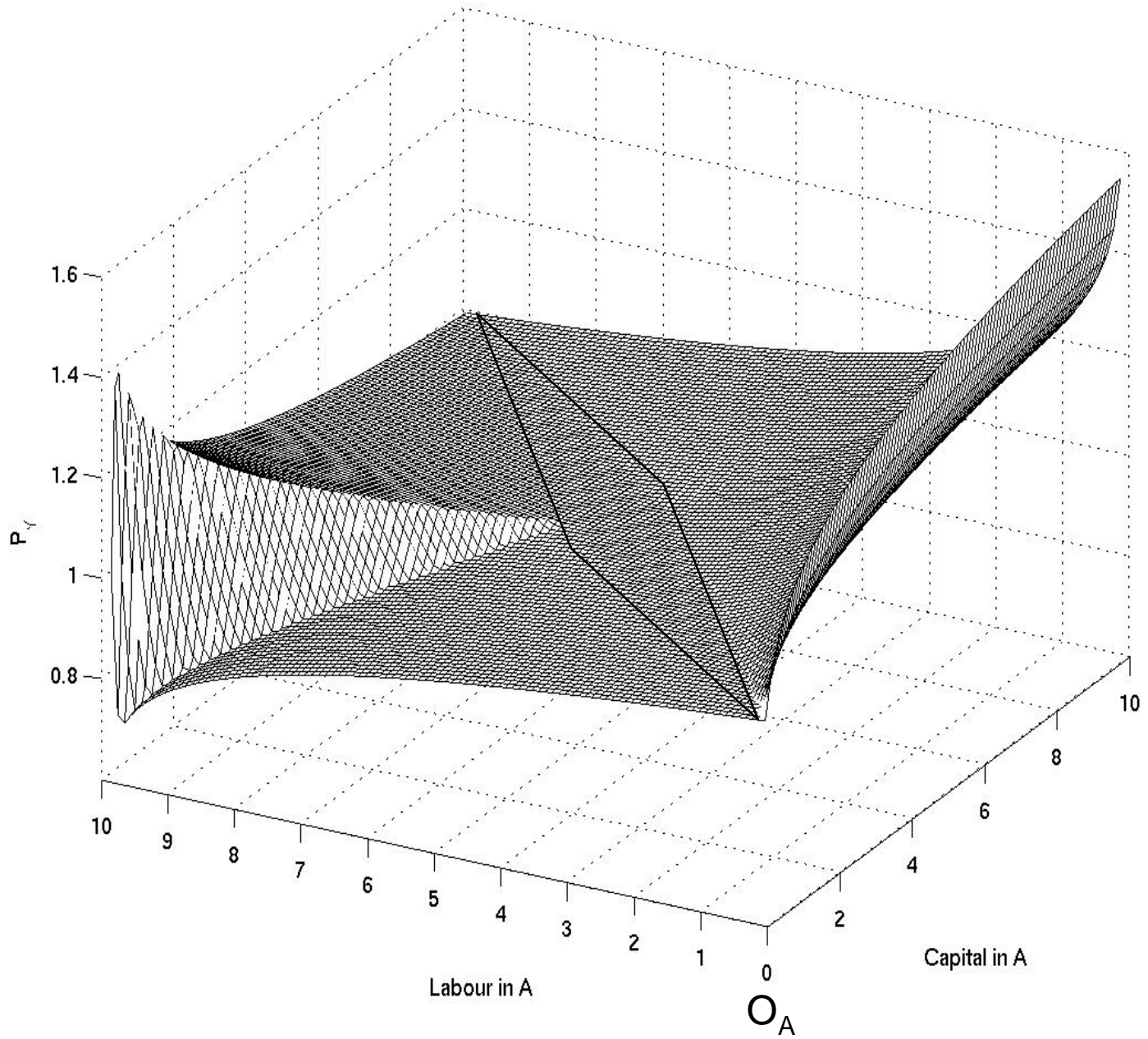
with shares of L in X .55, K in X .45

and L in Y .45, K in Y .55

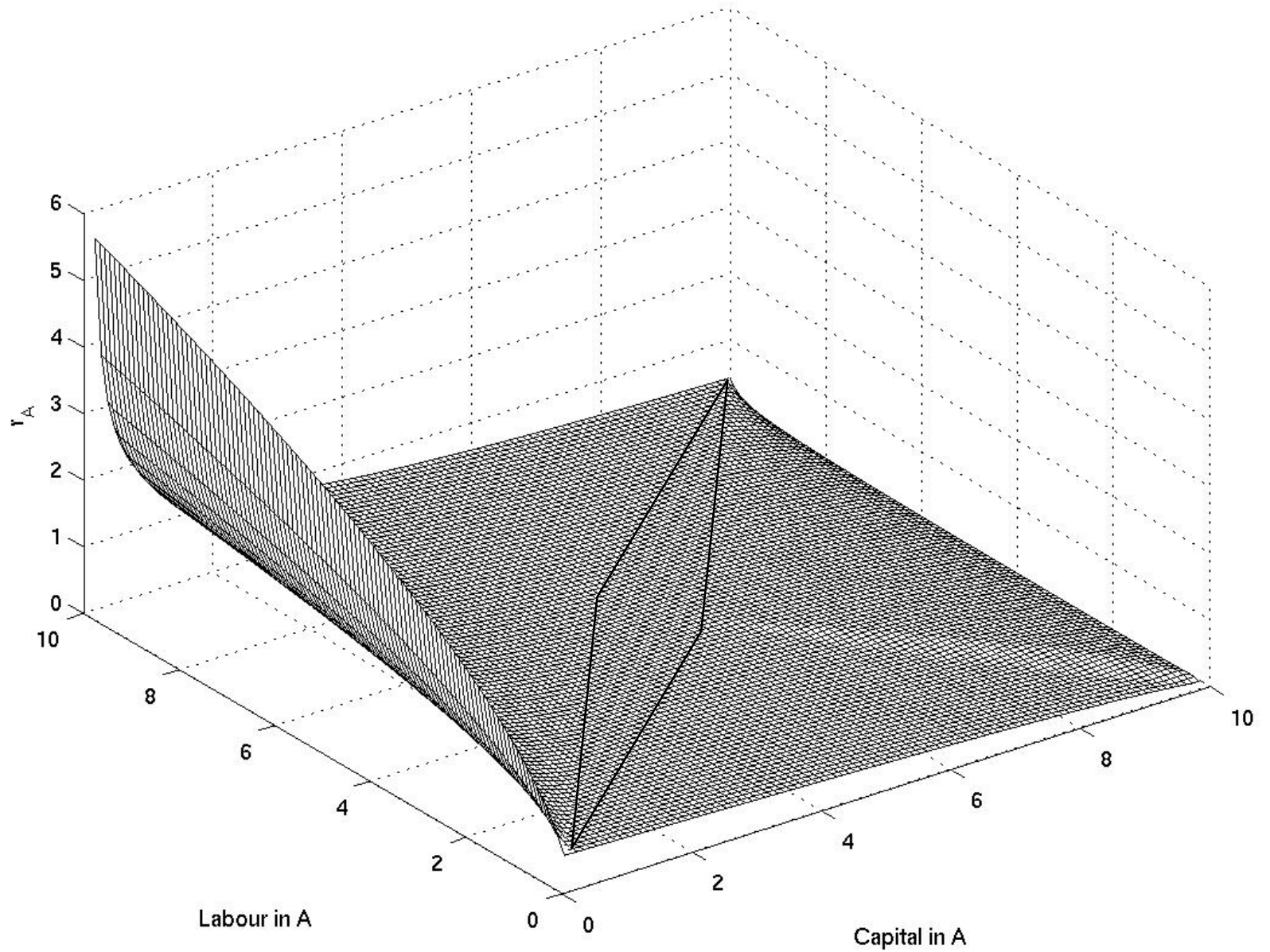
Cobb-Douglas Preferences

with shares of X and Y of .5

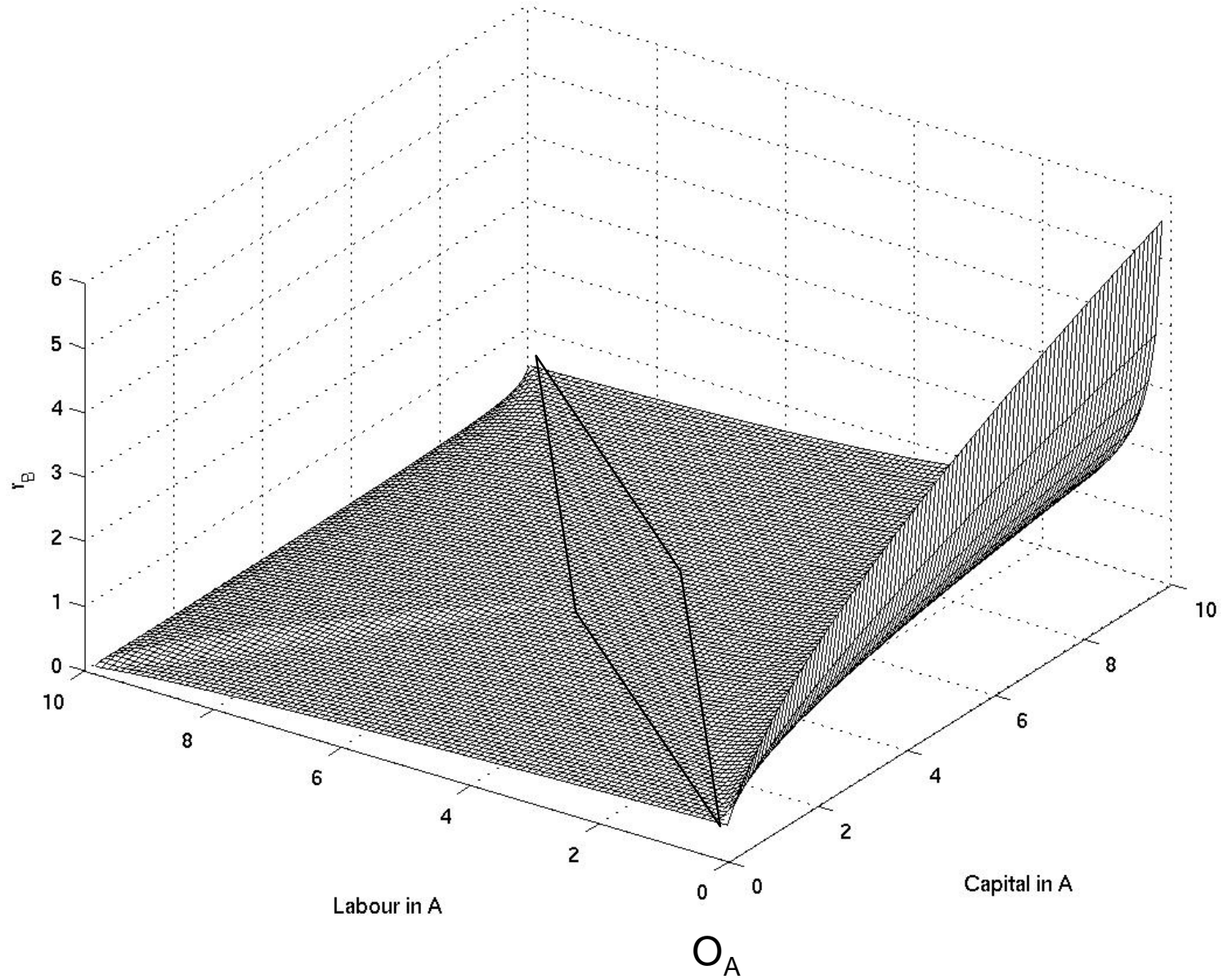
Price of product Y



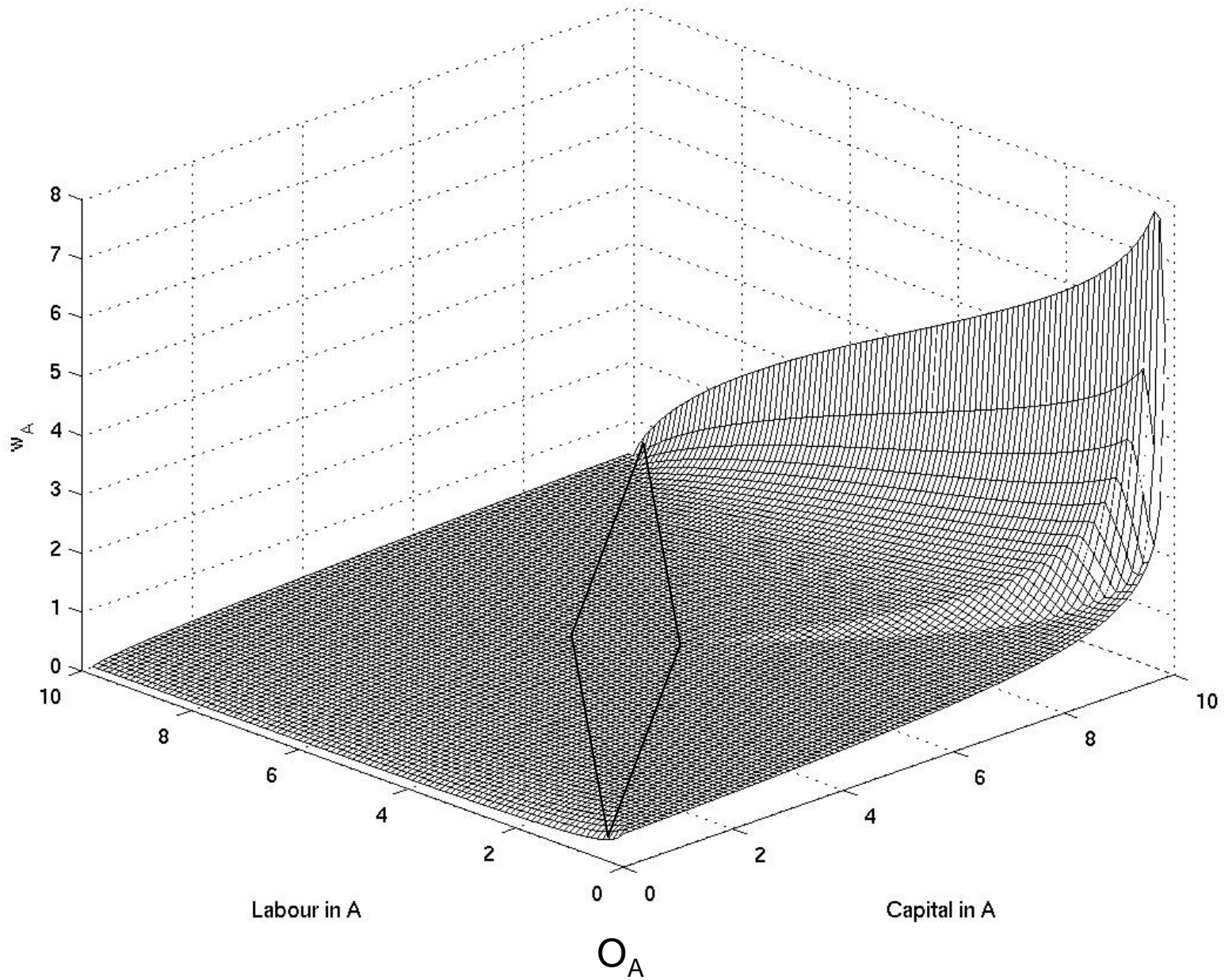
Rents in Country A



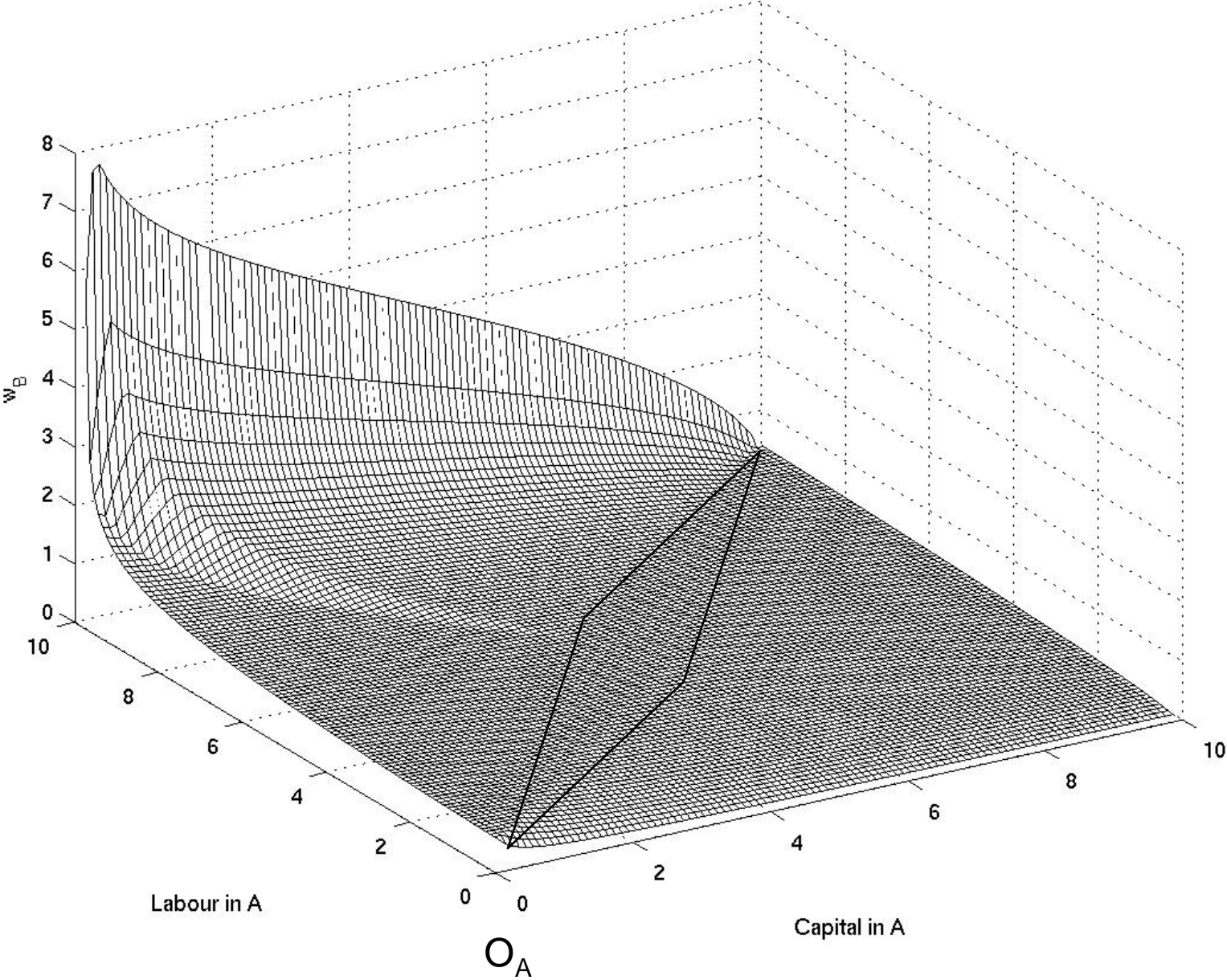
Rents in Country B



Wages in Country A



Wages in Country B



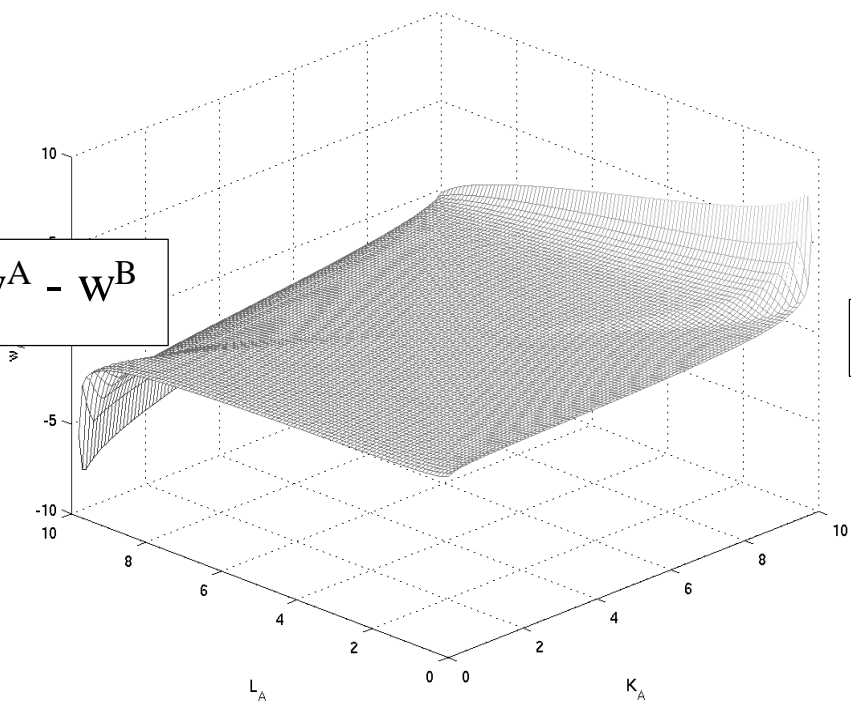
Migration

Migration pressure from factor price differentials between countries.

Ignoring

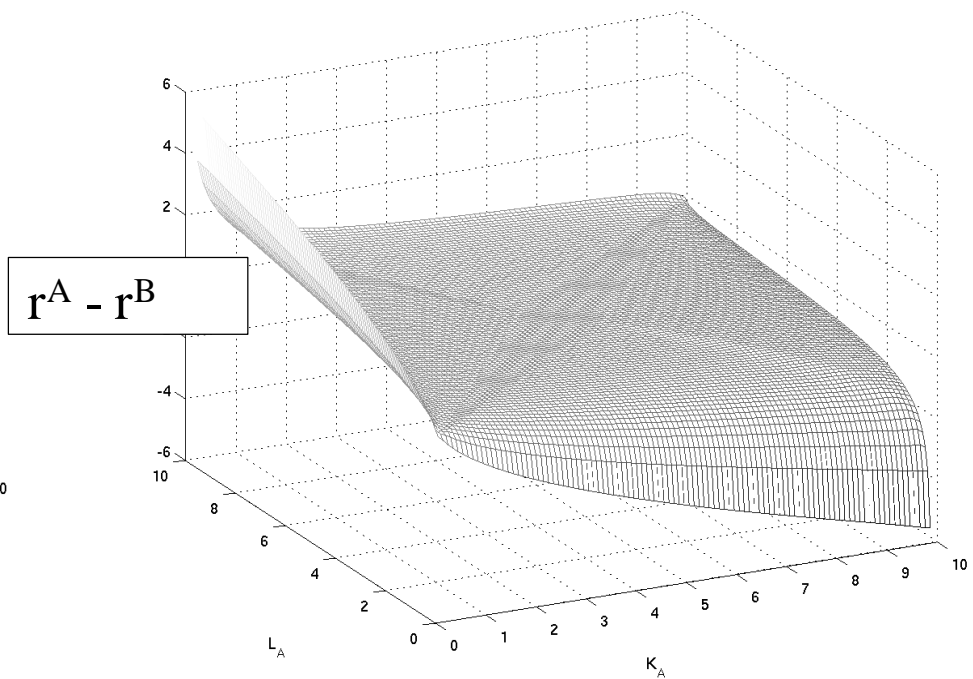
- average incomes in countries. public goods.
- goods price changes
- risk
- locational preferences

Figure 9 – Migration Pressure Unskilled Labour



Positive value means
pressure for the factor to
migrate from country B to A

Figure 10 – Migration Pressure Skill



Definition of Inequality

Ratio of skilled to unskilled wages r/w

There are more sophisticated measures of inequality, but this simple measure ties into recent debates.

(note: r , w and assumption that each individual owns a unit of a either skilled or unskilled labour imply a Gini coefficient)

Gini Coefficient

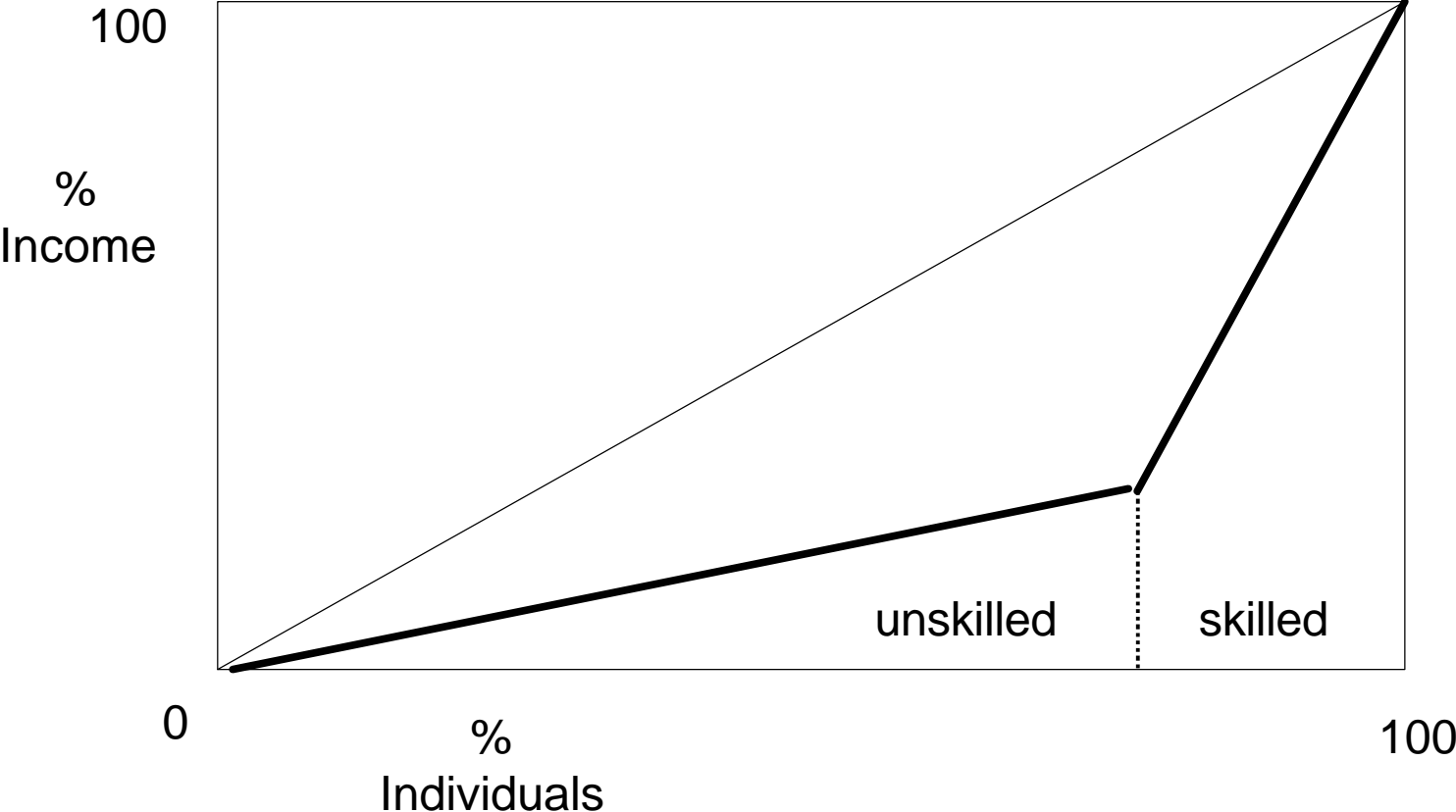
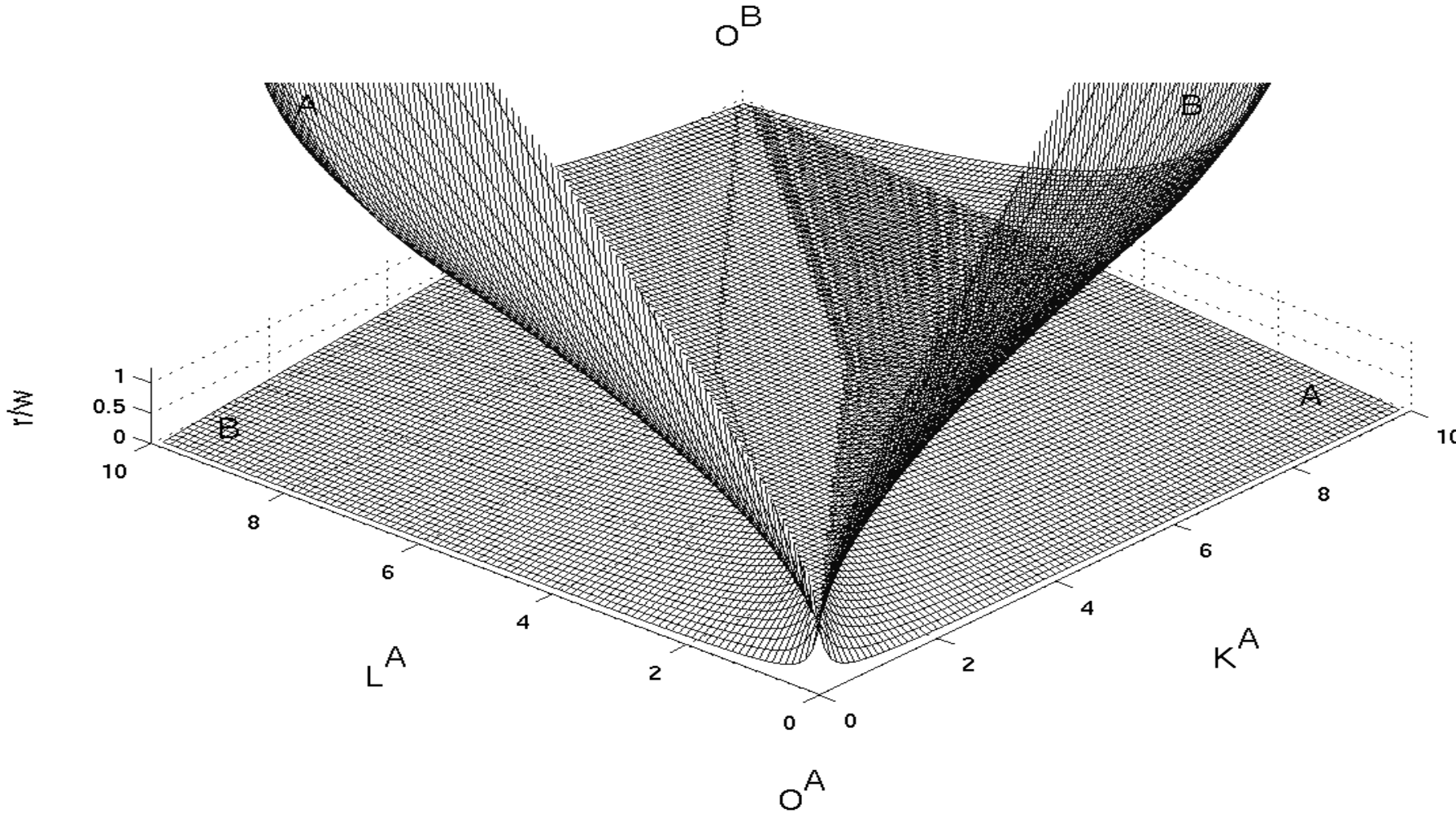


Figure 11 – Inequality Surfaces for each Country



Effect of Migration On Inequality e.g Mexico/US, Europe

Begin with endowment point NW of figure 12.

Allow unskilled labour to move between countries. Wage differential pulls labour from labour abundant country A to B. Unskilled wages rise in A fall in B, skilled wages fall in A rise in B. Inequality falls in unskilled labour abundant country A, and rises in B.

Opening up skilled labour flows has the same effects - inequality falls in A, and rises in B.

Instead begin in SE of figure 12. Opening up unskilled and/or skilled migration reduces inequality in labour abundant B, increases inequality in A.

Effect of Migration On Inequality e.g Mexico/US, Europe

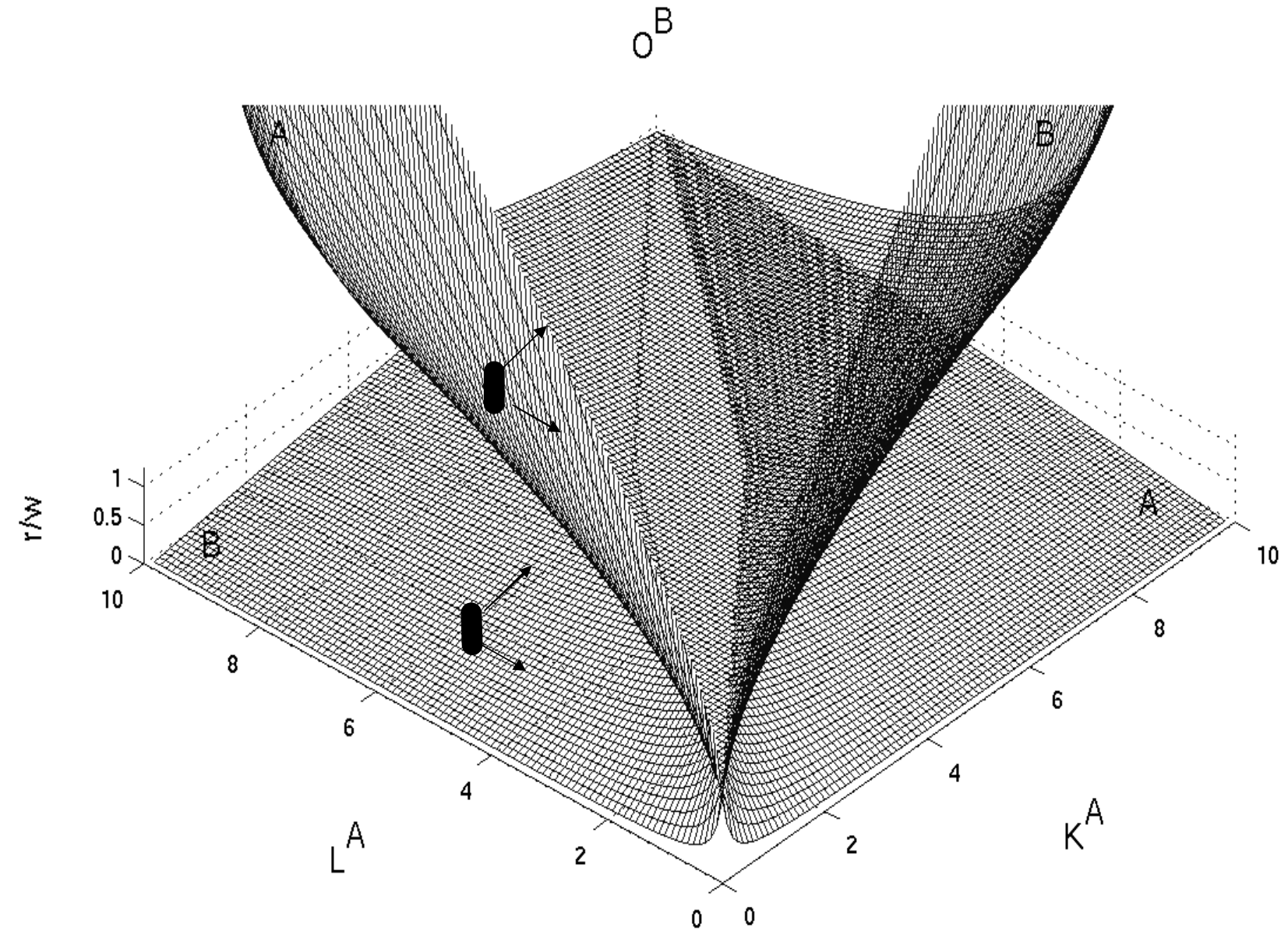
Proposition

Migration of either factor pushes countries towards the fpe plane, ie. level of inequality that would prevail in an integrated world economy.

Proposition

Migration of either factor reduces inequality in the most unequal country. i.e. the labour abundant country.

Figure 12 – Effect of Migration on Inequality



Entry of a Large Labour Abundant Economy e.g China

Endowment box stretched as shown in figure 13.

Changes the pattern of specialisation. Point V was previously diversified production but now X^B drops out.

Point U previously specialised but now X^A comes back into production.

Inequality surfaces are stretched and raised as in figure 14.

Figure 13 – Labour Endowment Expands

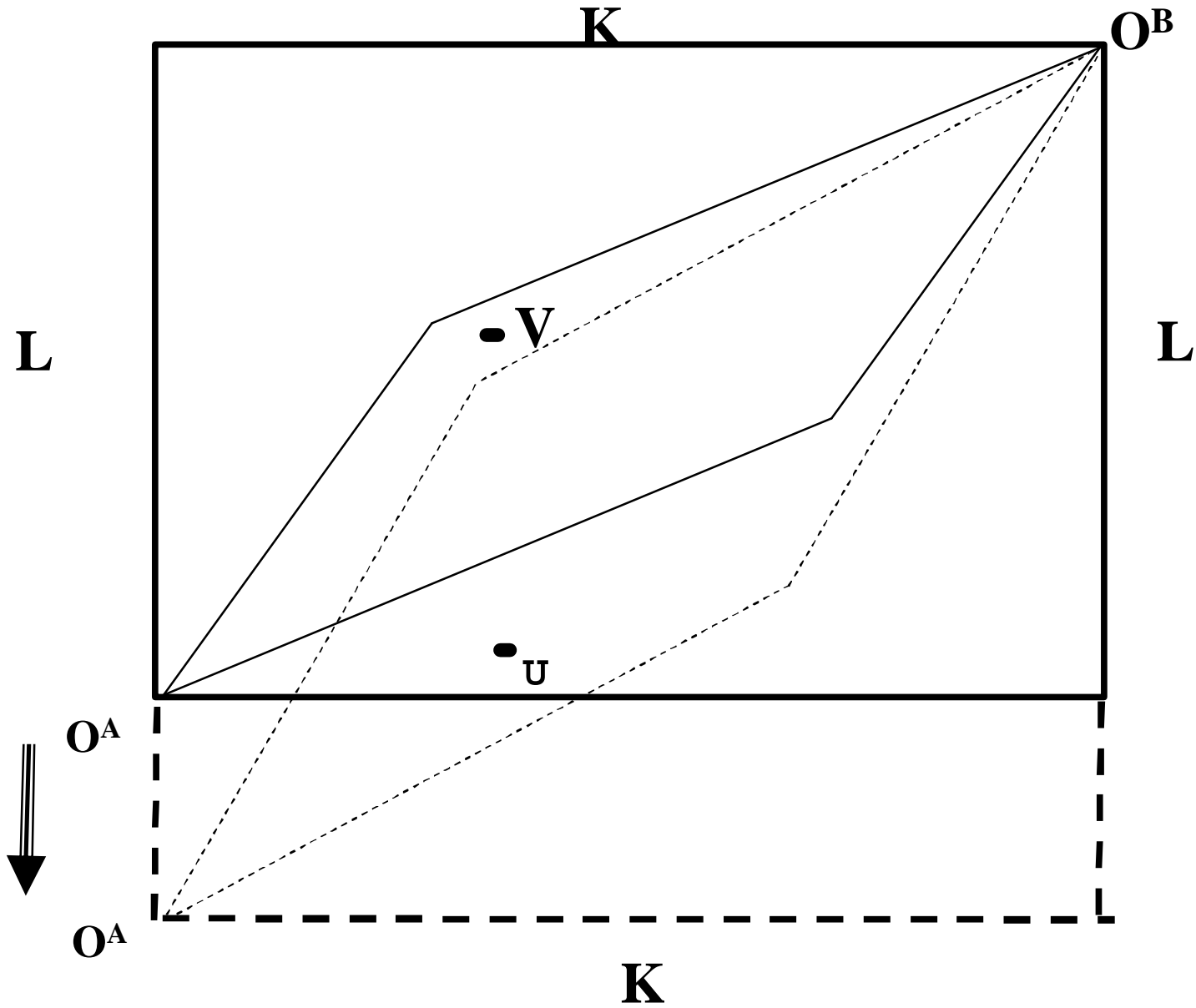
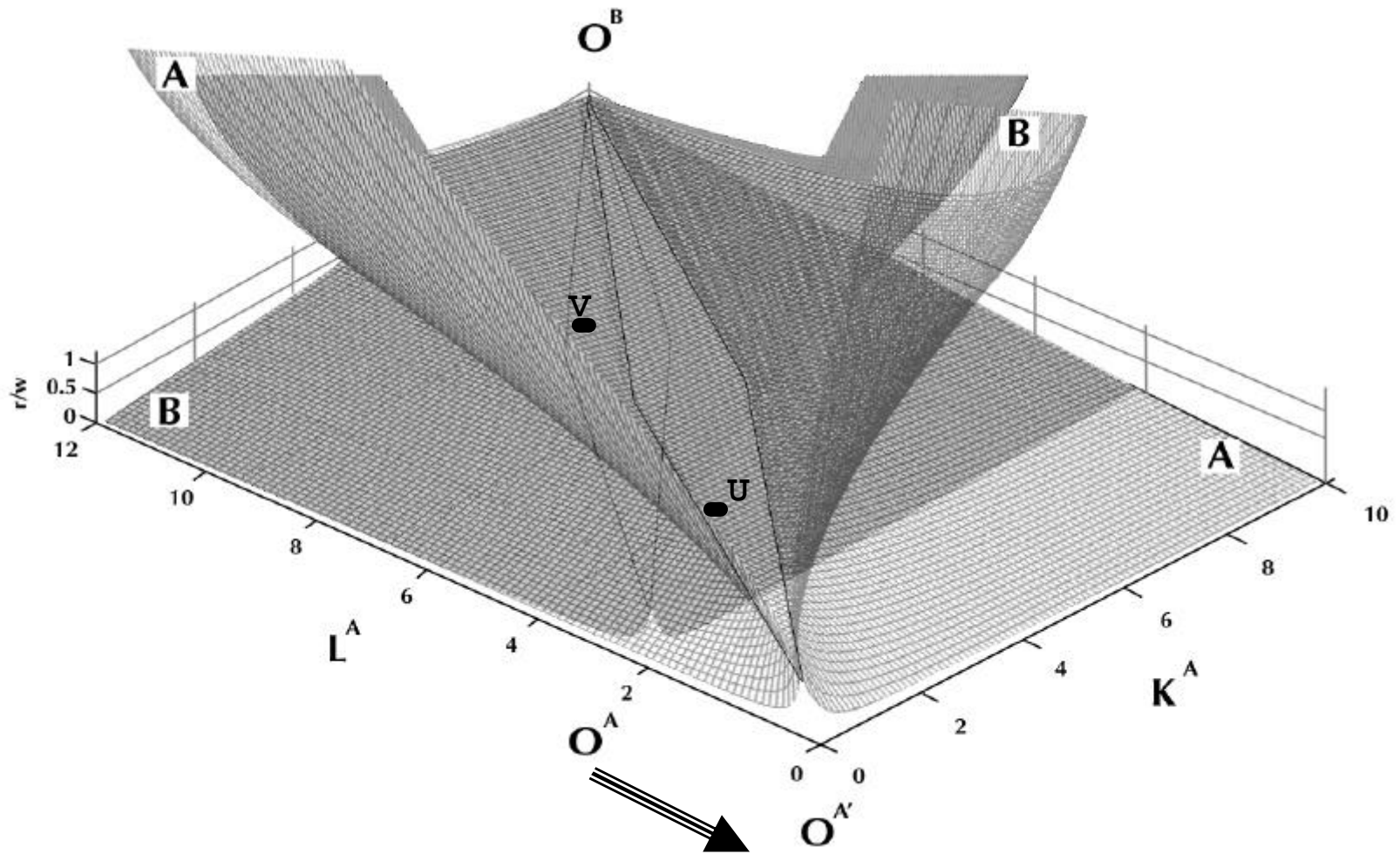


Figure 14 –Effect of Labour Endowment Expansion on Inequality



Inequality Effects of Entry of a Large Labour Abundant Economy

Starting in NW of figure 14.

Inequality rises in country A which brings the unskilled labour to the world economy, ambiguous effect on inequality in B.

Starting in SE inequality rises in A, ambiguous in B.

Inequality Effects of Entry of a Large Labour Abundant Economy

Proposition

With no migration, inequality rises in country which brings the unskilled labour to the world economy, and there is an ambiguous effect on inequality in rest of the world.

With migration, additional unskilled labour increases inequality in all countries, regardless of which country's labour force is growing.

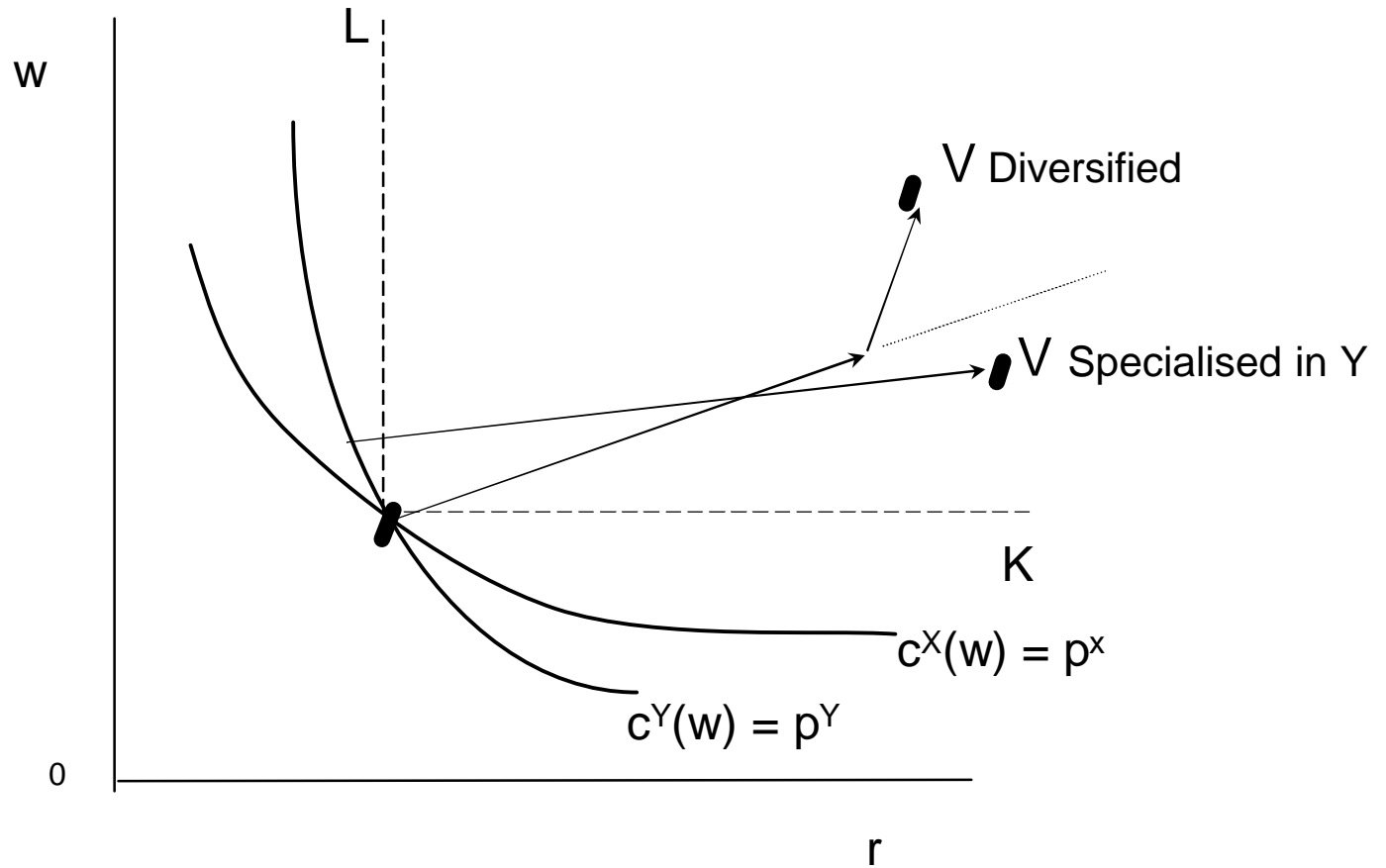
Conclusions

Mapping regions of specialisation, and factor and goods price patterns is not just a parlour game to trade theorists, but sheds light on important real world issues.

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Zero Profits, Endowments and Specialisation



Diversification - Factor Price Equalisation

Zero profit for each product produced in each country

$$(1) \quad 1 = c^X(r^A, w^A)$$

$$(2) \quad 1 = c^X(r^B, w^B)$$

$$(3) \quad p^Y = c^Y(r^A, w^A)$$

$$(4) \quad p^Y = c^Y(r^B, w^B)$$

Full employment of each factor in each country

$$(5) \quad c_{W}^X(r^A, w^A) X^A + c_{W}^Y(r^A, w^A) Y^A = L^A$$

$$(6) \quad c_{R}^X(r^A, w^A) X^A + c_{R}^Y(r^A, w^A) Y^A = K^A$$

$$(7) \quad c_{W}^X(r^B, w^B) X^B + c_{W}^Y(r^B, w^B) Y^B = L^B$$

$$(8) \quad c_{R}^X(r^B, w^B) X^B + c_{R}^Y(r^B, w^B) Y^B = K^B$$

Demand

$$(9) \quad \frac{X^A + X^B}{p^Y Y^A + p^Y Y^B} \equiv \frac{1 - \sigma^Y}{\sigma^Y}$$

Specialisation - X^B drops out

Zero profit for each product produced in each country

$$(10) \quad 1 = c^X(r^A, w^A)$$

$$(11) \quad p^Y = c^Y(r^A, w^A)$$

$$(12) \quad p^Y = c^Y(r^B, w^B)$$

Full employment of each factor in each country:

$$(13) \quad c^X_W(r^A, w^A) X^A + c^Y_W(r^A, w^A) Y^A = L^A$$

$$(14) \quad c^X_R(r^A, w^A) X^A + c^Y_R(r^A, w^A) Y^A = K^A$$

$$(15) \quad c^Y_W(r^B, w^B) Y^B = L^B$$

$$(16) \quad c^Y_R(r^B, w^B) Y^B = K^B$$

Demand

$$(17) \quad \frac{X^A}{p^Y Y^A + p^Y Y^B} = \frac{1 - \sigma^Y}{\sigma^Y}$$

Extreme Specialisation – Y^A drops out as well as X^B

Zero profit for each product produced in each country:

$$(18) \quad 1 = c^X(r^A, w^A)$$

$$(19) \quad p^Y = c^Y(r^B, w^B)$$

Full employment of each factor in each country:

$$(20) \quad c_{W}^X(r^A, w^A) X^A = L^A$$

$$(21) \quad c_{R}^X(r^A, w^A) X^A = K^A$$

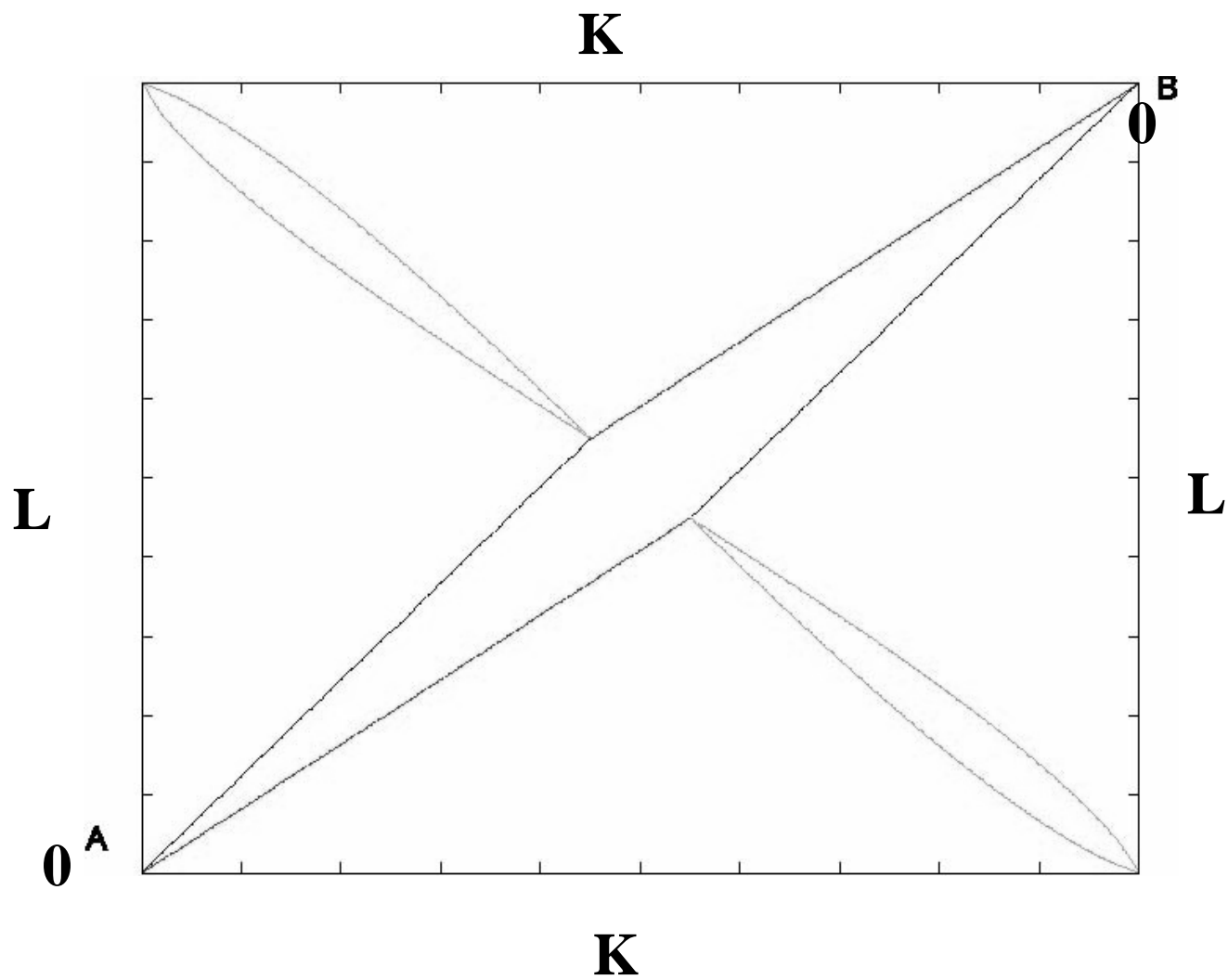
$$(22) \quad c_{W}^Y(r^B, w^B) Y^B = L^B$$

$$(23) \quad c_{R}^Y(r^B, w^B) Y^B = K^B$$

Demand

$$(24) \quad \frac{X^A}{p^Y Y^B} = \frac{1 - \sigma^Y}{\sigma^Y}$$

Simulated Specialisation and Diversification Regions



Extension - Unemployment

Difficult, and only possible for a common minimum wage.

Multiple equilibria, each with a different distribution of unemployment between the countries.

Unemployment expands fpe region.