Modelling Oil Prices in a Dynamic General Equilibrium Model with Free Entry

by Ippei Fujiwara and Naohisa Hirakata

Discussion by Paolo Pesenti

Federal Reserve Bank of New York, NBER and CEPR

Workshop on Commodity Price Issues, July 2006

This discussion

Kudos to Ippei and Naohisa

Revisiting some of the results and inspecting the mechanism

Quibbles, questions, issues for the future

The model

Sophisticated multi-country DGE setting with oil production and endogenous free entry

Methodology allows for treatment of both intensive and extensive margins of trade

Very nicely done. I heartfeltly support this research agenda.

Of course, there is a very large international trade *microeconomic* literature on the subject. But this literature is not interested in focusing on the *macroeconomic* implications. Macro guys care little about heterogeneity in production and trade costs (micro guys care!), micro guys care little about asset market structure, labor supply, inflation dynamics (macro guys care!)

Hope that soon we will have a brand new generation of institutional macromodels with features similar to the ones considered in this paper

The context

Benchmark multi-country DGE model takes number of consumption varieties and pattern of national specialization as given: national *types* of goods that come in different *brands*.

Unless substitution between Home and Foreign goods is very low, increased productivity leads to deterioration of terms of trade. Supply of goods must be absorbed by international markets at falling prices

Positive welfare spillover to rest of the world + convergence of real incomes (e.g. Acemoglu-Ventura (QJE 2002))

Empirical evidence is mixed

Theoretically, these results need not hold with *trade costs* and *endogenous creation of product varieties* (Krugman (EER 1989): when domestic producers take advantage of enhanced productivity to change the attributes of their products, a country may enjoy the benefits of technological progress without experiencing any fall in its international prices.

Macroeconomic adjustment occurs both along the INTENSIVE margin of trade (changes in relative prices of existing varieties of tradable goods) and the EXTENSIVE margin (creation and reallocation of new varieties).

In this case international spillovers of productivity gains are ambiguous: availability of more varieties of goods versus higher import prices.

Also: trade is not free. Transaction costs in international trade induce home bias in consumption, generating deviations from PPP even though all goods are tradable.

At the end of the day, models of trade adjustment and shock transmission cannot afford to overlook these issues. Hence the need for a new generation of open-economy DGE models.

Two notions of productivity

Distinction between:

- productivity in manufacturing affecting marginal costs — the typical definition of productivity in standard macro models of international transmission

- productivity related to the ability of creating new product varieties and new firms, reducing the costs of firms' entry and product differentiation.

Free entry

With free entry, the value of a firm = cost of creating a variety = value of operating profits.

In equilibrium, a fall in entry costs must translate into a corresponding fall in operating profits. The mechanism of adjustment requires a rise in the number of varieties supplied by domestic firms, driving profits down.

Global patterns of production

Number of varieties worldwide ↑ with: larger ROW market size, and gains in efficiency in setting up firms and creating new goods in the ROW, but ambiguous with manufacturing productivity.

Varieties and productivity differentials in manufacturing

Consider a shock that improves manufacturing productivity in the ROW (Z).

At the intensive margin, ROW firms unambiguously raise the scale of their production

Higher growth implies higher demand for oil, driving its price up.

From the vantage point of an individual downstream ROW firm, productivity gains that reduce the marginal costs of production represent an opportunity to expand its market share and profits, via a reduction in the price of its product.

However, all ROW firms experience the same fall in marginal costs: thus, they all compete with each other by cutting prices.

If the fall in the price of consumption does not have strong wealth effect on the demand for leisure, it leads to a more than proportional expansion in the demand for consumption goods.

Lower prices then translate into higher ROW profits.

With unchanged entry costs some firms now enter the ROW market increasing the number of ROW-produced varieties.

ROW labor becomes more expensive in response to manufacturing productivity improvements.

But the prices of ROW varieties unambiguously fall with productivity gains: TOT deteriorate from the point of view of the ROW.

Bottom line: ROW inflation low, TOT deteriorate in ROW. In the Home country, high OIL inflation but improved terms of trade. Positive consumption spillover

In the paper, Footnote 14, authors seem puzzled by the fact that labor increases in ROW after the technology shock, in spite of nominal rigidities. It seems to me that at the firm level labor falls but since the number of firms increases, in the aggregate labor supply expands.
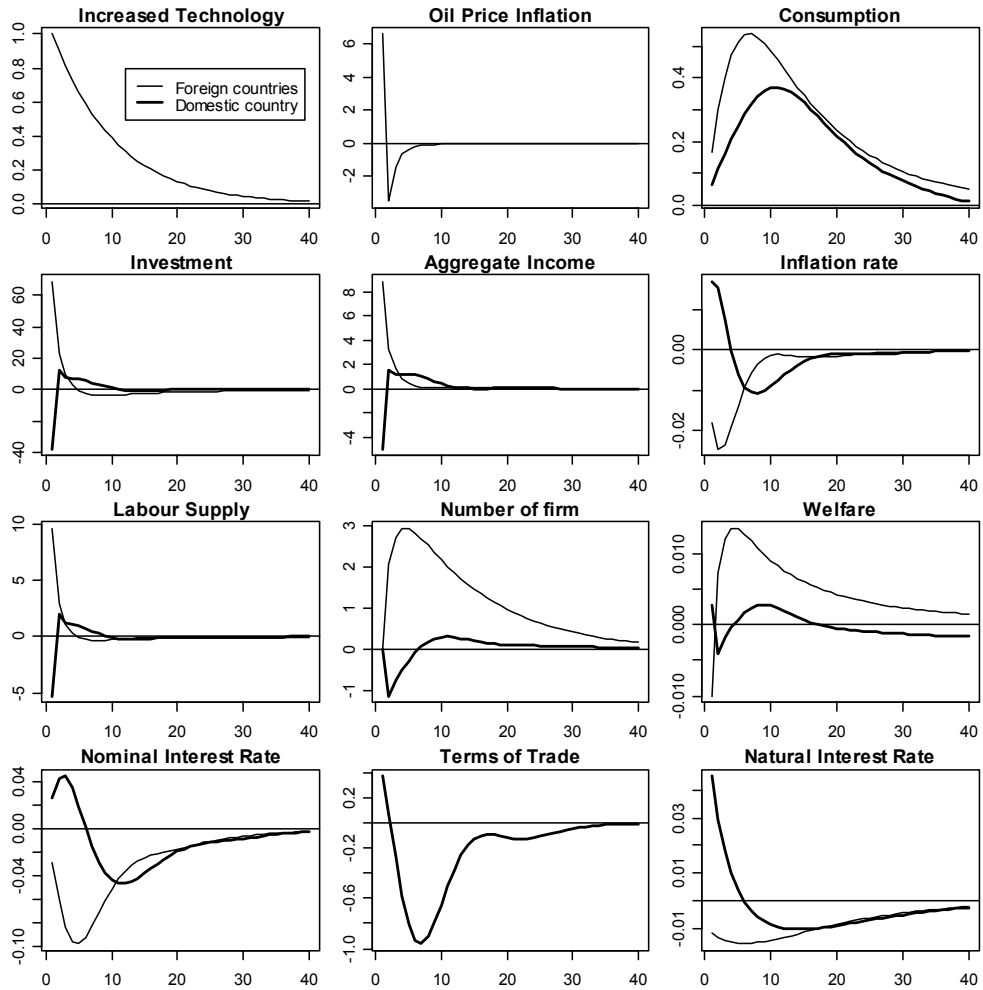
See Figure 6

Figure 6: Increased Technology

Varieties and productivity differentials in creating varieties

Now consider a different kind of productivity improvement in ROW, affecting entry costs (f_E).

Lower entry costs raise the number of varieties supplied at the global level, and the scale of ROW firms production is likely to fall.

The response of ROW varieties is unambiguously positive. In the Home country, instead, the response is generally ambiguous.

The terms of trade in the ROW appreciate with the upsurge of the relative demand for ROW labor.

The ROW terms of trade strengthen as the array of Home products increases.

Notice: ROW real GDP grows in response to both productivity shocks.

But the terms of trade deteriorate in response to an increase in productivity that lowers marginal costs in production, while they improve if productivity gains reduce the cost of firms' entry.
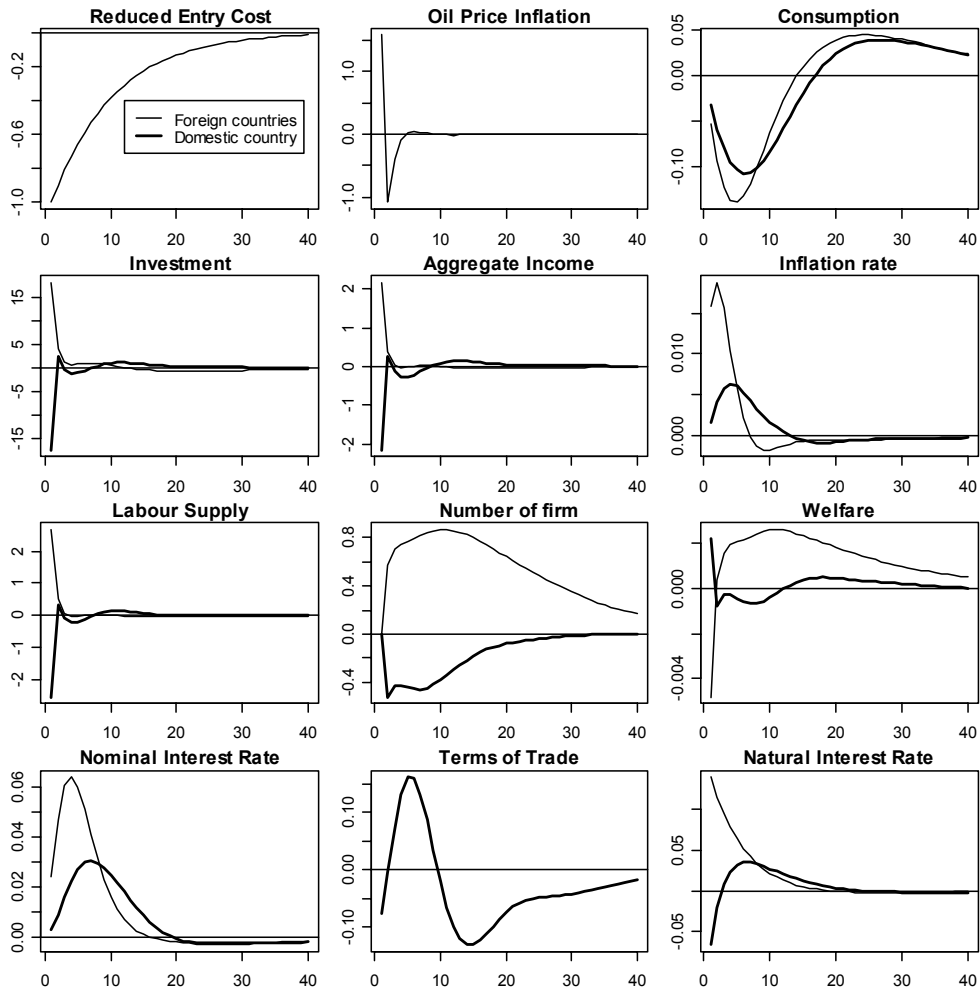
See Figure 7.

Figure 7: Reduced Entry Cost

Home market effect

In its original formulation (Krugman P., AER 1980), the 'home market effect' refers to a more-than-proportional increase in the number of varieties produced domestically following an increase in market size.

In the trade literature (say Helpman and Krugman, 1985) labor supply is exogenous.

Also TOT are constant: this follows from introducing a perfectly competitive sector without trade costs along with the imperfectly competitive sector with expanding varieties.

The zero trade cost constant returns sector equates wages and absorbs any trade imbalances caused by home market effects operating on the other industry. If this assumption is relaxed, the home market effect effect could take the form of a relative factor price appreciation.

In this model labor supply and TOT are both endogenous. Let's see what happens.

A relatively larger ROW market raises the number of varieties produced world-wide.

ROW varieties increase with L.

Puzzle: I would have predicted that the country-specific effects are similar to the case of reduced entry costs. A larger ROW market raises ROW labor costs relative to their Home counterparts and thus improves the ROW terms of trade.

Instead this is not the case: see Figure 5. Labor supply actually falls in the ROW: apparently strong wealth effect on demand for leisure (but if so, why didn't it show up earlier?)
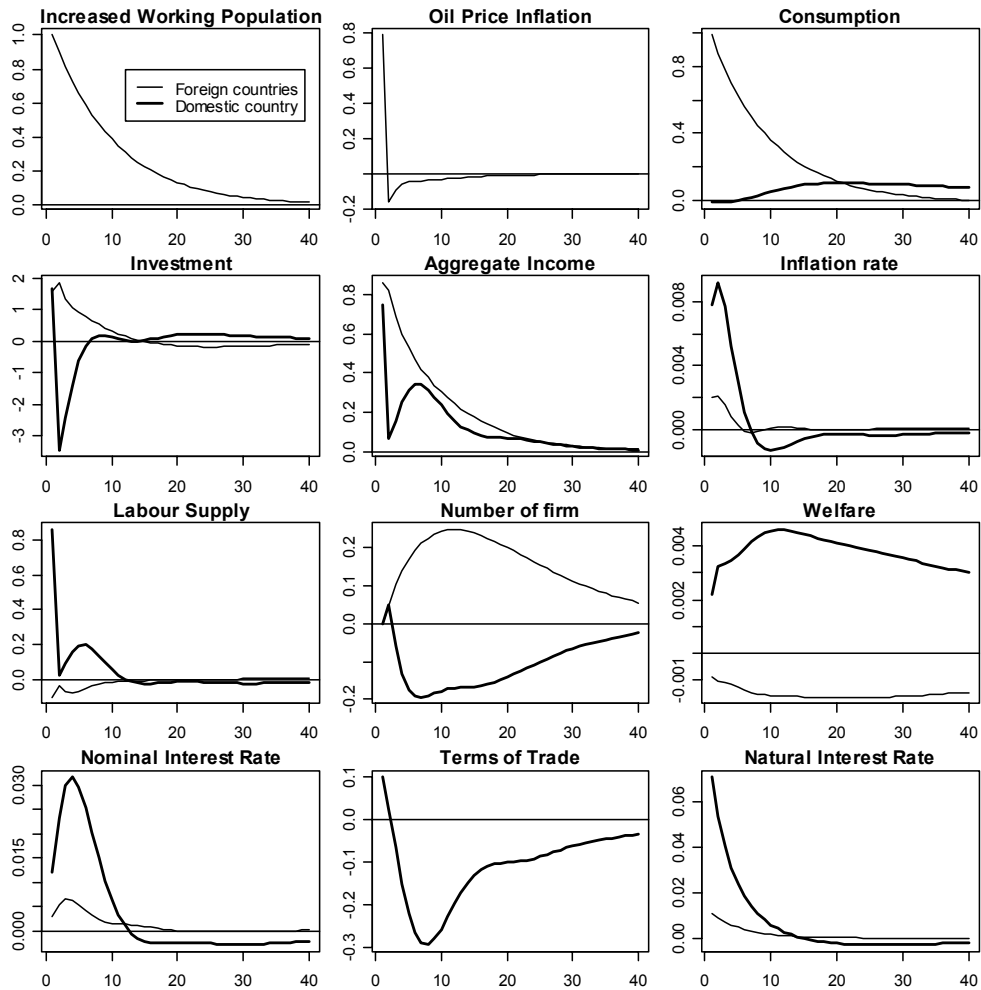
Figure 5: Increased Working Population

Quibbles and questions

I'd like to see some sensitivity analysis, especially elasticity of intertemporal substitution (source of wealth effects)

Related work shows that the transmission mechanism and the (re)allocation of varieties are very much affected by the asset market structure: the model assumes incomplete markers (bond economy). How do your results change under a complete markets benchmark? Conjecture: larger fluctuations of the extensive margin

Substantially, the paper considers a number of scenarios leading to oil price inflation. Oil price inflation is always bad for the Home economy. But the specific reasons underlying oil price inflation can end up making Home better off or worse off.

This is all good, but it is not clear to me what exactly do we gain by adding oil to the model with free entry.

Qualitatively, the paper does already a great job at illustrating different spillovers of ROW growth on the Home economy, depending on the nature of the shock themselves.

When we add oil to the model, we don't learn much from the exercise than we couldn't figure out (again, from a *qualitative* point of view). The whole is not larger than the sum of the parts.

Quantitatively, of course, it would be another story. If the paper presented a realistic simulation of, say, the effects of world oil price increases on the economy of Japan, or Italy, having the oil sector would obviously be relevant!

But the emphasis of the exercise is not on quantitative responses. Home country calibrated in terms of a 'typical' oil-importing economy (like the 'typical European landmarks' depicted on euro notes, so typical that they don't exist at all!).

Also not clear to me what exactly do we learn from the 'expected shocks' scenarios…

Question: what happens if the two kinds of shock are perfectly correlated ($Z\ times\ f_E = 1$).

Conjecture: the f_E shock prevails

Question: the relevance of love for variety

When the number of varieties increases, the Consumer Price Index falls by $\gamma - 1$, the marginal welfare gain of goods diversity.

In the model however $\gamma = 1$.

This eliminates a priori a lot of interesting dimensions of the transmission mechanism, including the effects of changes in varieties of the composition of the price basket relevant to determine inflation and real exchange rates...

Conclusion

Good job. A very promising role model for other institutional investigations

Emphasis on oil may be unwarranted, unless the paper becomes more focused on realistic country scenarios

When are we going to see an application to China vs. Japan trade?