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*Trade in Intermediate Producer Services under
Imperfect Competition*

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Objectives

- Study the impact of the market power in the intermediate producer services sector on the welfare, output of the downstream industry, pattern of trade and the prices of the factors of production
- Investigate the relative importance and interactions between various causal mechanisms in the framework of the stylized quantitative CGE model.

Motivation (1)

- Mattoo and Sauve (2003), Konan Assche (2007), Hoekman (2006) emphasize the importance of market structure and regulation on the outcome of the services trade liberalization
- Copeland (2002) states that despite many trade models with market power, there are few that address the special issues related to services.

Motivation (2)

- MRT(2000,2005) uses a model with monopolistic competition to show that the foreign producer services could provide substantial benefits to domestic firms.
- However, particularly in developing countries, many backbone services such as telecommunications, finance and insurance are characterized by oligopoly markets.

Characteristics of the producer services

- Used as intermediate goods
- Intensive in skilled labor
- Produced with increasing returns to scale
- Differentiated by firm type and nationality
- There is no cross border trade in services
- Services are traded only through mode3: commercial presence.
- Market power with conjectural output variations
- Producer services could positively affect value added productivity when used as an intermediate good
- Example: Business, transportation and telecommunication services

Model setting (1)

- There are 2 sectors:

Y-sector with imperfect competition

Z-perfectly competitive sector

- Consumers derive utility by consuming final goods only:

$$U = Z^{\alpha} * Y^{1-\alpha}$$

Model setting (2)

$$Y = (VA^{\frac{\gamma-1}{\gamma}} + PS^{\frac{\gamma-1}{\gamma}})^{\frac{\gamma}{\gamma-1}} \quad (1)$$

Here

- VA: value added
- PS: producer services

γ is corresponding elasticity of substitution

$$PS = (\delta * XD^{\frac{\sigma-1}{\sigma}} + (1-\delta) * XF^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}} \quad (2)$$

- XD- domestic industry
- XF-foreign industry

Model setting (3)

$$XD = \left(\sum_{i=1}^{n_d} xd_i^{\frac{\sigma_d-1}{\sigma_d}} \right)^{\frac{\sigma_d}{\sigma_d-1}} \quad (3)$$

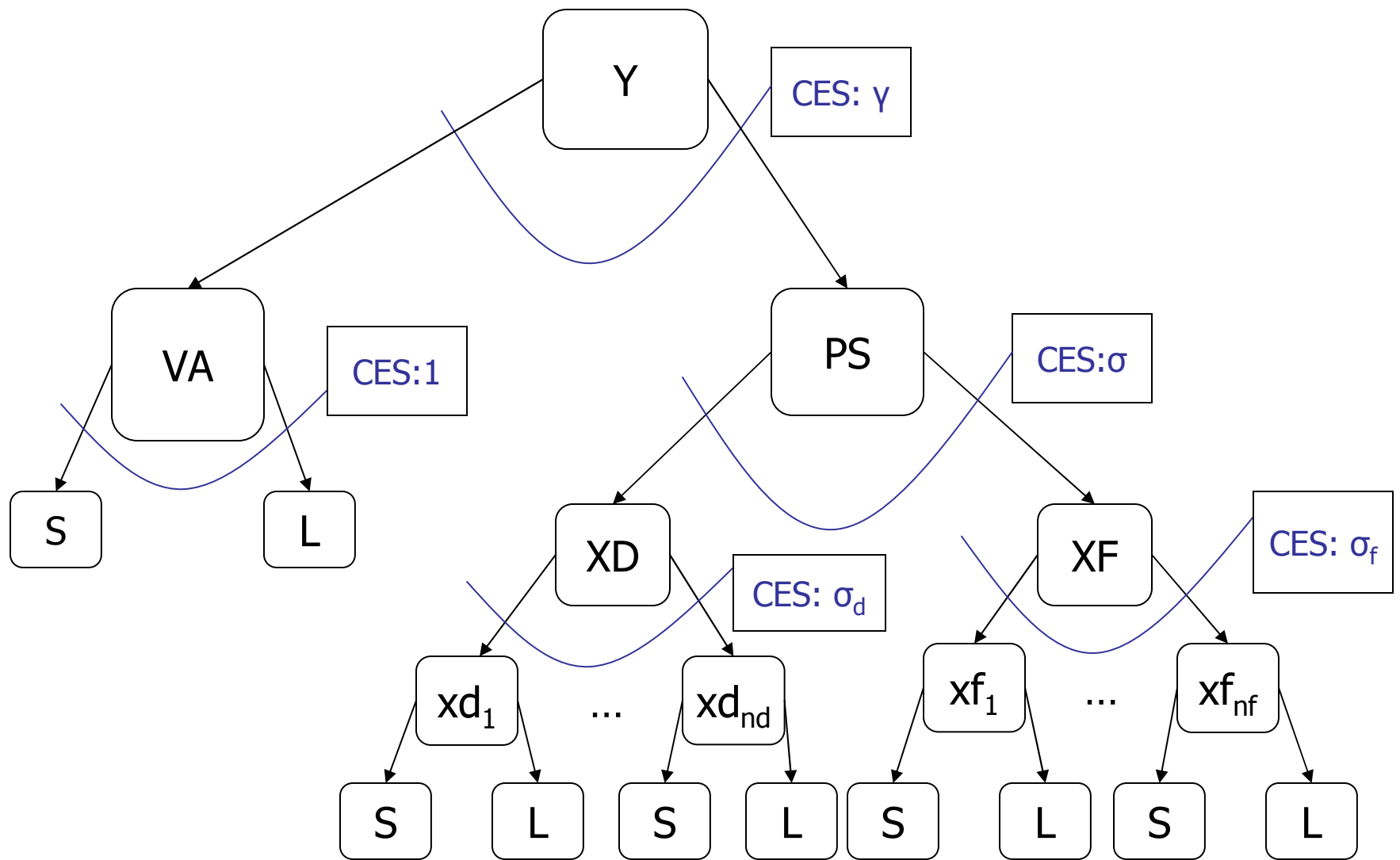
$$XF = \left(\sum_{j=1}^{n_f} xf_j^{\frac{\sigma_f-1}{\sigma_f}} \right)^{\frac{\sigma_f}{\sigma_f-1}} \quad (4)$$

The corresponding dual price indexes would look as follows:

$$PD = \left(\sum_{i=1}^{n_d} pd_i^{(1-\sigma_d)} \right)^{\frac{1}{1-\sigma_d}} \quad (3')$$

$$PF = \left(\sum_{j=1}^{n_f} pf_j^{1-\sigma_f} \right)^{\frac{1}{1-\sigma_f}} \quad (4')$$

The production structure of the sector with imperfect competition



Model assumptions

- Industry with imperfect competition is more skilled labor intensive than the perfectly competitive industry;
- Small open economy is a net importer of the skill-intensive good and net exporter of the other goods (could be reversed);

In comparison to the domestic firms, foreign service providers are:

- subject to trade barriers: output tax and lump sum tax
- more efficient
- less skilled labor intensive (could be reversed);
- subject to higher fixed costs

Markup equation (1)

The perceived price elasticity of demand for domestic firms could be derived under the assumption that the domestic firms make the same conjectures about the behavior of the foreign firms and there is a symmetry in-between the domestic firms as follows:

$$\frac{1}{\varepsilon_i^d} = \left[\frac{1}{\gamma} - \frac{1}{\sigma} + SH_{PS} \left(\frac{1}{\Omega} - \frac{1}{\gamma} \right) \right] \left(v_i^d + (1 - v_i^d) S_i^d \right) + \left(\frac{1}{\sigma} - \frac{1}{\sigma_d} \right) \left(v_i^d + (1 - v_i^d) / n_d \right) + \frac{1}{\sigma_d} \left(\frac{(v_i^d)^2 + 1}{1 + v_i^d (n_d - 1)} \right) \quad (6)$$

The inverse of the perceived price elasticity is the markup charged by the domestic firms

Markup equation (2)

Here

$v_i = \frac{d \log(xd_k)}{d \log(xd_i)}$ is the conjectural elasticity of firm output;

$\Omega = -\frac{d \log(Y)}{d \log(P_y)}$ is the price elasticity of demand in the downstream industry;

$S_i^d = s_d / n_d$ is the share of the domestic firm in the total producer services industry;

The Cournot competition will be a particular case of this setting with $v_i^d = 0$ and $v_i^f = 0$

The markup equation for the foreign firms is calculated by analogy

Partial derivatives of the markup (1)

$$\text{If } v_i > \frac{s_d}{s_d - n_d} \text{ then: } \frac{\partial(1/\varepsilon_i^d)}{\partial\Omega} = -\left(\frac{SH_{PS}}{\Omega^2}\right)(v_i^d + (1 - v_i^d)S_i^d) < 0 \quad (8)$$

$$\frac{\partial(1/\varepsilon_i^d)}{\partial\gamma} = -\left(\frac{1 - SH_{PS}}{\gamma^2}\right)(v_i^d + (1 - v_i^d)S_i^d) < 0 \quad (9)$$

$$\frac{\partial(1/\varepsilon_i^d)}{\partial\sigma} = \left(\frac{1}{\sigma^2}\right)((s_d - 1)(1 - v_i^d)/n_d) = \begin{cases} \leq 0 & \text{if } v_i < 1 \\ \geq 0 & \text{if } v_i > 1 \end{cases} \quad (10)$$

Partial derivatives of the markup (2)

Similarly:

$$\frac{\partial(1/\varepsilon_i^d)}{\partial\sigma_d} = \frac{v_i^2(n_d^2 - 3n_d + 1) + (2v_i - 1) * (n_d - 1)}{(1 + v_i(n_d - 1)) * n_d} \quad (11)$$

So that for in the Cournot case: $\frac{\partial(1/\varepsilon_i^d)}{\partial\sigma_d} < 0$

If $\left[\frac{1}{\gamma} - \frac{1}{\sigma} + SH_{PS} \left(\frac{1}{\Omega} - \frac{1}{\gamma} \right) \right] \geq 0$ and $\sigma_d \geq \sigma \geq \gamma$ and $n_d > 1$ then:

$$\frac{\partial(1/\varepsilon_i^d)}{\partial s_d} \geq 0 ; \quad \frac{\partial(1/\varepsilon_i^d)}{\partial n_d} < 0 ; \quad \frac{\partial(1/\varepsilon_i^d)}{\partial v_i} > 0 ;$$

Model setting (4)

The profit maximizing condition could be written as follows:

$$MR_i^d = \frac{\partial(pd_i * xd_i)}{\partial xd_i} = pd_i + \frac{\partial pd_i}{\partial xd_i} * xd_i = pd_i * \left(1 + \frac{1}{\frac{\partial xd_i}{\partial pd_i} * \frac{pd_i}{xd_i}} \right) = pd_i * \left(1 - \frac{1}{\varepsilon_i^d} \right) = MC_i^d \quad (7)$$

Under the symmetry between varieties assumption, it could be written as:

$$PD * n_d^{\frac{1}{\sigma_d - 1}} * (1 - markup^d) = MC^d \quad (12)$$

The total cost of the domestic industry is then:

$$TC^d = MC^d * n_d^{\frac{1}{1 - \sigma_d}} * XD + PD * XD * markup^d \quad (13)$$

Model setting (5)

I assume fixed costs in quantities at the firm level and that the total markup revenue of the firms in the domestic industry equals the fixed cost in values at the industry level:

$$PD * XD * markup^d = FC_d * P_{FC_d} * n_d$$

The number of firms is determined endogenously so that the profit at the industry level is zero.

Data and calibration

- The data reflects the assumptions of the stylized model and parameters are taken within the reasonable range of their values;
- I assume the case with Cournot conjectures in the numerical model;

Calibration strategy:

- Estimate markup and the number of firms and calibrate the bottom level elasticity of substitution residually. (Gasiorek et. al (1992), Haaland and Norman (1992), Willenbockel (1994, 2004))
- Christopoulou Vermeulen (2008): Euro area average markup in services is 1.56
- Assumptions on parameters:

$$\left[\frac{1}{\gamma} - \frac{1}{\sigma} + SH_{PS} \left(\frac{1}{\Omega} - \frac{1}{\gamma} \right) \right] \geq 0 \quad \text{and} \quad \sigma_d \geq \sigma \geq \gamma$$

Numerical results (1)

<u>Initial case</u>	Percentage change from the benchmark		
Variables	No output tax	No lump sum tax	Free trade
Welfare	-1%	-1%	-2%
Perfectly competitive sector (Z)	8%	9%	14%
Downstream industry (Y)	-43%	-48%	-68%
Producer services (PS)	-43%	-48%	-69%

Numerical results (2)

<u>Initial case</u>	Percentage change from the benchmark		
Variables	No output tax	No lump sum tax	Free trade
Domestic services (XD)	-52%	-58%	-80%
Foreign services (XF)	-14%	-17%	-28%
Price of the domestic services (PXD)	23%	28%	61%
Price of the foreign services (PXF)	-13%	-15%	-24%
Share of the domestic sector	-15%	-17%	-31%
Share of the foreign sector	15%	17%	31%

Numerical results (3)

<u>Initial case</u>	Percentage change from the benchmark		
Variables	No output tax	No lump sum tax	Free trade
Markup of domestic service providers	7%	9%	18%
Markup of foreign service providers	6%	7%	15%
Number of domestic firms	-35%	-40%	-61%
Number of foreign firms	-18%	-21%	-35%
Output per domestic firm	-26%	-30%	-50%
Output per foreign firm	5%	6%	9%

Numerical results (4)

<u>Initial case</u>	Percentage change from the benchmark		
Variables	No output tax	No lump sum tax	Free trade
Payments to the other factors of production	2%	2%	3%
Payments to skilled labor	-4%	-5%	-7%
Net exports of Z	100%	112%	163%
Net imports of Y	109%	123%	174%

Numerical results (5)

<u>The case with the low foreign fixed cost</u>	Change in levels	Percentage change
Welfare	1.078	8%
Perfectly competitive sector (Z)	0.114	-89%
Downstream industry (Y)	6.152	515%
Producer services (PS)	6.866	587%
Domestic services (XD)	3.974	297%
Foreign services (XF)	7.092	609%
Payments to the other factors of production	0.841	-16%
Payments to skilled labor	1.515	52%
Share of the domestic sector	0.428	-14%
Share of the foreign sector	0.572	14%

Numerical results (6)

<u>The case with the low foreign fixed cost</u>	Change in levels	Percentage change
Markup of domestic service providers	0.334	-11%
Markup of foreign service providers	0.145	-28%
Price of the domestic services (PXD)	0.876	-12%
Price of the foreign services (PXF)	0.736	-26%
Number of domestic firms	22.989	130%
Number of foreign firms	29.013	190%
Output per domestic firm	0.173	73%
Output per foreign firm	0.244	144%

Concluding remarks

- The experiments reveal that the anticompetitive effect is explained by the differences between domestic and foreign firms in fixed costs;
- The anticompetitive effect may dominate the system in such a way that more protectionism rather than openness is welfare improving;
- The result should be accepted with due caution because of the stylized nature of the underlying model;
- The results could be enhanced by improvements in data on relative efficiency between domestic and foreign service providers in developing countries;
- It is important to take into consideration the underlying market structure when liberalizing services trade.

Thank you!