Notes on “Varieties and the transfer problem: the extensive margin of current account adjustment”, by Corsetti, Martin & Pesenti (2008)

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1 Motivation

1.1 The transfer problem then

- **Policy roots.** Originally related to a well-defined policy problem (analysis of German reparations after WWI).

- **Controversy.** Keynes (1919, 1929) emphasized deterioration of terms of trade and real exchange rates in the debtor country that reduce welfare further. Ohlin (1929) criticized Keynes’ emphasis on relative prices, arguing that income effects can make terms-of-trade adjustments redundant. The textbook synthesis — say Krugman and Obstfeld (2006), p.98 — recognizes the validity of the Ohlin position but concludes that “Keynes was right in practice”.

1.2 What about the transfer problem today?


- Adjustment requires transfer of real resources from the U.S. to the rest of the world. Decrease in domestic spending relative to production, accompanied by a simultaneous increase abroad.

- Obstfeld and Rogoff (2005, 2007): transfer associated with unwinding of the U.S. current account deficit may be associated with “the potential collapse of the dollar” and estimate the extent of real effective depreciation at 30 percent or more.

- Official estimates by international organizations (IMF WEO 2006) project a 15-20 percent depreciation over a ten-year horizon under benign circumstances, but do not rule out sharp spikes of dollar under more disruptive scenarios.

- Similar results in the context of model-based simulations (Faruqee, Laxton, Muir, Pesenti 2007, Gertler, Ferrero, Svensson 2007,...)

1.3 The Obstfeld-Rogoff argument of a big RER adjustment

- Rests on the assumption that:
  - no reallocation of factors from non traded to traded goods sectors can occur
  - implies the US non traded price index falls a lot relative to traded prices
  - the fall in the US TOT accounts for a $ depreciation of between 5 and 15%; the change in relative price of non-tradables accounts for a real $ depreciation of between 20 and 30%. This relative price change plays the lion’s share.
• More general argument: current account adjustment is a medium-term, possibly long-term issue for the US. Over the time horizon relevant for adjustment:
  – endogenous production (labor supply)
  – factors of production mobile between sectors
  – baskets of tradable goods in the global economy should be allowed to change. Macroeconomic implications of firms’ entry and exit in the tradable sector are substantial (Broda and Weinstein (2004, 2006, 2007))

1.4 Trade in differentiated goods
• Evidence on vast change in composition of international trade towards differentiated goods.
  • U.S. imports of differentiated goods in % of total imports: 47.4 % to 75.5 % between 1975 and 2000
  • U.S. exports of differentiated goods in % of total exports: 61.3 % to 78.6 % between 1979 and 2000.

1.5 Extensive margin in trade growth
• Extensive versus intensive margin of trade growth: export of new differentiated varieties, as opposed to a rise in the volume of trade in existing goods (Gagnon 2003, Kehoe and Ruhl 2003, Ruhl 2005,Yi 2003)
• Hummels and Klenow (2005): extensive margin can account for about two thirds of the difference in trade across countries of different size.
• Debaere and Mostashari (2006): for 80 % of the countries, over 40 % of all goods categories exported to the U.S. in 1998-2000 were in newly traded goods (not exported in 1989-91).
• IMF (2007): economies with lower costs of starting and closing a firm, and of hiring and firing labor, have experienced smaller movements in real effective exchange rates during current account adjustment episodes.

1.6 The transfer problem revisited
What are the effects of a transfer on relative prices and employment, accounting for different margins of adjustment (extensive / intensive): non traded, local, exported differentiated goods with imperfect competition+ endogenous labor supply
• Framework related to new international trade literature with deliberate emphasis on macroeconomic aspects. Similar approach as CMP (JIE 2007)
• We consider two models: with extensive margin and traditional ‘fixed-variety’
• Calibrate the model to Obstfeld-Rogoff-style transfer experiment: eliminate a deficit of 6.5 % of GDP

1.7 Three results to comment upon:
• Much lower exchange rate movement in the extensive-margin model than in the fixed variety model (0 if constant fixed of entry even with consumption home bias)
• Effects on consumption and employment not terribly different across model specifications.
• Size of the dollar fall need not measure the welfare costs of current account adjustment
2 Model setup

- Two countries, Home and Foreign: \( L \) and \( L^* \) households
- Households consume a basket of differentiated varieties, domestically produced and imported.
- Households supply labor to domestic firms and own claims on firms’ profits worldwide.

2.1 Firms

- Continuum of varieties. Monopolistic competition in product markets.
- Firms operate either in the nontradables (\( N \)) or in the tradables sector.
- In the tradables sector: import-competing varieties for the domestic market (\( D \)), or exported varieties (\( X \))

2.1.1 Manufacturing

- Linear production technology:
  \[ Y(h_i) = \ell(h_i) \quad i = N, D, X \] (1)
- Numeraire is domestic labor costs. Wages (\( w, w^* \)) normalized to 1 in both countries.
- Fixed cost \( q(h_i) \), to start production in terms of Home labor costs:
  \[ q(h_i) \equiv c_i n_i^\gamma \quad i = N, D, X \] (2)
where \( c_i \) is constant; the cost of creating an additional variety increases with number of existing varieties in sector \( n_i \); parameter \( \gamma \) index of extensive margin. Rationale: more costly to differentiate products relative to competition (marketing and advertising)

- There are transportation ‘iceberg’ costs \( \tau \). Usually enter the model through \( \phi \equiv (1 + \tau)^{1-\sigma} < 1 \)
- The resource constraints in the product sectors are:
  \[ Y(h_N) = LC(h_N) \quad Y(h_D) = LC(h_D) \quad Y(h_X) = (1 + \tau) L^* C^*(h_X) \] (3)
- The resource constraint in the Home labor market is:
  \[ L\ell \geq \sum_i \left( \int_0^{n_i} Y(h_i) \, dh_i + c_i n_i^{1+\gamma} \right) \] (4)
- Operating profits of a Home exported variety:
  \[ \Pi(h_X) \equiv \varepsilon^* (h_X) L^* C^*(h_X) - \ell(h_X) \leq \left( \frac{\varepsilon^* (h_X)}{1 + \tau} - 1 \right) Y(h_X) \] (5)
where \( \varepsilon \) is exchange rate (relative unit labor cost or terms of labor)

2.2 Households

- Preferences:
  \[ U = \log C - \frac{1}{1 + \xi} \ell^{1+\xi} \] (6)
- \( C \): Cobb-Douglas of tradables and nontradables with \( \delta \) share of tradables in consumption
  \[ C = \frac{C_\delta^\delta C_{1-\delta}^\delta}{\delta^\delta (1 - \delta)^{1-\delta}} \] (7)
• Baskets of tradables and nontradables depend on endogenous number of varieties

\[
C_T = \left[ \int_0^{n_D} C(h_D)^{1-\frac{1}{\sigma}} \, dh_D + \int_0^{n_X} C(f_X)^{1-\frac{1}{\sigma}} \, df_X \right]^{\frac{1}{1-\sigma}}
\]

\[
C_N = \left[ \int_0^{n_N} C(h_N)^{1-\frac{1}{\sigma}} \, dh_N \right]^{\frac{1}{1-\sigma}}
\]

• Budget constraint of representative Home household:

\[
\int_0^{n_N} pC(h_N) \, dh_N + \int_0^{n_D} pC(h_D) \, dh_D + \int_0^{n_X} pC(f_X) \, df_X + I \leq \ell + \Pi - F/L
\]

\( F \): aggregate resource transfer to the rest of the world, \( I \) costs of setting up firms and introducing goods varieties, \( \Pi \) dividends revenue from the firms and \( \ell \) labor incomes.

2.3 Equilibrium

• Optimal labor supply implies:

\[
w = 1 = \ell^\xi PC
\]

Consumption decreases with price \( P \) index (with unit elasticity) and with labor \( \ell \) (with elasticity \( \xi \))

2.3.1 Prices

• Standard markups over marginal costs, equal in our setup to labor costs per unit of product.

\[
p(h_N) = p(h_D) = \frac{\sigma}{\sigma - 1} = p
\]

\[
\varepsilon p^*(h_X) = \frac{\sigma}{\sigma - 1} (1 + \tau) = p(1 + \tau)
\]

• Welfare-based price indices depend on endogenous varieties:

\[
P_N = p n_N^{\frac{1}{1-\sigma}} \quad P_T = p \left( n_D + n_X^* \phi \varepsilon^{1-\sigma} \right)^{\frac{1}{1-\sigma}}
\]

\[
P_N^* = p^* n_N^{\frac{1}{1-\sigma}} \quad P_T^* = p^* \left( n_D^* + n_X^* \phi \varepsilon^{\sigma - 1} \right)^{\frac{1}{1-\sigma}}
\]

2.3.2 Profits

• Operating profits:

\[
\Pi(h_N) = \frac{L}{\sigma} C(h_N) = \frac{1 - \delta L \ell^{-\xi}}{n_N}
\]

\[
\Pi(h_D) = \frac{L}{\sigma} C(h_D) = \frac{\delta}{\sigma n_D + n_X^* \phi \varepsilon^{1-\sigma}}
\]

\[
\Pi(h_X) = p(1 + \tau) \frac{L^*}{\sigma} C^*(h_X) = \frac{\delta}{\sigma n_D^* + n_X^* \phi \varepsilon^{\sigma - 1}}
\]

– higher number of varieties reduces demand and profits for each existing variety
2.3.3 Free entry conditions (extensive margin)

- Value of a variety = cost of creating a variety = value of operating profits.

\[ \Pi (h_i) = c_i n_i^\gamma \quad i = N, D, X \]  \hspace{1cm} (14)

- Free entry and budget constraints imply: \( PC = \ell - F/L \)

- FOCs on labor and budget constraint imply:

\[ \ell - \xi = \ell - F/L \]  \hspace{1cm} (15)

equivalent to home aggregate balance of payments:

\[ \phi \delta \left[ \frac{n_D^* L^* \ell^* - \xi \ell^{1-\sigma}}{n_D^* + n_X \phi \ell^{1-\sigma}} - \frac{n_X^* L^* \ell^* - \xi \ell^{1-\sigma}}{n_D^* + n_X \phi \ell^{1-\sigma}} \right] - F = 0 \]  \hspace{1cm} (16)

3 Rebalancing:

3.1 With an extensive margin

Look at an increase in \( F \) (transfer from Home to the ROW). Comparative statics of the macroeconomics of transfers with extensive margins

- Neighborhood of the symmetric equilibrium where \( F = 0 \), and trade openness (ratio of exports to GDP) is \( \delta \theta / (1 + \theta) \), with \( \theta \equiv (c_D/c_X)^{\frac{1}{1+\gamma}} \phi^{\frac{1+\gamma}{1+\gamma}} \)

- A CA adjustment requires Home exports to increase in value relative to Home imports. This can be achieved by combination of consumption fall, labor effort increases in the Home country relative to the rest of the world.

\[ \hat{\ell} = \hat{\text{GDP}} = -\hat{\ell}^* = \frac{1}{1 + \xi} > 0 \]  \hspace{1cm} (17)

- There is exit in the Home nontradables sector and entry into the nontradables sector in the Foreign country:

\[ \hat{n}_N = -\hat{n}_N^* = -\frac{\xi}{(1 + \xi)(1 + \gamma)} < 0 \]  \hspace{1cm} (18)

- Also, exportable varieties are created by the Home country, while are destroyed in the Foreign country. This is the key mechanism.

\[ \hat{n}_X = -\hat{n}_X^* > 0 \]  \hspace{1cm} (19)

- Ambiguous effect on \( n_D \) (import competing sector). \( n_D \) rises if (a) the size of the nontradables sector is large relative to the tradables sector (\( \delta \) is close to zero), so that the amount of resources released by the nontradables sector is large enough to produce additional varieties in the import-competing sector; (b) if labor supply is sufficiently elastic (\( \xi \) is close to zero), so that equilibrium labor supply increases sufficiently.

\[ \hat{n}_D = -\hat{n}_D^* > 0 \]  \hspace{1cm} (20)

- A sufficient condition for the tradables sector to expand as a whole \( \hat{n}_D + \hat{n}_X > 0 \), is that the mass of export-oriented firms is sufficiently small, that is \( \theta < 1 \).

- If the tradables sector as a whole expands, then the terms of labor (\( \varepsilon \)) must weaken. Depreciation is large when \( \gamma \) is high, so that adjustment at the extensive margin is more difficult.

\[ \hat{\varepsilon} = \frac{\gamma}{\sigma} (\hat{n}_D + \hat{n}_X) > 0 \]  \hspace{1cm} (positive if \( \theta < 1 \))  \hspace{1cm} (21)
• Note: if fixed cost of entry is constant \((\gamma \rightarrow 0)\): no TOL change. Intuition: Transfer increases relative size of Foreign market, sales and profits above (constant) fixed cost of entry \(\Rightarrow\) entry on the export market can occur with no fall in relative price. With increasing marginal cost of entry, sales and profits of firms must increase which requires a fall in relative prices.

• The paper claim that this means Ohlin applies even in the presence of Home bias in consumption (i.e. no change in relative wages).

• But ToT defined as \(P_X/P_X^*\) satisfy:

\[
\hat{P}_X - \hat{P}_X^* = -\hat{\varepsilon} + \frac{\hat{n}_X - \hat{n}_X^*}{1 - \sigma} < 0
\]

even if \(\gamma = 0\). The deterioration of the terms of trade comes from the fact that Home produces more export varieties, which tends to decrease the price index of exports, while Foreign produces fewer export varieties, which tends to increase their export price index.

• So in fact, we have a deterioration of the -properly measured- ToT.

• In the model, the relative price of tradables and nontradables varieties is not affected by the transfer, as a consequence of modelling symmetric markups and marginal costs in the two sectors. (see equation 11).

• Yet, the transfer affects the relative price of investment (i.e. setting up new production lines) in the two sectors. Specifically, the relative cost of investment falls in the nontradables sector relative to the export sector by \(\gamma (\hat{n}_N - \hat{n}_X)\).

• Consumption falls in the Home country, and raises abroad, by

\[
\hat{C} = -\hat{C}^* = (1 - \delta) \frac{\hat{n}_N}{\sigma - 1} + \delta \frac{\hat{n}_D}{\sigma - 1} \frac{\hat{n}_D - \theta \hat{n}_X - (\sigma - 1) \theta \hat{\varepsilon}}{(\sigma - 1)(1 + \theta)} - \xi \hat{\ell} < 0
\]

(22)

Consumption falls because (a) domestic and imported varieties contract; (b) foreign produced varieties are more expensive \((\hat{\varepsilon} > 0)\); (c) the negative wealth effect increases the labor supply [which reduces nominal consumption expenditures \(PC\)]. A lower elasticity of labor (high \(\xi\)) increases the negative impact on \(C\) : if \(Y\) cannot increase much, \(C\) needs to fall more.

• Of course, the transfer unambiguously worsens welfare:

\[
\frac{dU}{dF/L} = \hat{C} - \xi \hat{\ell} < 0
\]

(23)

• In sum, following a transfer there is an increase in exports along both extensive and intensive margins of adjustment

\[
\hat{X} = \hat{n}_X^{extensive} + \frac{1}{1 + \theta} \left[ \hat{n}_D - \theta \hat{n}_X + (\sigma + \theta) \hat{\varepsilon} + \xi (1 + \theta) \hat{\ell} \right] \hat{n}_X^{intensive}
\]

(24)

- Export varieties rise: extensive margin \(> 0\)
- Intensive margin more complicated: net effect depends on
  1. entry/exit in tradables sector increases level of competition in the export market, reduces intensive margin: \((\hat{n}_D - \theta \hat{n}_X) < 0\)
  2. the change in the terms of trade \(\hat{\varepsilon} > 0\) (traditional)
  3. wealth effect of the transfer associated with \(\hat{\ell} \hat{\ell} > 0\)

• Welfare-based Real Exchange Rate \(RER = \varepsilon P^*/P\)

\[
R\hat{E}R = \frac{1 + \theta - 2\delta \theta}{1 + \theta} \hat{\varepsilon} + \frac{2\delta}{\sigma - 1} \frac{\hat{n}_D - \theta \hat{n}_X}{1 + \theta} + \frac{2(1 - \delta)}{\sigma - 1} \hat{n}_N
\]

(25)
– first term represent the impact of depreciation in TOL. >0
– other terms reflect effect of extensive margin and go in the opposite direction. More varieties abroad tend to lower the foreign price level. Fewer varieties at home tend to increase the domestic price level. These other terms can dominate if the change in the number of varieties is large enough (extensive margin very active).

• But this welfare-based real exchange rate is not the official or CPI-based real exchange rate:

\[ \hat{\varepsilon} > R\hat{ER}^{CPI} = \frac{1 + \theta - 2\delta \hat{\varepsilon}}{1 + \theta} \hat{\varepsilon} > 0 \]  

as long as the tradable sector expands.

• If we look at the price of T and N, we get:

\[ \frac{P_T}{P_N} = \left( \frac{n_D + \varepsilon^{1-\sigma} \phi n_X}{n_N} \right)^{1/(1-\sigma)} \]  

\[ \hat{P}_T - \hat{P}_N = \frac{\theta}{1 + \theta} \hat{\varepsilon} - \frac{1}{\sigma - 1} \frac{\hat{n}_D - \theta \hat{n}_X}{1 + \theta} + \frac{1}{\sigma - 1} \hat{n}_N \]  

The effect is ambiguous: the first effect is positive (foreign tradable more expensive); the second term is positive when \( \hat{n}_D - \theta \hat{n}_X < 0 \) : there are less tradables so \( P_T \) increases. The last term is negative: there are less \( N \), so \( P_N \) increases. What this indicates is that

\[ R\hat{ER} = \left[ \hat{\varepsilon} + \hat{P}_T^* - \hat{P}_T \right] + (1 - \delta) \left[ \left( \hat{P}_T - \hat{P}_N \right) - \left( \hat{P}_T^* - \hat{P}_N^* \right) \right] \]  

\[ = \left[ \frac{1 - \theta}{1 + \theta} + \frac{2}{\sigma - 1} \frac{\hat{n}_D - \theta \hat{n}_X}{1 + \theta} \right] + 2(1 - \delta) \left[ \frac{\theta}{1 + \theta} \hat{\varepsilon} - \frac{1}{\sigma - 1} \frac{\hat{n}_D - \theta \hat{n}_X}{1 + \theta} + \frac{1}{\sigma - 1} \hat{n}_N \right] \]  

Extensive Margin Model (Symmetric)

<table>
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<th>( n_N )</th>
<th>( n_D )</th>
<th>( n_X )</th>
<th>( \varepsilon )</th>
<th>( R\hat{ER} )</th>
<th>( \varepsilon P_T^* / P_T )</th>
<th>( [(P_T / P_N) / (P_T^* / P_N^*)]^{1-\delta} )</th>
<th>( R\hat{ER}^{CPI} )</th>
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3.2 Compare with fixed variety economy

• Terms of trade depreciation is unambiguously larger but GDP and employment effect is identical.

• Consumption also falls, but this entirely reflects relative prices

4 A Calibration (with asymmetric countries)

• Calibration of the models to consider effects of transfer that restores balanced CA (as in Obstfeld and Rogoff 2007) from deficit of 6.5% of GDP. (\( F = -3.5 \) and \( \Delta F = 3.5 \)).

• Main parameter assumptions:

  – Weight of US economy in world GDP = 27%
  – elasticity of substitution between product varieties \( \sigma = 2 \)
  – Trade costs \( \tau = 20\% \)
  – Share of tradables = 25% of consumption
  – Ratio of Home exports to Home GDP = 11%
  – Hummels and Klenow (2005) numbers suggest: \( \partial \ln X / \partial \ln L = 2/3 \). In the model: \( \partial \ln X / \partial \ln L = 1/(1 + \gamma) \) so \( \gamma = 0.5 \)
  – Inverse of the Frisch elasticity \( \xi = 1 \).
Extensive Margin Model

<table>
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<th>n_D</th>
<th>n_X</th>
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- large increase in tradable varieties; small decline in nontradable varieties
- small movements in the terms of labor or the RER.
- Similar change in welfare despite very different movements in RER: with the extensive margins, consumers suffer from decline in varieties.
- Fluctuations in currency values and growth slowdowns, much emphasized in the traditional literature on current account rebalancing, are highly imperfect gauges of the social costs associated with the adjustment process.