SOLUTION TO FINAL - FALL, 2014

ECO-13101 Economia Internacional I (International Trade Theory)

December 12, 2014

Question 1 (50 points)

1. **(10 points)** The representative consumer in country j solves the following utility maximization exercise:

$$\max_{\{C_{ij}\}} \quad U_j = \sum_{i=1}^{N} n_i \left(C_{ij}\right)^{(\sigma-1)/\sigma} \quad ,$$

$$s.t. \quad \sum_{i=1}^{N} n_i p_{ij} C_{ij} = w_j \overline{L}_j \quad .$$

The first-order condition with-respect-to C_{ij} is

$$n_i \frac{(\sigma-1)}{\sigma} \left(C_{ij}\right)^{-1/\sigma} - \lambda_j n_i p_{ij} = 0 \quad ,$$

where λ_j is the lagrange multiplier for the consumer in country j. The first-order condition with-respect-to the lagrange multiplier just gives the budget constraint of the consumer in country j. The first-order condition above implies that

$$C_{ij} = \left[\frac{\sigma}{(\sigma-1)} \lambda_j p_{ij}\right]^{-\sigma} \quad .$$

Substituting this for C_{ij} in the budget constraint gives

$$\left[\frac{\sigma}{(\sigma-1)} \lambda_j\right]^{-\sigma} \sum_{i=1}^{N} n_i \left(p_{ij}\right)^{1-\sigma} = w_j \overline{L}_j \quad ,$$

$$\Rightarrow \left[\frac{\sigma}{(\sigma-1)} \lambda_j\right]^{-\sigma} = \frac{w_j \overline{L}_j}{\sum_{i=1}^{N} n_i \left(p_{ij}\right)^{1-\sigma}} \quad .$$

Substituting for $\left[\frac{\sigma}{(\sigma-1)} \lambda_j\right]^{-\sigma}$ in the expression for C_{ij} gives

$$C_{ij} = \frac{w_j \overline{L}_j}{\sum_{i=1}^{N} n_i \left(p_{ij}\right)^{1-\sigma}} \left(p_{ij}\right)^{-\sigma} \quad .$$

Since $P_j = \left(\sum_i^N n_i \left(p_{ij}\right)^{1-\sigma}\right)^{1/(1-\sigma)}$, it implies that $P_j^{1-\sigma} = \sum_i^N n_i \left(p_{ij}\right)^{1-\sigma}$. Using this gives the required demand function:

$$C_{ij} = \frac{w_j \overline{L}_j}{P_j} \left(\frac{p_{ij}}{P_j}\right)^{-\sigma} \quad .$$

2. **(15 points)** The profit function of a product produced in country i is

$$\pi_i = p_i X_i - (\alpha + \beta_i . X_i)\, w_i \quad .$$

Given that every product produced by country i is unique and is sold to every country in the world (includng itself), the output of every product must be equal to the world demand for it.

$$X_i = \sum_{j=1}^{N} C_{ij} \quad ,$$

which, given the expression for C_{ij} (derived above in (1)), implies that

$$X_i = \sum_{j=1}^{N} \frac{w_j \overline{L}_j}{P_j} \left(\frac{p_{ij}}{P_j}\right)^{-\sigma} \quad .$$

Since every product is sold for the same price $p_{ij} = p_i$

$$X_i = p_i^{-\sigma} \sum_{j=1}^{N} \frac{w_j \overline{L}_j}{P_j^{1-\sigma}} \quad .$$

Substitute this in the profit function.

$$\pi_i = p_i^{1-\sigma} \sum_{j=1}^{N} \frac{w_j \overline{L}_j}{P_j^{1-\sigma}} - \left(\alpha + \beta_i . p_i^{-\sigma} \sum_{j=1}^{N} \frac{w_j \overline{L}_j}{P_j^{1-\sigma}}\right) w_i \quad .$$

Maximsing this with respect to p_i gives the first order condition

$$(1-\sigma) p_i^{-\sigma} \sum_{j=1}^{N} \frac{w_j \overline{L}_j}{P_j^{1-\sigma}} + \sigma \beta_i w_i p_i^{-\sigma-1} \sum_{j=1}^{N} \frac{w_j \overline{L}_j}{P_j^{1-\sigma}} = 0 \quad ,$$

which can be re-arranged to

$$(1-\sigma) + \sigma \frac{\beta_i w_i}{p_i} = 0 \quad .$$

Thus, the price charged for every product produced in country i

$$p_i = \frac{\sigma}{\sigma - 1} \beta_i w_i \quad .$$

The total cost of produciton is $w_i L_i = w_i \alpha + \beta_i X_i w_i$. Differentiating this with respect to X_i gives the marginal cost to be $\beta_i w_i$. Since $\sigma > 1$ it implies that $\sigma/(\sigma - 1) > 1$, which means that price is greater than the marigal cost, i.e. $p_i > \beta_i w_i$. The mark-up, therefore, is $\sigma/(\sigma - 1)$.

3. **(10 points)** Due to free entry of firms, the profit of each firm is driven to zero, i.e. $p_i = AC_i$, where AC_i is the average cost of producing a product in country i.

$$AC_i = \frac{w_i \overline{L}_i}{X_i} = w_i \left(\frac{\alpha}{X_i} + \beta_i \right) \quad .$$

For zero profits

$$p_i = AC_i \quad ,$$

$$\frac{\sigma}{(\sigma - 1)} \beta_i w_i = w_i \left(\frac{\alpha}{X_i} + \beta_i \right) \quad ,$$

Solving this for X_i give

$$\Rightarrow X_i = \frac{\alpha(\sigma - 1)}{\beta_i} \quad .$$

Thus,

$$L_i = \alpha + \beta_i \frac{\alpha(\sigma - 1)}{\beta_i} = \alpha\sigma \quad .$$

Since every product produced in country i uses this amount of labor the total amount of labor used is $n_i L_i$ and it has to be equal to the endowment of labor in country i ($\overline{L}_i$). Thus,

$$n_i L_i = \overline{L}_i \Rightarrow n_i \alpha\sigma = \overline{L}_i \quad ,$$

$$n_i = \frac{\overline{L}_i}{\sigma\alpha} \quad .$$

4. Now we incorporate trade costs and derive the gravity equation.

   (a) **(10 points)** With trade costs, the demand, in country j, for products imported from country i is given by:

$$C_{ij} = \frac{w_j \overline{L}_j}{P_j} \left(\frac{\tau_{ij} p_i}{P_j} \right)^{-\sigma} \quad ,$$

   Multiplying the quantity demanded by the price paid by country j gives the expenditure on a product imported from country i.

$$\tau_{ij} p_i C_{ij} = t_{ij} = w_j \overline{L}_j \left(\frac{\tau_{ij} p_i}{P_j} \right)^{1-\sigma} \quad .$$

   Since all products imported from country i have the same expenditure, the total expenditure by country j on products of country i is $T_{ij} = n_i t_{ij}$.

$$T_{ij} = n_i Y_j \left(\frac{\tau_{ij} p_i}{P_i} \right)^{1-\sigma} \quad .$$

   $Y_j = w_j \overline{L}_j$.

(b) **(15 points)** Substituting for n_i in the expression for T_{ij} gives

-8 not much
-4-5 major mistakes

$$
\begin{aligned}
T_{ij} &= \frac{\overline{L}_i}{\sigma\alpha} Y_j \left(\frac{\tau_{ij} p_i}{P_i}\right)^{1-\sigma} ,\\
\Rightarrow T_{ij} &= \frac{w_i \overline{L}_i}{\sigma\alpha w_i} Y_j \left(\frac{\tau_{ij} p_i}{P_i}\right)^{1-\sigma} ,\\
\Rightarrow T_{ij} &= \frac{Y_i Y_j}{\sigma\alpha w_i} \left(\frac{\tau_{ij} p_i}{P_i}\right)^{1-\sigma} .
\end{aligned}
$$

Since $p_i = \frac{\sigma}{\sigma-1}\beta_i w_i \Rightarrow w_i = \frac{\sigma-1}{\sigma}\frac{p_i}{\beta_i}$. Thus,

$$
\begin{aligned}
T_{ij} &= \frac{Y_i Y_j}{\sigma\alpha} \frac{\sigma}{(\sigma-1)} \frac{\beta_i}{p_i} \left(\frac{\tau_{ij} p_i}{P_i}\right)^{1-\sigma} ,\\
\Rightarrow T_{ij} &= \frac{\beta_i}{\alpha(\sigma-1)} \frac{Y_i Y_j}{p_i^{\sigma}} \left(\frac{\tau_{ij}}{P_i}\right)^{1-\sigma} .
\end{aligned}
$$

An increase in τ_{ij} causes trade costs to increase. Thus, it makes importing products from country i more expensive. Since $\sigma > 1$, an increase in τ_{ij} reduces the demand for imported products, and also reduces the expenditure on imported products (T_{ij}). A higher σ will result in a greater decline in T_{ij} for a given change in τ_{ij}. This is because a higher σ implies a greater elasticity of substitution between products. Thus, when the products from country i become more expensive, due to an increase in τ_{ij}, country j consumer shifts to cheaper products from other countries (including products from itself) by a greater extent when σ is larger.

Question 2 (40 points)

1. **(20 points)** Cutoff Productivity for Exporting: All firms with a φ s.t. $\Pi_x(\varphi) \geq 0$ will export.

$$
\begin{aligned}
\therefore \quad \Pi_x(\underline{\varphi}_x) &= 0\\
\Rightarrow \left(\frac{(\sigma-1)}{\sigma}\frac{\underline{\varphi}_x}{\tau}P\right)^{\sigma-1} \cdot \frac{R}{\sigma} - f_x &= 0
\end{aligned}
$$

Remember for $\varphi = \underline{\varphi}$

$$
\begin{aligned}
\Pi_d(\underline{\varphi}) &= 0\\
\Rightarrow \left(\frac{(\sigma-1)}{\sigma}\underline{\varphi}P\right)^{\sigma-1} \cdot \frac{R}{\sigma} - f &= 0\\
\Rightarrow \left(\frac{(\sigma-1)}{\sigma}P\right)^{\sigma-1} \cdot \frac{R}{\sigma} &= \frac{f}{(\underline{\varphi})^{\sigma-1}}.
\end{aligned}
$$

$$
\begin{aligned}
\Rightarrow \left(\frac{\underline{\varphi}_x}{\underline{\varphi}\tau}\right)^{\sigma-1} \cdot f &= f_x\\
\Rightarrow \underline{\varphi}_x &= \tau\left(\frac{f_x}{f}\right)^{\frac{1}{\sigma-1}} \cdot \underline{\varphi}
\end{aligned}
$$

We will assume that $\tau\left(\frac{f_x}{f}\right)^{\frac{1}{\sigma-1}} > 1$ so that

$$\underline{\varphi}_x > \underline{\varphi}$$

Thus we get the following partitions:

(i) $\varphi < \underline{\varphi}$ $\rightarrow$ do not enter the domestic market

(ii) $\underline{\varphi} \leq \varphi < \underline{\varphi}_x$ $\rightarrow$ enter the domestic market but do not export

(iii) $\varphi \geq \underline{\varphi}_x$ $\rightarrow$ enter both domestic and foreign market

Probability of Exporting: Conditional on survival, the probability of exporting is simply

$$prob_x = \frac{1 - G(\underline{\varphi}_x)}{1 - G(\underline{\varphi})}$$

Average profit of a firm: Conditional on survival a firm's average profit is

$$\Pi(\tilde{\varphi}) = \Pi_d(\tilde{\varphi}) + \Pi_x(\tilde{\varphi}_x) \cdot prob_x$$

We know that

$$\Pi_d(\underline{\varphi}) = 0 \Rightarrow r(\underline{\varphi}) = \sigma f$$

And since $\frac{r_d(\tilde{\varphi})}{r(\underline{\varphi})} = \left(\frac{\tilde{\varphi}(\underline{\varphi})}{\underline{\varphi}}\right)^{\sigma-1}$

$$\begin{aligned} \Rightarrow \quad r_d(\tilde{\varphi}) &= \left(\frac{\tilde{\varphi}(\underline{\varphi})}{\underline{\varphi}}\right)^{\sigma-1} \cdot \sigma f \\ \therefore \quad \Pi_d(\tilde{\varphi}) &= \left[\left(\frac{\tilde{\varphi}(\underline{\varphi})}{\underline{\varphi}}\right)^{\sigma-1} - 1\right] f = \kappa(\underline{\varphi}) f \end{aligned}$$

Similarly, among the firms that export

$$\Pi_x(\tilde{\varphi}_x) = \left[\left(\frac{\tilde{\varphi}_x(\underline{\varphi}_x)}{\underline{\varphi}_x}\right)^{\sigma-1} - 1\right] f_x = \kappa(\underline{\varphi}_x) f_x$$

Thus,

(ZCP)

$$\Pi(\tilde{\varphi}) = \left[\left(\frac{\tilde{\varphi}(\underline{\varphi})}{\underline{\varphi}}\right)^{\sigma-1} - 1\right] f + prob_x \cdot \left[\left(\frac{\tilde{\varphi}_x(\underline{\varphi}_x)}{\underline{\varphi}_x}\right)^{\sigma-1} - 1\right] f_x = \kappa(\underline{\varphi}) f + prob_x \kappa(\underline{\varphi}_x) f_x \quad ,$$

where

(a)

$$prob_x = \frac{1 - G(\underline{\varphi}_x)}{1 - G(\underline{\varphi})}$$

And since

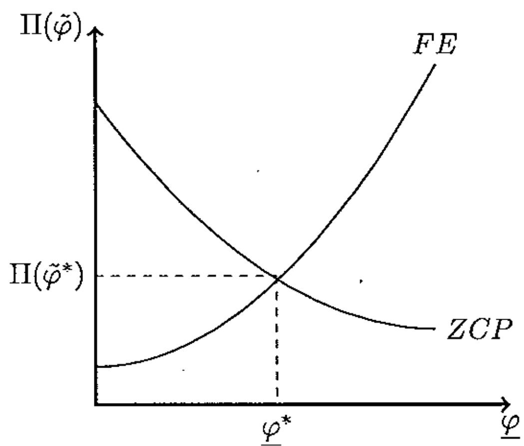
$$\text{(b)} \qquad \begin{aligned} \frac{r_x(\underline{\varphi}_x)}{r_d(\underline{\varphi})} &= \tau^{1-\sigma}\left(\frac{\underline{\varphi}_x}{\underline{\varphi}}\right)^{\sigma-1} &= \frac{f_x}{f} \\ \Rightarrow \qquad & \underline{\varphi}_x &= \tau\left(\frac{f_x}{f}\right)^{\frac{1}{\sigma-1}} \cdot \underline{\varphi} \end{aligned}$$

Free entry: due to free entry, the value from entry is driven to zero in equilibrium

$$V^e = \underbrace{(1 - G(\underline{\varphi}))}_{\substack{\text{Probability} \\ \text{of entry}}} \cdot \underbrace{\Pi(\underline{\varphi})}_{\substack{\text{Ex-ante profits} \\ \text{conditional on} \\ \text{which include} \\ \text{expected profits} \\ \text{from exporting}}} - \underbrace{f_e}_{\substack{\text{sunk cost} \\ \text{of entry}}}$$

$$\text{(FE)} \qquad \therefore V^e = 0 \;\Rightarrow \Pi(\tilde{\varphi}) = \frac{f_e}{1 - G(\underline{\varphi})} \quad .$$

ZCP and FE provide a system of two equations in two unknowns. Equilibrium cut-off productivity - $\underline{\varphi}^*$ - and the equilibrium average profits - $\Pi(\tilde{\varphi}^*)$ - solve the ZCP and FE. Equilibrium cut-off productivity - $\underline{\varphi}^*$ - also implies the equilibrium cut-off productivity for exporting - $\underline{\varphi}_x^*$.



Question 2:

Part 2:

(ZCP) $\pi(\tilde{\varphi}^*) = \left[\left(\frac{\tilde{\varphi}(\underline{\varphi}^*)}{\underline{\varphi}^*}\right)^{\sigma-1} - 1\right] f + \text{prob}_x \cdot \left[\left(\frac{\tilde{\varphi}_x(\underline{\varphi}_x^*)}{\underline{\varphi}_x^*}\right)^{\sigma-1} - 1\right] f_x$

$$= K(\underline{\varphi}^*) f + p_x \cdot K(\underline{\varphi}_x^*) \cdot f_x$$

where $\underline{\varphi}_x^* = \tau \left(\frac{f_x}{f}\right)^{\frac{1}{\sigma-1}} \underline{\varphi}^*$

~~Thermai~~

(FE): $\pi(\tilde{\varphi}^*) = \frac{f_e}{1-G(\underline{\varphi}^*)}$

$$\Rightarrow \frac{f_e}{1-G(\underline{\varphi}^*)} = K(\underline{\varphi}^*) f + \text{prob}_x \cdot K(\underline{\varphi}_x^*) f_x$$

$$\Rightarrow f_e = K(\underline{\varphi}^*)(1-G(\underline{\varphi}^*)) f + \text{prob}_x \cdot K(\underline{\varphi}_x^*)(1-G(\underline{\varphi}^*)) f_x$$

$$\Rightarrow f_e = \underbrace{K(\underline{\varphi}^*)(1-G(\underline{\varphi}^*))}f + \underbrace{K(\underline{\varphi}_x^*)(1-G(\underline{\varphi}_x^*))} f_x$$

$$f_e = j(\underline{\varphi}^*) f + j(\underline{\varphi}_x^*) f_x \quad \text{— } (*)$$

Differentiating this with respect to τ

$$0 = \frac{\partial j(\underline{\varphi}^*)}{\partial \tau} f + \frac{\partial j(\underline{\varphi}_x^*)}{\partial \tau} f_x \quad \text{— } (**)$$

$$\Rightarrow \frac{\partial j(\underline{\varphi}^*)}{\partial \tau} f = -\frac{\partial j(\underline{\varphi}_x^*)}{\partial \tau} f_x$$

$$\frac{\partial j(\underline{\varphi}^*)}{\partial \tau} = \frac{\partial j(\underline{\varphi}^*)}{\partial \underline{\varphi}^*} \cdot \frac{\partial \underline{\varphi}^*}{\partial \tau}$$

Similarly $\frac{\partial j(\underline{\varphi}_x^*)}{\partial \tau} = \frac{\partial j(\underline{\varphi}_x^*)}{\partial \underline{\varphi}_x^*} \cdot \frac{\partial \underline{\varphi}_x^*}{\partial \tau}$

Since $\underline{\varphi}_x^* = \underline{\varphi}^* \tau \left(\frac{f_x}{f}\right)^{\frac{1}{\sigma-1}}$

$$\Rightarrow \frac{\partial \underline{\varphi}_x^*}{\partial \tau} = \frac{\partial \underline{\varphi}^*}{\partial \tau} \tau \left(\frac{f_x}{f}\right)^{\frac{1}{\sigma-1}} + \underline{\varphi}^* \left(\frac{f_x}{f}\right)^{\frac{1}{\sigma-1}}$$

$$\Rightarrow \boxed{\frac{\partial \underline{\varphi}_x^*}{\partial \tau} = \frac{\partial \underline{\varphi}^*}{\partial \tau} \left(\frac{\underline{\varphi}_x^*}{\underline{\varphi}^*}\right) + \frac{\underline{\varphi}_x^*}{\tau}} \quad \text{—(i)}$$

$$\boxed{\frac{\partial \underline{\varphi}^*}{\partial \tau} \cdot \frac{\partial j(\underline{\varphi}^*)}{\partial \underline{\varphi}^*} \cdot f = -\frac{\partial j(\underline{\varphi}_x^*)}{\partial \underline{\varphi}_x^*} \cdot \frac{\partial \underline{\varphi}_x^*}{\partial \tau} \cdot f_x} \quad \text{—(A)}$$

$$\frac{\partial \underline{\varphi}^*}{\partial \tau} \cdot \frac{\partial j(\underline{\varphi}^*)}{\partial \underline{\varphi}^*} \cdot f = -\frac{\partial j(\underline{\varphi}_x^*)}{\partial \underline{\varphi}_x^*} \cdot f_x \left[\frac{\partial \underline{\varphi}}{\partial \tau} \cdot \left(\frac{\underline{\varphi}_x^*}{\underline{\varphi}^*}\right) + \frac{\underline{\varphi}_x^*}{\tau}\right]$$

$$\Rightarrow \frac{\partial \underline{\varphi}^*}{\partial \tau}\left[\frac{\partial j(\underline{\varphi}^*)}{\partial \underline{\varphi}^*} f + \frac{\partial j(\underline{\varphi}_x^*)}{\partial \underline{\varphi}_x^*} \cdot f_x \cdot \frac{\underline{\varphi}_x^*}{\underline{\varphi}^*}\right] = -\frac{\partial j(\underline{\varphi}_x^*)}{\partial \underline{\varphi}_x^*} \cdot f_x \cdot \frac{\underline{\varphi}_x^*}{\tau}$$

$$\Rightarrow \boxed{\frac{\partial \underline{\varphi}^*}{\partial \tau} = -\frac{\underline{\varphi}^*}{\tau} \cdot \frac{\frac{\partial j(\underline{\varphi}_x^*)}{\partial \underline{\varphi}_x^*} \cdot f_x \cdot \underline{\varphi}_x^*}{f \cdot \underline{\varphi}^* \cdot \frac{\partial j(\underline{\varphi}^*)}{\partial \underline{\varphi}^*} + f_x \cdot \underline{\varphi}_x^* \cdot \frac{\partial j(\underline{\varphi}_x^*)}{\partial \underline{\varphi}_x^*}}} \quad \text{—(ii)}$$

Now $j(\underline{\varphi}^*) = K(\underline{\varphi}^*)(1-G(\underline{\varphi}^*))$

$$\Rightarrow \frac{\partial j(\underline{\varphi}^*)}{\partial \underline{\varphi}^*} = \frac{\partial K(\underline{\varphi}^*)}{\partial \underline{\varphi}^*}(1-G(\underline{\varphi}^*)) - K(\underline{\varphi}^*)\frac{\partial G(\underline{\varphi}^*)}{\partial \underline{\varphi}^*}$$

It is given to us that

$$\frac{\partial K(\underline{\varphi}^*)}{\partial \underline{\varphi}^*} = \frac{K(\varphi)g(\varphi)}{1-G(\varphi)} - \frac{(\sigma-1)[K(\varphi)+1]}{\varphi}$$

$$\Rightarrow \frac{\partial j(\underline{\varphi}^*)}{\partial \underline{\varphi}^*} = \left\{\frac{K(\underline{\varphi}^*)g(\underline{\varphi}^*)}{1-G(\underline{\varphi}^*)} - \frac{(\sigma-1)}{\underline{\varphi}^*}[K(\underline{\varphi}^*)+1]\right](1-G(\underline{\varphi}^*)) - K(\underline{\varphi}^*)g(\underline{\varphi}^*)$$

$$= K(\underline{\varphi}^*)g(\underline{\varphi}^*) - \frac{(\sigma-1)}{\underline{\varphi}^*}(1-G(\underline{\varphi}^*))[K(\underline{\varphi}^*)+1] - K(\underline{\varphi}^*)g(\underline{\varphi}^*)$$

$$\Rightarrow \frac{\partial j(\underline{\varphi}^*)}{\partial \underline{\varphi}^*} = -\frac{(\sigma-1)}{\underline{\varphi}^*}(1-G(\underline{\varphi}^*))[K(\underline{\varphi}^*)+1] < 0 \quad \text{(iii)}$$

Analogously $\frac{\partial j(\underline{\varphi}_x^*)}{\partial \underline{\varphi}_x^*} < 0 \longrightarrow$ (iv)

$$\Rightarrow \frac{\partial j(\underline{\varphi}^*)}{\partial \underline{\varphi}^*}\frac{\partial \underline{\varphi}^*}{\partial \tau} < 0 \quad \text{(Using (iii) \& (iv) in (ii))}$$

(v)

~~Substituting (ii) in (i)~~

~~$$\frac{\partial \varphi_x^*}{\partial \tau} = \left(\frac{\varphi_x^*}{\varphi^*}\right)\left(\frac{-\varphi^*}{\tau}\right) \cdot \frac{f_x \, \varphi_x^* \cdot \frac{\partial j(\varphi_x^*)}{\partial \varphi_x^*}}{f \cdot \varphi^* \frac{\partial j(\varphi^*)}{\partial \varphi^*} + f_x \, \varphi_x^* \frac{\partial j(\varphi_x^*)}{\partial \varphi_x^*}}$$~~

From (A) we know that

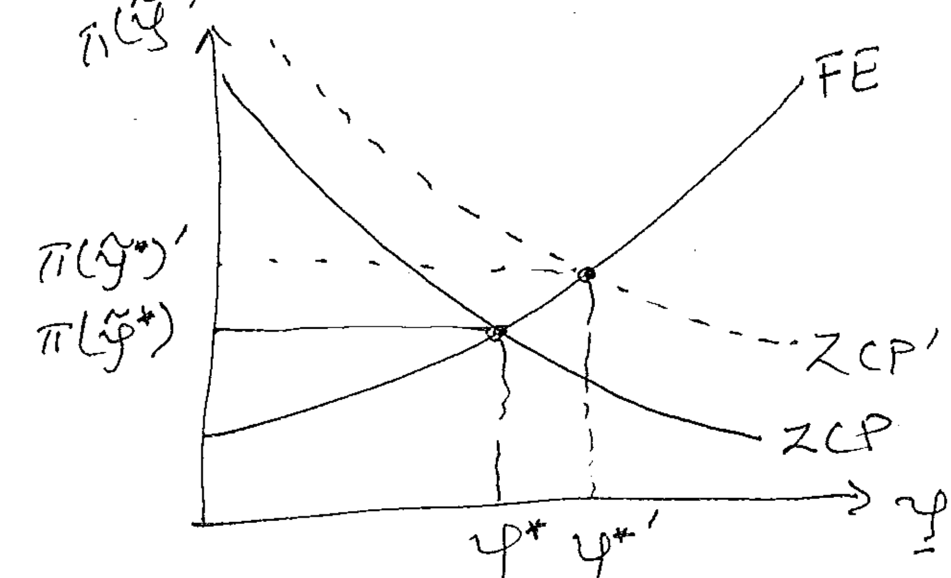
$$\frac{\partial \varphi^*}{\partial \tau} \cdot \frac{\partial j(\varphi^*)}{\partial \varphi^*} \cdot f = -\frac{\partial j(\varphi_x^*)}{\partial \varphi_x^*} \cdot \frac{\partial \varphi_x^*}{\partial \tau} \cdot f_x$$

$$\Rightarrow \frac{\partial \varphi_x^*}{\partial \tau} = -\frac{f}{f_x} \cdot \frac{\frac{\partial j(\varphi^*)}{\partial \varphi^*}}{\frac{\partial j(\varphi_x^*)}{\partial \varphi_x^*}} \cdot \frac{\partial \varphi^*}{\partial \tau}$$

Using (iii), (iv) & (v) we get that

$$\frac{\partial \varphi_x^*}{\partial \tau} > 0 \qquad \text{--- (vi)}$$

<u>Intuition</u>: A decrease in τ will shift the ZCP curve up & hence result in an increase in the cut-off productivity φ^*. The ZCP curve shifts up because a lower trade cost will increase average profits because of increase in profits from exporting.



However, the new exporting cut-off productivity will be lower. This is because the marginal cost of exporting is lower due to the lower τ & this allows lower productivity firms to be able to export profitably, ~~now~~.

Overall, a reduction in trade cost forces the least productive firms to exit but allows new lower (relative to the initial open economy equilibrium) productivity firms to enter the export market.