1 From the DFS Hecksher-Ohlin model to Davis and Weinstein (2003)

1.1 Near FPE and non-FPE: Implications

With non FPE, even goods with very similar technologies will be produced with capital intensities that vary according to the variation in $\sigma = r/w$ across countries. This will generate differences in the A matrices across countries.

Consider an industry in the data. It is composed of a set of goods, each with different technologies, some more capital intensive than others. With "near FPE" the capital-abundant country will specialize in the capital intensive goods within each "empirical industry," whereas the labor-abundant country will specialize in the labor intensive goods. Thus, the A matrices will differ in spite of the fact that σ is almost the same across countries. These A differences are due to the fact that "empirical industries" are "lumpy."

Why is all this important? Consider first the case of near FPE. True factor content of trade is obviously not affected by moving slightly outside the FPE set. So $PFCT$ is close to what it was in the HOV model (with FPE). But consider $MFCT$. Recall that when A matrices differ, then one must use the exporting country's A matrix to convert gross exports to factor content. It is interesting to see the bias that would be introduced if one didn't do this. In particular, consider two countries, Home is capital abundant relative to Foreign. If we use Home's A matrix to measure the factor content of trade between Home and Foreign, then we would overstate capital services in imports, and this understantes net exports of capital services from Home to Foreign. Similarly, this would understate labor services in imports, and this understantes net imports of labor services by Home from Foreign. In other words,

$$\widetilde{MFCT} = A^H T^{HF} < V^H - s^H V^{H+F} \approx PFCT$$

This could then help to explain the "Mystery of the Missing Trade."

This problem is dealt with by DW by allowing the A^i matrix to vary with K^i/L^i and then measuring the factor content of gross exports with the exporting country's A matrix. Clearly, this is takes care of A matrix differences generated by true factor price differences. But here a new problem is introduced in the empirical exercise. It has to do with the way in which HOV deals with non-tradables.

We have already discussed that for the FPE set to have full dimensionality within the V-box we need the number of tradable goods to be at least as large as the number of factors. The existence of non-tradable goods doesn't help in enlarging the dimensionality of the FPE set because although they also introduce new constraints, namely that total consumption equals total production in each country. Helpman and Krugman (1985, section 1.4) explain how to characterize the FPE set when there are two tradable goods, one non-tradable good, and two factors. It is clear there that the FPE set has full dimensionality, and the equilibrium with FPE entails $V_k^{iN} = s^i V_k^{WN}$, where V_k^{iN} is the quantity of factor k

used by country i to produce its consumption of non-tradables. This just says that if V_k^{WN} are used of factor k to produce the total quantity of non-tradables in the integrated equilibrium, then country i will allocate a share s^i of this to produce its own consumption of non-tradables. HOV theory is then robust to non-tradables, because

$$\begin{aligned} \widetilde{PFCT} &= V^i - s^i V^W \\ &= \left(V^i - s^i V^W\right) - \left(V^{iN} - s^i V^{WN}\right) \\ &= V^{iT} - s^i V^{WT} = PFCT \end{aligned}$$

But this clearly relies on FPE. Without FPE, then it seems reasonable to expect that if factor k is abundant in country i (i.e., $V_k^i > s^i V_k^W$), then $V_k^{iN} > s^i V^{WN}$, so $\widetilde{PFCT}$ is biased upwards. Similarly, if k is scarce in country i then $\widetilde{PFCT}$ would also be biased upwards. So non-FPE could also help in dealing with the Mystery of the Missing Trade.

1.2 Davis and Weinstein (2003)

Sample of 20 OECD countries plus the RW, 34 sectors, and two factors (L, K) around 1985.

They also obtained the input-output matrix for 10 OECD countries (only for labor and capital). They used this to obtain an estimated A matrix for each country, by running the regression:

$$\ln a_{jk}^i = \beta_{jk} + \alpha^i + \gamma_k (K^i / L^i) + \varepsilon_{jk}^i$$

- The term β_{jk} will just capture the average entry jk for the A matrix across the OECD countries. If this term alone was in the regression, then this would simply estimate some average $\bar{A}$ matrix.
- The term α_i captures scalar productivity differences across countries, as in Trefler (1995).
- The term γ captures the impact of the capital labor ratio on unit labor and capital requirements across countries.

The regression delivers reasonable results. DW then use this to obtain estimated A matrices, and then use these to obtain

$$\hat{F}^{ij} = \hat{A}^i X^{ij}$$

and then use

$$PFCT_k^i = V_k^i - s^i \sum_j V_k^j = \sum_{j \neq i} \hat{F}_k^{ij} - \sum_{j \neq i} \hat{F}^{ji} = MFCT_k^i$$

Their results can be summarized as follows:

	Sign test	Slope ($MFCT$ on $PFCT_k^i$)	MT ratio
Using A^{US} (as Bowen et. al.)	32%	-0.002	0.0005
Using $\bar{A}$ ($\alpha^i = \gamma_k = 0$)	45%	-0.006	0.0003
Scalar technology differences ($\alpha^i \neq 0$)	50%	0.02	0.008
Non-FPE ($\gamma_k \neq 0$)	86%	0.17	0.07
Adjustment for non FPE in non-tradables	86%	0.43	0.19
Adjustment for Rest of the World	82%	0.59	0.38
Gravity	91%	0.82	0.69