INTERNATIONAL RISK-SHARING 
AND COMMODITY PRICES

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What is the paper (second part) about?

- Measures the extent of international risk sharing using data on consumption, output, world commodity prices and countries specialization in major commodities for a large sample of commodity producers.

- Provides insights on the main sources of deviations from perfect risk-sharing: mostly terms-of-trade risk (fluctuations in world prices) but national output risk still relevant.

- Argues that the ’Cole and Obstfeld’ mechanism of risk-sharing (due to terms-of-trade adjustment) is rather weak in the data. Provides theoretical insights of why this might be the case: Cole and Obstfeld’s findings are weakened with multiple commodities and multiple producers of a given commodity.
Discussion

- Will focus on the theoretical interpretation of their findings

- To do so, I will revisit some of the reasons why the prefect risk-sharing results of Cole and Obstfeld might not hold

- This hopefully might shed some lights on the empirical findings in the present paper
Revisiting Cole and Obstfeld (JME, 1991)

Consider a country $i$.

Two commodities $\{1, 2\}$ are produced in the world (all the results extend easily to $N$—commodities)

Preferences over the two commodities are defined as follows (identical across countries)

$$C_i = \left[ \alpha^{1/\phi} (c_{1i})^{(\phi-1)/\phi} + (1 - \alpha)^{1/\phi} (c_{2i})^{(\phi-1)/\phi} \right]^{\phi/(\phi-1)}$$

Commodities are sold in international markets at prices $p_1$ and $p_2$
Revisiting Cole and Obstfeld

**Imperfect specialization**: country $i$ produces both goods

**Financial autarky** gives the following budget constraint:

$$PC_i = p_1y_{1i} + p_2y_{2i} = p_1\lambda_{1i}y_{1w} + p_2\lambda_{2i}y_{2w}$$

$y_{1w}$ is world production of commodity 1

$\lambda_{1i}$ the market share of country $i$

Same notations for commodity 2
Revisiting Cole and Obstfeld

At the world level ($w$)

$$PC_w = p_1 y_{1w} + p_2 y_{2w}$$

Relative world demand/supply for commodities gives the equilibrium relative prices:

$$\frac{c_{1w}}{c_{2w}} = \frac{a}{1 - a} \left( \frac{p_1}{p_2} \right)^{-\phi} = \frac{y_{1w}}{y_{2w}}$$

$$\frac{p_1}{p_2} = \left( \frac{a}{1 - a} \right)^{1/\phi} \left( \frac{y_{1w}}{y_{2w}} \right)^{-1/\phi}$$

Note that **world relative prices are fully determined by world relative supplies**
Revisiting Cole and Obstfeld

Using budget contraints

\[
\frac{C_i}{C_w} = \frac{p_1 \lambda_1 y_1 w + p_2 \lambda_2 y_2 w}{p_1 y_1 w + p_2 y_2 w}
\]

Using relative world demand/supply for commodities:

\[
\left( \frac{C_i}{C_w} \right) = \frac{a^{1/\phi} \left( \frac{y_1 w}{y_2 w} \right)^{1-1/\phi} \lambda_1 i + (1-a)^{1/\phi} \lambda_2 i}{a^{1/\phi} \left( \frac{y_1 w}{y_2 w} \right)^{1-1/\phi} + (1-a)^{1/\phi}}
\]

This gives the extent of deviations from perfect-risk sharing (where \( C_i \) stays a constant fraction of \( C_w \))
Revisiting Cole and Obstfeld

\[
\left( \frac{C_i}{C_w} \right) = \frac{a^{1/\phi} \left( \frac{y_{1w}}{y_{2w}} \right)^{1-1/\phi} \lambda_{1i} + (1 - a)^{1/\phi} \lambda_{2i}}{a^{1/\phi} \left( \frac{y_{1w}}{y_{2w}} \right)^{1-1/\phi} + (1 - a)^{1/\phi}}
\]

So consumption of country \(i\) relative to world consumption fluctuates because:

- relative world supply of goods fluctuates (hence relative prices fluctuate).

- market shares \(\lambda\) in the production of both goods fluctuate

Let’s explore different cases...
Revisiting Cole and Obstfeld

'Cole and Obsteld'

Perfect specialization $\lambda_{1i} = 1$ and $\lambda_{2i} = 0$ and $\phi = 1$

$$\left( \frac{C_i}{C_w} \right) = a$$

Perfect risk-sharing: country $i$ consumption and world consumption moves in lock-steps.

According to the present paper: bad approximation of the world: none of the two previous assumptions hold?
Revisiting Cole and Obstfeld

‘Cole and Obstfeld light’

Relaxing the perfect specialization assumption but keeping $\phi = 1$

\[
\left( \frac{C_i}{C_w} \right) = a\lambda_{1i} + (1 - a)\lambda_{2i}
\]

Countries are only exposed to their fluctuations in world market shares (country specific risk) and fluctuations in relative prices do no matter.

Surprising? Any increase in production of a given commodity in a given country leads to an equivalent fall in the price of this commodity at the world level.
Revisiting Cole and Obstfeld

Cole and Obstfeld light

In other words, with $\phi = 1$, Cole and Obstfeld logic is still operating but weakened in the sense that countries' changes in market shares of a given commodity are not insured.

Bad approximation of reality since countries' consumption (relative to world consumption) is very exposed to fluctuations in world prices.
Revisiting Cole and Obstfeld

'Cole and Obstfeld super light': perfect specialization but $\phi \neq 1$

$$\left( \frac{C_i}{C_w} \right) = \frac{a^{1/\phi} \left( \frac{y_{1w}}{y_{2w}} \right)^{1-1/\phi}}{a^{1/\phi} \left( \frac{y_{1w}}{y_{2w}} \right)^{1-1/\phi} + (1 - a)^{1/\phi}}$$

Only affected by fluctuations in relative world supply (or equivalently relative prices). Cole and Obstfeld logic is weakened and significantly so if $\phi$ is far away for unity. Idiosyncratic country risk does not matter (or only to the point where it affects world supply/prices) as country $i$ is the only producer of good 1.

The paper tells us that countries idiosyncratic risk accounts for a significant share of departure from perfect risk-sharing (on the top of fluctuations in relative world prices).
Revisiting Cole and Obstfeld

’Anti Cole and Obsteld’: extreme ’non-specialization’

\[ \lambda_{1i} = \lambda_{2i} = \lambda_i \text{ at all dates and } \phi \text{ can take any value} \]

\[ \left( \frac{C_i}{C_w} \right) = \lambda_i \]

Imperfect risk sharing but only country specific shocks matter: countries are not exposed to fluctuations in world production of both goods (or equivalently fluctuations in relative prices) as they produce both goods in constant proportion of world supplies.

Note that the value of \( \phi \) does not matter in this case but still...

Bad approximation of the world as countries consumption is very exposed to terms-of-trade fluctuations, hence very specialized?
Revisiting Cole and Obstfeld

Shall I take from the paper the following insights?

- Countries a **very specialized** otherwise they would not be affected by fluctuations in relative prices

- \( \phi \) is very low such that there are **large variations in relative prices** which makes countries very exposed to terms-of-trade fluctuations

- But the presence of other producers of the same commodities makes **countries idiosyncratic risk still very relevant**
Caveats: The role of shocks

Unless we are not considering the most relevant shocks. So far only supply shocks. What if relative prices of commodities are mostly determined by demand shocks of a given commodities (shocks to $a$ as a shortcut)?

Assume $\phi = 1$ such that world supply shocks are irrelevant

$$\left(\frac{C_i}{C_w}\right) = a\lambda_1 + (1 - a) \lambda_2$$

Assume that country $i$ is specialized in good 1, $\lambda_1 > \lambda_2$

$\lambda_1 = \lambda_i(1 + \theta)$ and $\lambda_2 = \lambda_i$ (changes in country $i$ output is balanced across sectors)
Caveats: The role of shocks

\[
\left( \frac{C_i}{C_w} \right) = \lambda_i (1 + a\theta) \Rightarrow \Delta C_i - \Delta C_w \approx \Delta \lambda_i + \frac{\theta}{1 + \alpha \theta} \Delta a
\]

Sum of two terms: country $i$ output risk and terms-of-trade fluctuations driven by demand shocks for commodity 1 relative to 2. The latter becomes important if country very specialized (high $\theta$)

From a modeling perspective, which shocks matter for commodity prices? Cole and Obstfeld mechanism provides insurance for supply shocks but not demand shocks. Note that such shocks can move prices and quantities in the same direction (more in line with the data?)
Caveats: Real exchange rate

With real exchange rate fluctuations, perfect risk-sharing becomes

\[
\left( \frac{C_i}{C_w} \right) \# \left( \frac{P_i}{P_w} \right)^{-1/\sigma} \quad (\sigma = \text{CRRA coefficient})
\]

Suggests that if producers eat a larger share of their own commodities than what is consumed at the world level, risk sharing is even worse!

(terms-of-trade and \(\frac{C_i}{C_w}\) should move in opposite directions)
Conclusion

Very interesting paper! Raise a number of questions.

Show that Cole and Obstfeld result is strongly weakened (both in theory and in the data)

- if multiple producers of the same commodities and important fluctuations in market shares

- if the number of commodities produced by a given country expands with countries still sufficiently specialized in few commodities

Note that Cole and Obstfeld is also weakened if demand shocks instead of supply shocks. More relevant?
Conclusion

As a result, deviations from perfect risk-sharing are large, dominated by fluctuations in world commodity prices and countries idiosyncratic output risk

⇒ What does prevent these countries to reap the gains from risk-sharing?

Missing assets?

Financial frictions?

What is the right theoretical framework (beyond financial autarky)?