Advanced Macroeconomics

Alessandro Ruggieri
University of Nottingham

PROBLEM SET 3

1. Bernard, Jensen, Redding, and Schott (2007).
Replicate Table 2 (Column 1 and 2) and Table 3 (Columns 1 and 2) in Bernard, Jensen, Redding, and Schott (2007) for a country of your interest. Feel free to use any firm-level dataset you have available. Alternatively, you can use data from the WB-ES and download it from:

- World Bank Enterprise Survey (WB-ES) dataset, file called "StandardizedNew-2006-2021-core4.zip"

You should hand over both the code and the data.

References

1. Bernard, A. B., Jensen, J. B., Redding, S. J., and Schott, P. K. 2007. Firms in international trade. Journal of Economic perspectives. Vol.21, N.3, pp. 105-130.

2. Chaney (2008).
Consider the following extension of Melitz (2003) proposed in Chaney (2008). The economy is populated by a representative consumer with Cobb-Douglas preferences over a two goods: a homogeneous good c_o, and a CES bundle of differentiated varieties $\omega \in \Omega$. The problem of the representative consumer reads as:

$$\max_{c_o, c(\omega)} \quad (1-\alpha)\log c_o + \frac{\alpha}{\rho}\log\left(\int_\Omega c(\omega)^\rho d\omega\right) \qquad \rho < 1$$
$$\text{s.t.} \quad p_o c_o + \int_\Omega p(\omega)c(\omega)d\omega \leq wL + \bar{\Pi}$$
$$c(\omega) \geq 0, c_o \geq 0$$

Here L is the measure of labor supplied to the market, while $\bar{\pi}$ are aggregate profits of the firms, which are owned by the consumers. Let the wage be the numeraire of this economy, i.e. $w = 1$.

- Solve the consumer's utility maximization problem

Suppose good o is produced with a production function linear in labor ℓ_o,

$$q_o = A\ell_o$$

and it is sold in a competitive market. Suppose instead that the producer of good ω takes the price function $p(\omega)$ as given. Suppose that this producer has the following production function:

$$q(\omega) = \max\{0, z(\omega)[\ell(\omega) - f]\}$$

where $z(\omega)$ is the productivity of firm ω, $\ell(\omega)$ is labor employed, and f is a fixed costs of operation.

- Solve the problem of the firm producing the homogeneous good 0 and derive the optimal pricing rule, p_0
- Solve the problem of the firm producing variety ω and derive the optimal pricing rule, $p(\omega)$
- Compute firm-level profits, $\pi(z(\omega))$

Suppose firm productivities are distributed on the interval $z \geq 1$ according to the Pareto distribution with CDF

$$G(z) = 1 - z^{-\gamma} \quad \gamma > 2$$

Assume that there is a *finite* measure, M_p, of potential firms that first observe their productivity, z, and only then decide whether to enter or not. Notice that this assumption makes the entry decision different than Melitz (2008), where i) there is an *infinite* measure of potential entrants, and ii) entry happens before observing z, not after.

With a *finite* measure of potential firms, the free-entry condition does not hold anymore, i.e. the expected value of entry is not equal to the entry costs f_e. Instead:

- Show that there is a level of productivity z^* s.t. firms with productivity $z = z^*$ earn zero profits
- Compute the measures of new entrants as a function of potential entrants, i.e.

$$M_e = M_p \int_{z^*}^{\infty} dG(z)$$

- Construct the distribution of active firms over productivity, $mu(z)$

After entry, firms exit with an exogenous probability δ.

- Use the stationarity condition to compute the measure of active firms, M as a function of potential entrants, M_p

- Compute aggregate profits, $\Pi = M\bar{\pi}$, where $\bar{\pi} = \int_{z^*}^{\infty} \pi(z)\mu(z)dz$ as a function of wages.

Suppose now that there are two symmetric countries, $i = 1, 2$, with same labor force size, L, and have same measure of potential firms, M_p. Assume firms productivities in both countries are again distributed according to same the Pareto distribution, with CDF $G(z)$ defined above. Countries engage in international trade subjects to a fixed cost of exporting $f_x \geq f$ and a variable iceberg costs $\tau > 1$.

- Explain now why there are two relevant cutoff levels of firm productivity, one for entry z_i^*, and one for exporting, z_i^{**}. Find expressions for these cutoff productivity levels.
- How does the value you find for a z_i^* compare to the closed economy case?
- Find an expression for aggregate profits, Π
- Explain the pattern of reallocation across firms induced by opening the economy to trade. Is the representative consumer better off in this open economy? Discuss.
- Discuss the strengths and weaknesses of this model. In particular: What economic phenomena can this sort of model help to account for? What sort of phenomena can it not account for? How can we modify the model to account for these phenomena?
- What would change if countries were asymmetric as in Chaney (2008)? Discuss

References

1. Chaney, T. 2008. Distorted gravity: the intensive and extensive margins of international trade. American Economic Review. Vol. 98 N.4 pp. 1707-21.