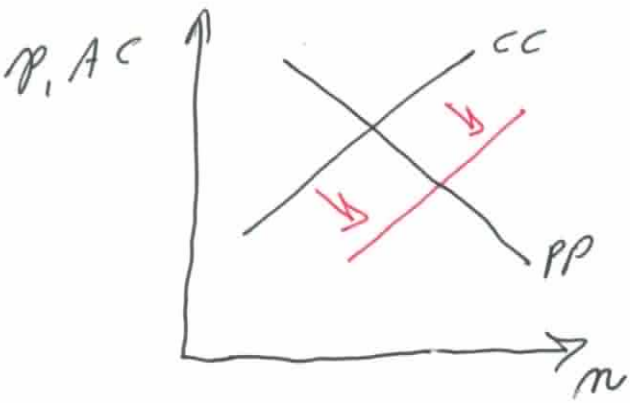
Economies of Scale

notes for Grad Students

When we discussed the monopolistic competition model we noted that



trade increases mkt size
→ lowers price
→ supports more firms
⇒ more varieties
→ each firm sells more

But → varieties available to consumers rises
→ varieties produced w/in each country falls

Scale Effect – surviving firms expand
Selection Effect – some firms forced to exit

---

when countries have very different K/L ratios trade based on comparative advantage + there are redistribution effects
when countries have very similar K/L ratios trade is NOT based on comparative advantage
→ trade is intraindustry
→ no redistribution effects

Gravity Equation

→ at first glance gravity equation will appear to be a ridiculous statement of the obvious the bilateral trade between is proportionate to the product of their GDPs Well obviously the bilateral trade between the US + Monaco is going to be much smaller than the bilateral trade ~~between~~ between the US + Canada

→ there are two useful empirical applications of the gravity equation

- to test if trade between countries with similar K/L ratios is intra-industry + trade between countries with different K/L ratios is inter-industry
- to examine border effects i.e. how much does the effect of a border lead to more ~~international~~ internal trade than external trade

Gravity equation

→ countries completely specialized in different product varieties

→ ASSUME • identical prices

• good produced in any country is sent to all other countries in proportion to purchasing ~~country~~ country's GDP

exports of good k from country i to country j

$$X_k^{ij} = s^j y_k^i$$

s^j: country j purchases

y_k^i: country i's production of good k

$$X^{ij} = \sum_k X_k^{ij} = s^j \sum_k y_k^i = s^j Y^i = \frac{Y^j Y^i}{Y^w}$$

$$\frac{Y^j Y^i}{Y^w} = s^j s^i Y^w = X^{ji}$$

$$X^{ij} + X^{ji} = \frac{2}{Y^w} Y^i Y^j$$

define: Y^w as world GDP

Y^A as GDP in area A

$$Y^A = Y^1 + Y^2$$

$$s^i \equiv \frac{Y^i}{Y^w} \qquad s^A \equiv \frac{Y^A}{Y^w} \qquad s^{iA} \equiv \frac{Y^i}{Y^A}$$

$$X^{ij} + X^{ji} = 2 s^i s^j Y^w \qquad \boxed{s^i \equiv s^{iA} s^A}$$

$$= 2 s^{iA} s^A s^{jA} s^A Y^w$$

$$= 2 s^{iA} s^{jA} (s^A)^2 Y^w$$

Note that: $(s^{iA} + s^{jA})^2 = 1^2 = 1$

$$(s^{iA})^2 + (s^{jA})^2 + 2 s^{iA} s^{jA} = 1$$

$$\therefore \quad 2 s^{iA} s^{jA} = 1 - (s^{iA})^2 - (s^{jA})^2$$

$$X^{ij} + X^{ji} = \left[1 - (s^{iA})^2 - (s^{jA})^2\right](s^A)^2 Y^w$$

$$\frac{X^{ij} + X^{ji}}{Y^A} = s^A \left[1 - (s^{iA})^2 - (s^{jA})^2\right]$$

volume of trade in area A rel to GDP in Area A

size dispersion index

taking logs

$$\ln \frac{X^{ij} + X^{ji}}{Y^i + Y^j} = \ln (s^i + s^j) + \ln \left(1 - (s^{ik})^2 - (s^{jk})^2\right)$$

regression eqn w/ time indices and country fixed effects α_{ij}

$$\ln \left(\frac{X_t^{ij} + X_t^{ji}}{Y_t^i + Y_t^j} \right) = \alpha_{ij} + \gamma \ln (s^i + s^j) + \beta \ln \left[Disp_t^{ij} \right]$$

Debaere (2002) tested gravity eqn on OECD + non-OECD countries. Altho he did NOT always obtain an estimate of β that was close to one,

→ estimated coefficient for OECD was always positive

→ estimated coeff for non-OECD countries was occasionally negative ← not surprising because gravity equation assumes complete specialization

→ OECD trade is intraindustry

→ non-OECD trade is interindustry

BORDER EFFECTS US + Canadian Trade

$$X^{ij} + X^{ji} = \frac{2}{\gamma^w} \gamma^i \gamma^j$$

but $X^{ij} = s^j s^i \gamma^w = X^{ji}$

so $X^{ij} = \frac{1}{\gamma^w} \gamma^i \gamma^j$

$$\ln X^{ij} = \underbrace{-\ln \gamma^w}_{\text{CONSTANT}} + \ln \gamma^i + \ln \gamma^j$$

McCallum (1995) estimated an equation like the one above to compare intranational trade between Canadian provinces to international trade between Canadian provinces + US states

$$\ln X^{ji} = \alpha + \beta_1 \ln \gamma^i + \beta_2 \gamma^j + \gamma \delta^{ij} + \rho d^{ij} + \varepsilon_{ij}$$

X^{ji} – exports from each Canadian province to other Canadian provinces or US states such exports depend on the GDPs of the provinces or states $\gamma^i + \gamma^j$

McCallum also controlled for:

d^{ij} distance between any two province or state

S^{ij} dummy variable to pick up border effect
variable is ONE if trade betw/n two Canadian provinces, ZERO otherwise

the coefficient on S^{ij} was very large which indicated that:

→ prior to Canada US FTA (1988) presence of the border led to 22 times more Canadian internal trade (within Canada trade) than external trade

→ data from 1993 suggest a border effect of 16,4 times more Canadian internal trade than external

→ border effect ~~[illegible]~~ MUCH SMALLER for US
border led to 1,5 times more American internal trade than external trade

BORDER EFFECTS HAVE AN ASYMMETRIC EFFECT ON COUNTRIES of DIFFERENT SIZE
Anderson + Wincoop (2003)

why are border effects asymmetric when comparing countries of different size? EXAMPLE:

- FRICTIONLESS TRADE
  - → Canada exports 90% GDP to US (sells 10% internally)
  - → US GDP 10 times larger than Canadian GDP so US exports 10% GDP to Canada (sells 90% internally)
- BORDER EFFECT reduces cross-border trade by one half
  - → Canada exports 45% GDP to US (55% internal)
  - → US exports 5% GDP to Canada (95% internal)
- effect on internal trade
  - → [illegible]
  - → Canadian internal trade rises 5,5 fold external trade falls by half

internal trade has risen 11 times more than cross-border trade has shrunk

$$\frac{55\%/10\%}{45\%/90\%} = \frac{5,5}{0,5} = 11$$

⇒ US internal trade risen
95%/90% = 1,055 bold

US external trade halb
5%/10% = 0,5 by half

internal trade has risen 2,1 times more than cross-border trade has shrunk

$$\frac{95\%/90\%}{5\%/10\%} = 2,111$$