14.582 International Trade
— Lecture 12: Markups (Theory) —
Today’s Plan

1. Markups, Misallocations, and Trade
2. Krugman (1979)
3. ACDR (2018)
1. Markups, Misallocations, and Trade
Markups ⇒ Misallocation

- Trade liberalization affects markups, and in turn, affects misallocation (+ or -?)
- Trade liberalization affects allocation, even if markups are fixed, and in turn affects misallocation (+ or -?)

Markups ⇒ Terms-of-trade

- If a country raises its tariff, and foreigners charge a markup, then markup may change in response to the tariff
- If there is incomplete pass-through from tariff to markup, rationale for a positive optimal tariff (absent GE effects)
Suppose that we are interested in the welfare impact of a TFP shock.

- Think of trade liberalization as a particular type of TFP shock.
- In a standard trade model, this would be a change in iceberg trade cost.
- But for now, let us just index technology by $T$.

Consider the representative agent's utility maximization problem:

$$U(T) \equiv \max_c u(c)$$

$$s.t.: \ p(T) \cdot c \leq R(T)$$

where $R(T) \equiv p(T) \cdot y(T)$ denotes revenues.
Firms maximize revenues:

\[ R(T) \equiv \max_y p(T) \cdot y \]

\[ \text{s.t. } F(y, T) \leq 0 \]

The Envelope Theorem therefore implies:

\[ U'(T) = \lambda \left[ -p'(T) \cdot c(T) + R'(T) \right] \]

\[ R'(T) = p'(T) \cdot y(T) - \mu F_T(y, T) \]

where \( \lambda \) and \( \mu \) are the associated Lagrange multipliers

Combining these two expressions:

\[ \frac{U'(T)}{\lambda} = p'(T) \cdot [y(T) - c(T)] - \mu F_T(y, T) \]

First-term = TOT effect; Second term = Solow residual
1. In a closed economy, market clearing requires $y(T) = c(T)$
   - Thus first term is equal to zero
   - One only needs to know the direct effect of the productivity shock and the initial allocation to compute its welfare impact

2. In an open economy, international trade implies $y(T) \neq c(T)$
   - Thus country now gains if country exports good $i$ ($y_i(T) - c_i(T) > 0$) and its price increases ($p'_i(T) > 0$)
   - But now we need full model to compute price changes and, in turn, welfare impact

3. Of course, the world economy is closed
   - So Solow residual is all that is needed at the world level
   - See Atkeson and Burstein (2010) and Burstein and Cravino (2015)
Suppose that firms have market power

In equilibrium, they therefore charge a markup over marginal cost

It is as if we had $\tilde{p}(T) \neq p(T)$ such that firms solve:

$$\tilde{R}(T) \equiv \max_y \tilde{p}(T) \cdot y$$

$$s.t. : F(y, T) \leq 0$$

Markup on good $i$ is given by $m_i \equiv p_i / \tilde{p}_i$

This is no different at if we were taxing good $i$ at rate $t_i = 1 - 1 / m_i$

- Previous approach more general than markups
- Markups simply act as “wedges” in the Hsieh and Klenow sense

Note that for firms to take prices as given, we need CRS or DRS
Growth Accounting Revisited

- The Envelope Theorem now implies:

\[ \tilde{R}'(T) = \tilde{p}'(T) \cdot y(T) - \mu F_T(y, T) \]

- By definition, we also know that:

\[ \tilde{R}'(T) = \tilde{p}'(T) \cdot y(T) + \tilde{p}(T) \cdot y'(T) \]

\[ R'(T) = p'(T) \cdot y(T) + p(T) \cdot y'(T) \]

- We therefore obtain:

\[ \frac{U'(T)}{\lambda} = \left[ -p'(T) \cdot c(T) + R'(T) \right] \]

\[ = p'(T) \cdot [y(T) - c(T)] + p(T) \cdot y'(T) + \tilde{R}'(T) - \tilde{R}'(T) \]

\[ = p'(T) \cdot [y(T) - c(T)] - \mu F_T(y, T) + [p(T) - \tilde{p}(T)] \cdot y'(T) \]

  - Reallocation \((y'(T))\) now has a first-order effect on welfare
  - \(> 0\) if good \(i\) is under-supplied \((p_i > \tilde{p}_i)\) and output increases \((y'_i > 0)\)
Although \( p(T) - \tilde{p}(T) \) appears in the previous expression, it is relative, not absolute prices that matter

- Firms’ supply is homogeneous of degree zero in prices

\[ \Rightarrow \text{variation of markups across goods matters, not absolute level} \]

- A uniform tax is not distortionary

- "Decrease in markups is good" is a partial equilibrium intuition where one good is subject to a markup and the other is not

Changes in markups are not required for them to affect the consequences of productivity shocks and hence trade liberalization

- Once there is a wedge, reallocations have first-order effects...

- Even if the wedge is not affected by the shock

First-order type result less useful once there are distortions:

- Formula still provides intuition, but in order to be implemented, we now need \( y'(T) \), which requires the full structure of the model...

- True even in a closed economy where terms of trade can be ignored
2. Krugman (1979)
Model = Dixit-Stiglitz (1977) with symmetric firms

c and \( p/w \) are simultaneously characterized by

\[
\frac{p}{w} = \left[ \frac{\sigma(c)}{\sigma(c) - 1} \right] \frac{1}{\varphi}
\]

\[
\frac{p}{w} = \frac{f}{q} + \frac{1}{\varphi} = \frac{f}{Lc} + \frac{1}{\varphi}
\]

\( n \) can then be computed using market clearing conditions

\[
n = \frac{1}{f/L + c/\varphi}
\]
Refresher

Graphical Analysis

![Graphical Analysis Diagram]
Suppose that two identical countries open up to trade

- This is equivalent to a doubling of country size (which would have no effect in a neoclassical trade model)

Because of IRS, opening up to trade now leads to:

- **Increased product variety**: $c_1 < c_0 \Rightarrow \frac{1}{f/2L+c_1/\varphi} > \frac{1}{f/L+c_0/\varphi}$
- **Pro-competitive/efficiency effects**: $(p/w)_1 < (p/w)_0 \Rightarrow q_1 > q_0$
Comments

- It is common in the literature to present the two previous channels as two new sources of GT absent from neoclassical models
- Two issues with this view:
  - New varieties could appear under perfect competition (Armington)
  - Markups and new varieties are tied together by free entry condition: when markups go down, entry decreases and vice versa
- Note also that markups do not vary across goods in Krugman (1979):
  - There is therefore no misallocation across goods that are produced
  - The only distorted margin here is entry (it is as if goods that are not produced had infinite markups relative to other goods)
  - If entry was fixed, then increasing country size would affect markups, and profits, but not the allocation...
  - From welfare standpoint, key questions = Is entry too low or too high? Does an increase in country size increase or decrease entry?
3. ACDR (2018)
Arkolakis, Costinot, and Rodriguez-Clare (2012), have shown that for fairly large class of trade models, welfare changes caused by trade shocks only depend on two statistics:

1. Share of expenditure on domestic goods, $\lambda$
2. Trade elasticity, $\varepsilon$, in gravity equation

Assume small trade shock so that, $d\ln \lambda < 0$: associated welfare gain is given by

$$d \ln W = - \frac{d \ln \lambda}{\varepsilon}$$
What About the Pro-Competitive Effects of Trade?

Important qualification of ACR’s results:

- All models considered in ACR feature CES utility functions
- Thus firm-level markups are constant under monopolistic competition
- This de facto rules out “pro-competitive” effects of trade

Recall monopolistic competition with CES leads to efficient allocation:

- Envelope theorem implies that starting from initial allocation, the effect of productivity shocks are the same as under perfect competition
- If we relax CES, gains from trade may be very different
Goal: Study the pro-competitive effects of trade, or lack thereof
- Depart from CES demand and constant markups.
- Consider demands with variable elasticity and variable markups

Focus: Monopolistic competition models with firm-heterogeneity

Experiment:
- Consider two classes of models with CES and without
  - Impose restrictions so that all these models have same macro predictions (Pareto distributions of productivity)
  - What are the welfare gains under these two scenarios?
ACDR (2018): Main Results

- Characterize welfare gains in this environment
  - Suppose small trade shock, $d \ln \tau$, raises trade openness, $d \ln \lambda < 0$
  - Welfare effect is given by
    \[
    d \ln W = -(1 - \eta) \frac{d \ln \lambda}{\varepsilon}
    \]
  - $\eta \equiv$ structural parameter depends on
    - Degree of pass-through
    - Magnitude of GE effects
Whether models with variable markups lead to larger or lower gains from trade liberalization depends on sign of $\eta$.

**What is the sign of $\eta$ in theory?**

- Under common alternatives to CES: $\eta \geq 0$
- **Intuition:**
  - Incomplete pass-through (Trade costs affect TOT)
  - GE effects (Trade costs also affect misallocations)
  - Direct effect dominates GE effect (Non-homotheticity is key)

**What is the sign of $\eta$ in the data?**

- Direct demand estimation and existing pass-through estimates point to $\eta \geq 0$, but small. Hence the “elusive” pro-competitive effects.
Focus of ACDR is on misallocations:

- Distribution of markups is fixed (because of Pareto)
- ... and does not vary across origin countries (because of Pareto)
- Misallocations is across varieties from the same origin country
- Entry is fixed too (because of Pareto)

In general, if distribution of markups is fixed, reallocations require sector-specific productivity shocks

- In ACDR, though, trade costs do not vary across firms/varieties

This explains the role of non-homothetic preferences in ACDR:

- With homotheticity = back to first best results and ACR formula
- Without homotheticity = if trade costs go down and country gets richer, consumers change shares of expenditure on different varieties
- This is good if reallocation leads to expansion of high-markup varieties
- But under common alternative to CES, marginal varieties tend to have lower markups and richer consumers tend to buy more varieties...