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# Varieties and the transfer problem: the extensive margin of current account adjustment*

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**Abstract**

The strong expansion in the volume of global trade has been accompanied by a vast change in its composition, in favor of differentiated manufacturing goods and services. A substantial fraction of trade growth occurs at the extensive margin, i.e. consists in export of new varieties, as opposed to a rise in the volume of trade in existing products. Yet most analyses of the macroeconomic adjustment required to correct global imbalances ignore trade at the extensive margin as well as firms' net entry in the tradables market. In this paper we reconsider the classic 'transfer problem' using a model where the set of exportables, importables and nontraded goods is endogenous. Our results suggest that the equilibrium exchange rate movements associated with a transfer are dramatically lower when firms' entry and net creation of varieties are accounted for, relative to traditional models in which no adjustment occurs at the extentive margin. We also find that consumption and employment (hence welfare) are not highly sensitive to product differentiation, thus change little regardless of whether adjustment occurs through movements in relative prices or quantities. This result warns against interpreting the size of real depreciation associated with trade rebalancing as an index of macroeconomic distress. When applied to the current debate on global rebalancing, our results question the received wisdom about the need for further sharp real depreciation of the dollar.

JEL Classifications: F32, F41

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# 1 Introduction

Between 1997 and 2006, the U.S. current account deficit rose from 140 billion dollars, i.e. 1.7 percent of U.S. output, to over 840 billion dollars, i.e. 1.7 percent of *world* output. Regardless of whether one attributes the strong deterioration of the U.S. current account to internal factors (the investment boom of the mid-1990s accompanied by a secular decline in private saving and followed by the emergence of large public deficits) or to a 'saving glut' (and investment drought) in the rest of the world, the consensus is that the current imbalance is unsustainable and adjustment is in the cards.

The ABC of adjustment is straightforward. A transfer of real resources from the U.S. to the rest of the world requires a decrease in domestic spending relative to production, accompanied by a simultaneous increase abroad. This implies a reallocation of purchasing power across countries through a change in relative prices, whose extent can be sizable. For instance, well-known contributions by Maurice Obstfeld and Kenneth Rogoff (2005, 2007) emphasize that the 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 project a 15 percent depreciation over a ten-year horizon under benign circumstances, but do not rule out sharp spikes of dollar under more disruptive scenarios.[1]

The emphasis on the magnitude of dollar adjustment, however, has somewhat overshadowed the debate on the underlying adjustment mechanism. This is essentially the setting of the classical controversy on the macroeconomic effects of a transfer, associated with Keynes (1919, 1929a,b,c) and Ohlin (1929a,b). Deteriorating terms of trade and real exchange rates in the debtor country played a crucial role in Keynes' analysis of German reparations after World War I. Ohlin criticized Keynes' emphasis on relative prices, arguing that income effects can make terms-of-trade adjustments redundant.[2] Subsequent contributions have explored the transfer problem in its many nuances. Nowadays, the textbook synthesis of the debate recognizes the validity of the Ohlin position but concludes that "Keynes was right in practice."[3]

In our opinion, there are compelling reasons for a modern revisitation of the transfer problem. One has been stressed in several contributions by Obstfeld and Rogoff: thanks to recent theoretical developments, the received wisdom of classical open-economy macro-

[1] See e.g. IMF (2006), Box 1.3. Similar estimates are discussed in Faruqee et al (2007).

[2] See Brakman and Van Marrewijk (1998, 2005) for a recent overview of the Keynes-Ohlin debate.

[3] Krugman and Obstfeld (2006), p.98.

economics can now be re-assessed within the framework of models with explicit and robust choice-theoretic foundations. Another argument, less frequently made but equally relevant in light of the current debate, is that the strong expansion in the volume of international trade has been accompanied by a vast change in its composition, in favor of differentiated goods. Following the methodology by Rauch (1999), Tang (2006) reports that U.S. imports of differentiated products rose from 47.4 percent in 1975 to 75.5 percent in 2000 while the proportion of U.S. exports of differentiated goods increased from 61.3 to 78.6 percent between 1979 and 2000.

Recent literature has also provided pervasive estimates of the fraction of trade growth which occurs at the extensive margin, i.e. consists in export of new varieties, as opposed to a rise in the volume of trade in existing goods and services. Over the medium or long term (the time horizon of a current account adjustment), the macroeconomic implications of firms' entry and exit in the tradable sector are substantial (Broda and Weinstein (2004, 2006, 2007)). Hummels and Klenow (2005) show that the extensive margin can account for about two thirds of the difference in trade across countries of different size. Yi (2003), Kehoe and Ruhl (2003), and Ruhl (2005) show that trade liberalization results in a significant increase of the extensive margin.

Using highly disaggregated product-level data, Debaere and Mostashari (2006) report that, for around 80 percent of the countries, over 40 percent of all goods categories exported to the U.S. in 1998-2000 were in newly traded goods, that is, goods that were not exported in 1989-91. While tariff reductions help explaining such increase in the extensive margin of trade, other factors captured by country fixed effects (possibly reflecting macroeconomic conditions) account for the lion's share of why goods are newly traded. The role of product varieties in international trade is emphasized in Gagnon (2003): building on Krugman's (1989) notion that economic growth is channelled into product proliferation, Gagnon (2003) provides evidence on the strong correlation between the growth of U.S. bilateral manufactured imports between 1972 and 2000 and the average growth rate of GDP of the exporting countries.

Most important from our purposes is the evidence discussed by IMF (2007), suggesting that economies where the cost 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.[4] The traditional analysis of the international transfer problem typically abstracts from the possibility of trade in new varieties as a potential engine

[4] IMF (2007), pp. 103-104.

of international adjustment.[5] For this reason, it provides an incomplete framework for the analysis of global current account rebalancing. Regrettably, existing projections (from back-of-the-envelop estimates to model-based scenario analyses) of the forthcoming dollar depreciation build — to our knowledge — on foundations ignoring this point.

To what extent does trade at the extensive margin influence the macroeconomics of transfers? In this paper, we address this issue using a stylized yet rigorous analysis of the different margins of adjustment, stressing changes in relative prices and employment as well as product differentiation. In the model, firms in each sector produce under constant returns to scale, and introduce new product varieties sustaining a fixed entry cost which depends on the number of existing varieties in the sector. Households in each country consume domestically produced nontradables, domestically produced import-competing goods, and imports. Trading costs allow us to map the international macroeconomics of current account adjustment depending on the degree of 'insularity' of national economies.

In our quantitative experiments, the model is calibrated to U.S. data and used to assess the effects of improving net exports from a deficit as high as 6.5 percent of GDP to a balanced position. We compare our results with those of a conventional 'fixed-variety' model in which there is no entry and adjustment occurs exclusively at the intensive margin. We conduct several experiments checking robustness by varying the key parameters of the calibration.

In our calibration of the 'fixed variety' model, closing the external imbalance requires a fall in long-run consumption by around 6 percent, and an increase in employment by 3 percent; the real exchange rate and the terms of trade depreciate by 17 and 21.9 percent, respectively. This is a reasonable scenario, well in line with related exercises in the literature allowing for some output flexibility.[6]

The equilibrium exchange rate movements caused by transfers can however be dramatically lower when adjustment occurs at the extensive margin. In our baseline calibration with endogenous-variety effects, the possibility of adjustment at the extensive margin does not affect the impact of the transfer on employment and consumption: total hours still grow at 3 percent. Aggregate consumption falls mainly because of changes in the basket of products available to households. Yet, the equilibrium movement of the above international prices are only 1.1 and 6.4 percent, respectively. Specifically, these results are driven by a large expansions in the varieties of home goods produced for the export markets (+24 percent), matched by a substantial rise in import competing goods (+12 percent) of goods.

[5] A relevant exception worth emphasizing is the work by Brakman and van Marrewijk (1995).

[6] Interestingly, these figures are comparable with experiments by Obstfeld and Rogoff (2007) in which output of tradables is increased parametrically by 20 percent.

The number of varieties of nontraded goods instead contract, although at a much lower rate (-2.1 percent), and much less than imports from abroad (-13 percent). [7]

As the size of the dollar adjustment has been in the spotlight as a key indicator of macroeconomic stress, can we conclude that the welfare costs of adjustment would be lower if this occurs mostly at the extensive margin? Our benchmark calibration provides a clear negative answer. The welfare costs for the country making the transfer are comparable in the two simulations, irrespective of the change in international prices. In other words, the equilibrium movement in international relative prices is obviously a function of the type of macroeconomic adjustment: there are different possible combinations of quantity and price adjustment that are consistent with a given correction in relative wealth and welfare. Correspondingly, in the simulation with entry, the 'competitiveness position' of the rest of the world deteriorates substantially with the transfer, even though changes in the terms of trade and relative labor costs are contained.

The degree of economic flexibility, indexed by the cost of entry, affects the magnitude of relative price movements: a higher convexity of the cost of product differentiation has only a minor impact on employment and consumption, but clearly magnifies real exchange rate movements relative to quantity adjustment. However, our results stress that the overall macroeconomic allocation is reasonably sensitive to varying the elasticity of labor supply. In our experiments with a low labor elasticity, with and without extensive margins, the response of employment to the transfer is only 1.1 percent. However, the fall in consumption is three times larger in the specification with endogenous varieties than in the economy with fixed varieties: -10 percent against -3 percent. A low response of employment translates into a sharp fall in the production of nontradables: the number of goods varieties in this sector falls by 3.5 percent. As in our benchmark specification, the difference in the terms of trade and real exchange rate movement is quite dramatic.

These results suggest that, while containing relative price movements, entry of exporters able to exploit monopoly power does not necessarily shelter domestic households from the negative welfare implications of a transfer. With some love for variety in households preferences, domestic agents face the costs of a large contraction in the nontradable sector. In

[7] Past evidence provides some guidance in this respect. Freund and Warnock (2007) look at 26 episodes between 1980 and 2003 in which the current account deficit was at least 2 percent of GDP before going through a reversal (i.e., a reduction by at least two percentage points over three years). During such reversals, countries on average experience slow GDP growth, increasing unemployment, and a real depreciation. Real export growth and declining consumption and investment spur adjustment. Focusing on persistent deficits (above 2 percent of GDP for more than 5 years), the resolution of large deficits does not require a more extensive depreciation, nor is more likely to be associated with an exchange rate crisis. If anything, large and persistent deficits involve less depreciation than average. Similar results are reported by Fratzscher, Juvenal and Sarno (2007) in a time-series analysis of the U.S. case.

the specification with fixed varieties, the sharp depreciation of the terms of trade and the real exchange rate is less consequential.

This paper is organized as follows. Section 2 introduces the model. Section 3 sets up our experiment. Section 4 presents a quantitative assessment. Section 5 concludes.

# 2 The transfer problem revisited: product varieties and relative prices in the global economy

## 2.1 Structure of the model

The world economy consists of two countries, Home and Foreign — Foreign variables are denoted with a star. In each country households consume all varieties of goods available in the market, both domestically produced and imported. They supply labor in a competitive market to domestic firms only, but own claims on firms' profits worldwide. There are $L$ households in the Home country and $L^*$ households in the Foreign country. In both countries, firms operate either in the nontradables or in the tradables sector. Firms in the tradables sector either produce import-competing goods for the domestic market, or export their production.

Each firm produces a single good variety and operates under conditions of monopolistic competition. The number of varieties produced is endogenously determined in the model. There is free entry, but firms face fixed entry costs to start production of a particular variety. The entry costs consist of wages paid to the labor employed in setting up a firm. In the Home country varieties (and firms) in the nontradables sector are defined over a continuum of mass $n_N$ and indexed by $h_N \in [0,\, n_N]$. Home tradables (import-competing) varieties produced for the domestic market are indexed by $h_D \in [0,\, n_D]$. Similarly, Home varieties produced for the export market are indexed by $h_X \in [0,\, n_X]$ By the same token, in the Foreign country nontradables varieties are defined over the continuum $f_N \in [0,\, n_N^*]$, import-competing varieties are indexed by $f_D \in [0,\, n_D^*]$ and export varieties are indexed by $f_X \in [0,\, n_X^*]$.

## 2.2 Firms

Firms have access to a linear technology in labor, which is the only input in production. The production function of the representative Home firm producing a specific variety is:

$$Y(h_i) = \ell(h_i) \quad i = N, D, X \tag{1}$$

where $Y(h_i)$ is the output of variety $h_i$, $\ell(h_i)$ is labor used in its production.

To start the production of a variety $h_i$, a firm needs to pay a fixed cost $q(h_i)$, defined in terms of Home labor costs:

$$q(h_i) \equiv wc_i n_i^\gamma \tag{2}$$

where $w$ is the wage rate and $c_i n_i^\gamma$ are units of labor used in the activities required to introduce a variety in the $i$ sector. For $\gamma > 0$, the cost function is convex: the cost of creating an additional variety is an increasing function of the number of existing varieties in the sector. The idea underlying this specification of the cost function is that, the higher is the number of existing varieties on the market, the more difficult is for a firm to differentiate its product relative to the competition, thus the higher are the costs of marketing and advertising associated with the introduction of a new variety or brand. The parameter $\gamma$ measures the sensitivity of the latter costs to the number of sectoral varieties.

In addition, shipping goods abroad entails transportation costs, denoted by $\tau$ and expressed in units of the export good — thus modelled as 'iceberg' costs. The resource constraints for each variety of Home goods are therefore:

$$Y(h_N) \geq LC\left(h_N\right) \qquad Y(h_D) \geq LC\left(h_D\right) \qquad Y(h_X) \geq (1+\tau)\, L^* C^*\left(h_X\right) \tag{3}$$

where $C\left(h_N\right)$ is per-capita consumption of good $h_N$ in the Home country, $\left(h_D\right)$ is per-capita consumption of good $h_D$ by the representative Home resident, and $C^*\left(h_X\right)$ is consumption of good $h_X$ by the representative Foreign resident. As domestic households provide labor both for firms' start-up and production activities, the resource constraint in the Home labor market is:

$$L\ell \geq \sum_i \left( \int_0^{n_i} Y\left(h_i\right) dh_i + c_i n_i^{1+\gamma} \right) \tag{4}$$

Without loss of generality, in each country domestic labor units are the *numeraire* in terms of which all prices are measured. We let $p(h_N)$, $p(h_D)$ and $p(f_X)$ denote the Home prices of, respectively, Home nontradables, Home import-competing varieties and Home imports. A similar notation holds in the Foreign country. Wages in both countries are $w = w^* = 1$, and $\varepsilon$ denotes the exchange rate, defined as Home labor per unit of Foreign labor. Using the above notation, the operating profits of Home firms are, respectively:

$$\Pi\left(h_N\right) \equiv p\left(h_N\right) LC\left(h_N\right) - w\ell\left(h_N\right) \leq \left(p\left(h_N\right) - 1\right) Y\left(h_N\right) \tag{5}$$

$$\Pi\left(h_D\right) \equiv p\left(h_D\right) LC\left(h_D\right) - w\ell\left(h_D\right) \leq \left(p\left(h_D\right) - 1\right) Y\left(h_D\right) \tag{6}$$

$$\Pi\left(h_X\right) \equiv \varepsilon p^*\left(h_X\right) L^* C^*(h_X) - w\ell\left(h_X\right) \leq \left(\frac{\varepsilon p^*\left(h_X\right)}{1+\tau} - 1\right) Y\left(h_X\right) \tag{7}$$

Similar expressions hold for the Foreign country.

### 2.3 Households

In the Home country the utility of the representative household is a positive function of consumption $C$ and a negative function of labor effort $\ell$:

$$U = \log C - \frac{1}{1+\xi}\ell^{1+\xi} \tag{8}$$

where $\xi$ is the inverse of the Frisch elasticity. $C$ is a Cobb-Douglas index of tradables and nontradables varieties sold in the country:

$$C = \frac{C_T^{\delta} C_N^{1-\delta}}{\delta^{\delta}\left(1-\delta\right)^{1-\delta}} \tag{9}$$

where $1-\delta$ is the share of nontradables in consumption, and the baskets $C_T$ and $C_N$ are defined as:

$$C_T = \left[\int_0^{n_D} C\left(h_D\right)^{1-\frac{1}{\sigma}} dh_D + \int_0^{n_X^*} C\left(f_X\right)^{1-\frac{1}{\sigma}} df_X\right]^{\frac{\sigma}{\sigma-1}} \tag{10}$$

$$C_N = \left[\int_0^{n_N} C\left(h_N\right)^{1-\frac{1}{\sigma}} dh_N\right]^{\frac{\sigma}{\sigma-1}} \tag{11}$$

In the expressions above $\sigma$ denotes the elasticity of substitution across varieties, as well as the elasticity of substitution between import-competing goods $h_D$ and imports $f_X$. We assume that this elasticity is higher than the elasticity of substitution between the tradables and nontradables baskets, that is $\sigma > 1$.

The budget constraint of the representative Home household is:

$$\int_0^{n_N} p\left(h_N\right) C\left(h_N\right) dh_N + \int_0^{n_D} p\left(h_D\right) C\left(h_D\right) dh_D + \int_0^{n_X^*} p\left(f_X\right) C\left(f_X\right) df_X + I \leq \ell + \Pi - F/L \tag{12}$$

Home households earn labor incomes $w\ell$ (recall that wages are normalized to one) and spend on consumption goods. They finance the fixed costs of setting up firms and introducing goods varieties ($I$ in our notation), receive dividends revenue from the firms they own ($\Pi$) and pay $F/L$ to Foreign households, where $F$ is the aggregate resource transfer to the rest of the world. For tractability, we posit that households are endowed with a well-diversified international portfolio of claims on firms' profits, so that they finance the same fraction of the cost of creating new varieties in each country.[8] Formally, Home households invest in a portfolio of firms worldwide:

$$I \equiv \frac{1}{L+L^*}\left(\sum_i \int_0^{n_i} q\left(h_i\right) dh_i + \varepsilon \sum_i \int_0^{n_i^*} q\left(f_i\right) df_i\right) \tag{13}$$

[8] This is in contrast with the standard assumption that households only own and finance domestic firms. As long as free entry is assumed, positing complete home bias in equity portfolio would not alter our results.

and in return receive an equal share of profits:

$$\Pi \equiv \frac{1}{L+L^*}\left(\sum_i \int_0^{n_i} \Pi\left(h_i\right) dh_i + \varepsilon \sum_i \int_0^{n_i^*} \Pi^*\left(f_i\right) df_i\right) \tag{14}$$

Optimal consumption demand satisfies:

$$C(h_N) = \left(\frac{p\left(h_N\right)}{P_N}\right)^{-\sigma} C_N, \qquad C(h_D) = \left(\frac{p\left(h_D\right)}{P_T}\right)^{-\sigma} C_T, \quad C\left(f_X\right) = \left(\frac{p\left(f_X\right)}{P_T}\right)^{-\sigma} C_T, \tag{15}$$

$$PC = \frac{P_T C_T}{\delta} = \frac{P_N C_N}{1-\delta} \tag{16}$$

where $P$, $P_T$ and $P_N$ are the utility-based consumer price indexes, defined as the minimum expenditures required to purchase one unit of the respective baskets:

$$P = P_T^{\delta} P_N^{1-\delta}, \qquad P_N = \left[\int_0^{n_N} p\left(h_N\right)^{1-\sigma} dh_N\right]^{\frac{1}{1-\sigma}} \tag{17}$$

$$P_T = \left[\int_0^{n_D} p\left(h_D\right)^{1-\sigma} dh_D + \int_0^{n_X^*} p\left(f_X\right)^{1-\sigma} df_X\right]^{\frac{1}{1-\sigma}} \tag{18}$$

and optimal labor supply implies:

$$w = 1 = \ell^{\xi} PC \tag{19}$$

Note that, as a result of our choice of numeraire, consumption increases when its price $P$ falls (with unit elasticity) and when labor $\ell$ decreases (with elasticity $\xi$). Similar expressions hold in the Foreign country.

### 2.4 Prices

The prices charged by Home firms take the standard form of markups over marginal costs, equal in our setup to labor costs per unit of product:

$$p\left(h_N\right) = p\left(h_D\right) = \frac{\sigma}{\sigma-1} \equiv p \tag{20}$$

$$\varepsilon p^*\left(h_X\right) = \frac{\sigma}{\sigma-1}\left(1+\tau\right) = p(1+\tau) \tag{21}$$

Similar expressions hold in the Foreign country. Given that the two countries have identical labor productivities and demand elasticities, it must be the case that $p = p^*$. It follows that the equilibrium price indexes are:

$$P_N = p n_N^{\frac{1}{1-\sigma}} \qquad P_T = p B^{\frac{1}{1-\sigma}} \qquad P_N^* = p^* n_N^{*\frac{1}{1-\sigma}} \qquad P_T^* = p^* B^{*\frac{1}{1-\sigma}} \tag{22}$$

where:

$$B \equiv n_D + n_X^* \phi \varepsilon^{1-\sigma}, \qquad B^* \equiv n_D^* + n_X \phi \varepsilon^{\sigma-1} \qquad \phi \equiv \left(1+\tau\right)^{1-\sigma} \tag{23}$$

The parameter $\phi$ — borrowing a familiar notation from the international trade literature — is positive and less than one; the case $\phi = 0$ corresponds to infinite trade costs and the case $\phi = 1$ to zero trade costs.

### 2.5 Free entry, balance of payments and equilibrium

To characterize the equilibrium in our model, we first rewrite the operating profits earned by Home firms as follows:

$$\Pi(h_N) = p\frac{L}{\sigma}C(h_N) = \frac{1-\delta}{\sigma}\frac{L\ell^{-\xi}}{n_N} \quad (24)$$

$$\Pi(h_D) = p\frac{L}{\sigma}C(h_D) = \frac{\delta}{\sigma}\frac{L\ell^{-\xi}}{n_D + n_X^*\phi\varepsilon^{1-\sigma}} \quad (25)$$

$$\Pi(h_X) = p(1+\tau)\frac{L^*}{\sigma}C^*(h_X) = \frac{\delta}{\sigma}\frac{\phi L^*\ell^{*-\xi}\varepsilon^{\sigma}}{n_D^* + n_X\phi\varepsilon^{\sigma-1}} \quad (26)$$

Other things being equal, a higher number of firms (and varieties) in a sector reduces the profits of each firm operating in that sector. In the tradables sector, transportation costs partially shield local firms' profits from foreign competition: if $\phi$ is close to zero both $\Pi(h_D)$ and $\Pi(h_X)$ depend only on the number of import-competing firms, $n_D$ and $n_D^*$ respectively.

With free entry, optimal investment in new varieties implies that the value of a firm is equal to the cost of creating a variety, and in equilibrium this must be equal to the value of operating profits. Competition in the goods market thus implies the following *free entry conditions*:

$$\Pi(h_i) = c_i n_i^{\gamma} \qquad i = N, D, X \quad (27)$$

From (5-7) and (20-21) it follows immediately that profits for all firms are proportional to sales. Thus, using (28) the level of entry costs pins down firms' size:

$$Y(h_i) = (\sigma - 1)\, c_i n_i^{\gamma} \qquad i = N, D, X \quad (28)$$

Combining these expressions with (4),[9] (12) and (27), we obtain:

$$PC = \ell - F/L \quad (29)$$

Recalling (19), the previous expression implies that Home labor effort is univocally determined as a function of the transfer:

$$\ell^{-\xi} = \ell - F/L \quad (30)$$

The aggregate budget constraint (29) can also be rewritten as the Home aggregate *balance of payments*:

$$\phi\delta\left[\frac{n_X L^*\ell^{*-\xi}\varepsilon^{\sigma}}{n_D^* + n_X\phi\varepsilon^{\sigma-1}} - \frac{n_X^* L\ell^{-\xi}\varepsilon^{1-\sigma}}{n_D + n_X^*\phi\varepsilon^{1-\sigma}}\right] - F = 0 \quad (31)$$

[9] Note that Home per-capita employment is $\ell = \sigma\left(c_N n_N^{\gamma+1} + c_D n_D^{\gamma+1} + c_X n_X^{\gamma+1}\right)/L$.

The first two terms are Home exports less Home imports measured in Home labor units, both inclusive of trade costs. Similar expressions hold abroad. In particular, Foreign labor effort in equilibrium is:

$$P^*C^* = \ell^{*-\xi} = \ell^* + F/L^* \tag{32}$$

Given $\ell$ and $\ell^*$ from (30) and (32), and accounting for (24-26), the system of free entry conditions (27), their Foreign analogs, and the balance of payments (31) jointly determine the exchange rate $\varepsilon$, the number of varieties $n_N$, $n_D$, $n_X$, and their Foreign analogs as functions of exogenous variables ($L$, $c_N$, $c_D$, $c_X$ and their Foreign analogs). The price indexes are then determined according to (17-18) and Foreign analogs, and consumption levels are determined according to (30) and (32).

# 3 Domestic and international implications of current account adjustments

## 3.1 The macroeconomics of extensive margins

In a symmetric equilibrium with $L = L^*$ and $F = 0$, our model is solved by $\ell = \ell^* = 1$ and $\varepsilon = 1$. Aggregate GDP is therefore equal to $L = L^*$. In what follows, define a measure of trade openness $\theta$ such as:

$$\theta \equiv \left(\frac{c_D}{c_X}\right)^{\frac{1}{\gamma}} \phi^{\frac{1+\gamma}{\gamma}} \tag{33}$$

$\theta$ depends on both transport costs and the relative fixed cost of entry on export markets. It is straightforward to show that in a symmetric equilibrium with balanced trade, the ratio of exports (or imports) to GDP is equal to $\delta\theta/(1+\theta)$, and the ratio of exportable varieties to import-competing varieties in the tradables sector is $n_X/n_D = \theta/\phi$.[10]

Consider now a *current account adjustment*, defined as a scenario in which the Home country engineers a transfer $\Delta F$ to the Foreign country.[11] For sufficiently small values of $\Delta F/L$ we can approximate the effects of the transfer with the equilibrium multipliers in the neighborhood of the symmetric equilibrium. In what follows, for any generic variable $x$ we adopt the notation:

$$\widehat{x} = \frac{dx/x}{dF/L} \tag{34}$$

[10] Note that in the tradables sector, the ratio of export profits to domestic profits $\Pi(h_X)/\Pi(h_D)$ is equal to $\phi$ in the symmetric equilibrium. Similarly, $\Pi(h_N)/\Pi(h_D) = \frac{1-\delta}{\delta}\frac{1+\theta}{n_N/n_D}$, and the ratio $n_N/n_D$ is equal to $\left[\frac{1-\delta}{\delta}\frac{c_D}{c_N}(1+\theta)\right]^{1/(1+\gamma)}$ in the symmetric equilibrium.

[11] More generally, a current account deficit as a fraction of GDP is deemed to be sustainable if a country is able to run trade surpluses that are sufficient to cover on average the net transfer to foreigners. A current account adjustment is the difference between sustainable and actual current accounts. In our framework, $\Delta F$ represents the total net transfer to foreigners.

Table 1: Comparative statics

$$\widehat{\ell} = -\widehat{\ell^*} = \frac{1}{(1+\xi)} \tag{35}$$

$$\widehat{n_N} = -\widehat{n_N^*} = -\frac{\xi}{(1+\xi)(1+\gamma)} < 0 \tag{36}$$

$$\widehat{n_X} = -\widehat{n_X^*} = \frac{(1+\theta)}{\Gamma(1+\gamma)\theta} \left\{ \left[\sigma(1+\gamma) + \gamma\theta\right] \left[1 + \xi(1-\delta)\right] + \sigma\xi\delta(1+\gamma) \right\} > 0 \tag{37}$$

$$\widehat{n_D} = -\widehat{n_D^*} = \frac{(1+\theta)}{\Gamma(1+\gamma)} \left\{ \left[\sigma + \gamma(\sigma - 1)\right] \left[1 + \xi(1-\delta)\right] - \sigma\xi\delta(1+\gamma) \right\} \tag{38}$$

$$\widehat{n_D} + \widehat{n_X} = \frac{\sigma(1+\theta)}{\theta\Gamma} \left[(1+\theta)(1+\xi) - 2\delta\xi\theta\right] \tag{39}$$

$$\widehat{\varepsilon} = \frac{\gamma(1+\theta)}{\theta\Gamma} \left[(1+\theta)(1+\xi) - 2\delta\xi\theta\right] = \frac{\gamma}{\sigma} \left(\widehat{n_D} + \widehat{n_X}\right) \tag{40}$$

$$\Gamma \equiv \delta \left[2\sigma + \gamma(2\sigma - 1 + \theta)\right](1+\xi) > 0 \tag{41}$$

The equilibrium implications of current the external imbalance are shown in Table 1. A current account adjustment requires Home exports to increase in value relative to Home imports. This can only be achieved if labor effort increases in the Home country relative to the rest of the world. The adjustment occurs at both the extensive and the intensive margins: the number of varieties produced changes in both the tradable and nontradable sectors; along the 'traditional' intensive margin, terms of trade depreciation allows exporting firms to produce and sell more, import-competing firms to increase their market share.

Observe that there is exit in the Home nontradables sector, and entry into the nontradables sector in the Foreign country. Also, exportable varieties are created by the Home country, while are destroyed in the Foreign country. The magnitude of entry and exit crucially depend on the convexity of the cost function.

The effect of the transfer on the number of import-competing varieties $n_D$ is ambiguous. Specifically, $n_D$ rises (a) if 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 enough to produce additional varieties in the import-competing sector; (b) if labor supply is sufficiently elastic ($\xi$ is close to zero), so that there will be no shortage of labor. When these two conditions fail, exit from the nontradables sector $n_N$ may not be sufficient to meet agents' demand for leisure: the number of import-competing varieties $n_D$ has to shrink as well. In this case, the net effects of the transfer on the size of the Home tradables, $n_D + n_X$, sector depends of the relative magnitude of the rise in $n_X$ increases vis-a-vis the contraction in $n_D$. A sufficient condition for the positive effect $\widehat{n_X} > 0$ to prevail and the tradables sector to expand as a whole, is that the mass of export-oriented firms is sufficiently high, that is $\theta < 1$.

If the tradables sector as a whole expands, then the terms of trade (and the relative price of labor) must weaken. Note that when trade costs are high ($\phi$ and therefore $\theta$ goes to zero), the adjustment of relative wages needs to be large. Depreciation is also large when $\gamma$ is high, so that adjustment at the extensive margin is more difficult, or when the Frisch elasticity is low, making employment less responsive to the transfer.

We should observe here that in our setup 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. 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 $\gamma(\widehat{n_N} - \widehat{n_X})$.

The impact of the current account adjustment on aggregate consumption $C = \ell^{-\xi} P^{-1}$ is symmetric in the two countries: consumption falls in the Home country, and raises abroad, by

$$\widehat{C} = -\widehat{C^*} = (1-\delta)\frac{\widehat{n_N}}{(\sigma-1)} + \delta\frac{\widehat{n_D} - \theta\widehat{n_X} - (\sigma-1)\theta\widehat{\varepsilon}}{(\sigma-1)(1+\theta)} - \xi\widehat{\ell} < 0 \tag{42}$$

The change in aggregate consumption is driven by the fall in nontradables consumption, corresponding to a contraction of varieties produced in the sector, as well as by the contraction in imported varieties (remember that $\widehat{n_X^*} = -\widehat{n_X} < 0$). Demand for imports responds to the rise in their price ($\widehat{\varepsilon} > 0$). Recall that the negative wealth effect from the transfer also increases labour supply. The magnitude of consumption adjustment thus depends on the labor elasticity. It is more pronounced when a low Frisch elasticity (a high $\xi$) dampens the response of employment and production.

The analysis of the macroeconomic effects of a transfer is completed by looking at its aggregate effect on Home employment ($\ell$) and GDP, which rise by the same amount:

$$\widehat{GDP} = \widehat{\ell} = \frac{1}{1+\xi} \tag{43}$$

As the fixed costs faced by firms to bring new good varieties on the market are a form of investment, we can note here that the current account adjustment to a transfer generates an increase in investment which exactly offset the change in GDP given in the above equation.

It can also be shown that

$$\frac{dU}{dF/L} = \widehat{C} - \xi\widehat{\ell} < 0 \tag{44}$$

A transfer unambiguously worsens welfare.

## 3.2 The interaction between extensive and intensive margins

Because of trade costs and because price indices depend on the number of goods varieties — which is affected by the current account adjustment — the real exchange rate need not coincide with the terms of trade. Let $RER$ denote the welfare-based real exchange rate, i.e., $RER \equiv \varepsilon P^*/P$. Following the current account adjustment, the real exchange rate can go either way:

$$\widehat{RER} = \frac{1+\theta-2\delta\theta}{1+\theta}\widehat{\varepsilon} + \frac{2\delta}{\sigma-1}\frac{\widehat{n_D}-\theta\widehat{n_X}}{1+\theta} + \frac{2(1-\delta)}{\sigma-1}\widehat{n_N} \tag{45}$$

The above expression is positive, i.e. the real exchange rate depreciates, for reasonable parameters values. But an appreciation scenario is possible when entry by Home exporters (and exit by Foreign exporters) is large enough. In this case, changes in the number of varieties raise the Home price index relative to the Foreign one.

The interaction between adjustment at the extensive and the intensive margin is crucial to our understanding of the movement of the real exchange rate (45) and other macroeconomic variables. To analyze this interaction, it is useful to rewrite Home exports $X$ and imports $M$ as

$$X = n_X \cdot \left(\frac{\delta\phi L^*\ell^{*-\xi}\varepsilon^{\sigma}}{n_D^* + n_X\phi\varepsilon^{\sigma-1}}\right) \qquad\qquad M = n_X^* \cdot \left(\frac{\delta\phi L\ell^{-\xi}\varepsilon^{1-\sigma}}{n_D + n_X^*\phi\varepsilon^{1-\sigma}}\right) \tag{46}$$

Strictly speaking, the extensive margin of exports is given by the change in the number of exportable varieties $n_X$ (the first term on the right hand side). However, changes in quantities (i.e. the intensive margin, corresponding to the terms in parenthesis on the right hand side) also depend on the number of Foreign import-competing varieties, and the number of Home exporters itself. These affect the size of the sales by each individual exporter, via their general equilibrium effect on total demand for Home products in the Foreign market. This general equilibrium interaction between the two margins makes the distinction between the two (especially from an empirical point of view) quite a difficult task.

These points are best illustrated by writing the response of Home exports and imports to a transfer distinguishing between the two margins, as follows:

$$\widehat{X} = \underbrace{\widehat{n_X}}_{extensive} + \underbrace{\frac{1}{1+\theta}\left[\widehat{n_D} - \theta\widehat{n_X} + (\sigma+\theta)\widehat{\varepsilon} + \xi(1+\theta)\widehat{\ell}\right]}_{intensive} \quad (47)$$

$$\widehat{M} = \underbrace{-\widehat{n_X}}_{extensive} - \underbrace{\frac{1}{1+\theta}\left[\widehat{n_D} - \theta\widehat{n_X} + (\sigma-1)\widehat{\varepsilon} + \xi(1+\theta)\widehat{\ell}\right]}_{intensive} \quad (48)$$

Following a transfer, both the number of exports, and the sales abroad per good variety rises — in our setup the intensive margin is positive as long as the cost function of entry is convex ($\gamma > 0$). The intensive margin can be further decomposed into different components, shown in the square bracket of equation (47). These consists of the change in the level of competition on the export market (captured by $\widehat{n_D} - \theta\widehat{n_X}$), the change in the terms of trade, and the wealth effect of the transfer on labour supply.

In light of these considerations, one could actually redefine the extensive margin of exports adjustment to encompass all the effects from entry and exit of new varieties, thus including the first two terms in the square brackets on the right hand side of the export equation. The intensive margin would then residually include only the last two terms. The adjustment at the intensive margin also comes in two parts: exports of each variety increases because of the terms of trade depreciation, and the transfer raises expenditures in the Foreign country. This new definition would better capture the general equilibrium implications of changes in the number of varieties predicted by theory.

### 3.3 An economy with a fixed number of varieties

How would our results above compare with the effects of a transfer in an economy in which the number of goods (both local and exported) is exogenously given? To address this question, we note that under the assumption of a fixed set of goods, in our economy the ratio of exported to local varieties $\phi n_X / n_D = \theta$ is a constant. Then the terms of trade response to the transfer is:

$$\widehat{\varepsilon} = \frac{(1+\theta)\left[(1+\theta)(1+\xi) - 2\xi\delta\theta\right]}{\delta\theta(2\sigma - 1 + \theta)(1+\xi)} \quad (49)$$

The terms of trade change is unambiguously larger in an economy in which no adjustment occurs at the extensive margin.[12]

Interestingly, the effect of a transfer on GDP and employment is identical in the two economies: labor rises exactly by the same amount Similarly, for reasonable parameters

[12] One would obtain the same expression by taking (??) and letting $\gamma$ tend to infinity. Very high values of $\gamma$ corresponds to the case of unsormountable barriers to entry.

values, the fall in (the welfare-based index of) consumption is also comparable across the two model specifications.

In the case of consumption, however, similar quantitative effects on consumption may correspond to quite different transmission mechanisms. In the economy with a fixed number of varieties, consumption falls by:

$$\widehat{C} = -\widehat{C^*} = -\frac{\delta\theta}{1+\theta}\widehat{\varepsilon} - \xi\widehat{\ell} \tag{50}$$

The fall in consumption is due to relative price and wealth effects. When the number of goods varieties is endogenous, instead, consumption also responds to changes in the pattern of production patterns. As discussed above, since households love goods varieties, consumption falls in part because of the the equilibrium contraction in the number of goods available to the consumers through imports or local production (nontradables and possibly importable).

The reason why the aggregate effects of a transfer on consumption can be similar in the two economies is then apparent. With a fixed number of varieties, larger terms of trade movements compensate for the missing adverse effects from changes in the availability of goods varieties.

# 4 Quantitative simulations

In this section we calibrate our model and provide some basic quantitative elements for an analysis of the US current account. Our simulations mirror the comparative statics presented above. In Sections 3 and 4 we started from a symmetric balanced equilibrium and engineered a current account surplus to match the transfer to foreign creditors. In this section we account for country asymmetries. The initial conditions are such that the Home country runs a trade deficit, and we consider the effects of a transfer that restores the balanced equilibrium. The approach is therefore similar to the one adopted by Obstfeld and Rogoff 2007. As in the latter paper, we also assume that prices are flexible. However we do not assume a fixed output, allowing for an endogenous response of employment, both total and across sectors. We also analyze the macro response for different degrees of economic 'flexibility', in terms of creation and destruction of goods varieties. In this respect, we should make it clear that the calculations below are not meant to provide a framework for a critical sudden stop-scenario — which is more plausible for small emerging markets than for the US. On the contrary, we want to provide a rough assessment of the relative price and macroeconomic adjustment associated with a correction of trade imbalances over time periods in which new firms and goods variety can be created.

## 4.1 The choice of parameters

We normalize the size of the world economy to 200 and choose $L = 54$ and $L^* = 146$ to roughly approximate the weight of the US economy in world GDP, about 27 percent in 2006. Consistently, we set $F = -3.5$ in the initial equilibrium, which yields a Home country deficit of roughly 6.5 of GDP (corresponding to the US deficit in 2006), and consider the effects of a transfer $\Delta F = 3.5$.

In the baseline calibration the elasticity of substitution between product varieties $\sigma$ is set equal to 2, a value consistent with macro studies of current account adjustment. We also experiment with $\sigma = 5$, a value suggested by trade studies. Trade costs $\tau$ are set at 20% following Anderson and van Wincoop (2004). Following Obstfeld and Rogoff (2007) we take the share of tradables to be 25% of consumption (e.g. $\delta = 0.25$), although in sensitivity analysis we consider the implications of values as high as $\delta = 2/3$.

We normalize $c_N$ and $c_N^* = 1$. We set $c_X$ such that the ratio of Home exports to Home GDP is 11 percent (corresponding to US values in 2006). Similarly, in the rest of the world $c_X^*$ is such that Foreign exports as a ratio of Foreign GDP are equal to 6.6%. The latter value is equal to US imports from the rest of the world in 2006 (about \$2280 billion) divided by world GDP excluding the US in 2006 (\$47800 billion minus \$13000 billion). In our model the choice of $c_D$ and $c_D^*$ is not consequential for our analysis, in the sense that changes in these parameters only affect the ratios $n_X/n_D$ and $n_X^*/n_D^*$ without modifying relative profits across sectors, thus leaving unchanged the equilibrium allocation of resources and agents' response to macroeconomic shocks.

The parameter $\gamma$, the measure of convexity in the cost function for the creation of new varieties, is directly related to the extent of extensive margin. Hummels and Klenow (2005) show that the extensive margin accounts for two-thirds of the greater exports of larger economies. In our model the latter effect is equal to $\partial \ln_X / \partial \ln L = 1/(1+\gamma) = 2/3$, suggesting $\gamma = 0.5$. Other empirical estimates suggest a smaller role for the extensive margin. In sensitivity analysis we experiment with more conservative parameters such as $\gamma = 1$ (i.e. a quadratic cost function corresponding to a 50% extensive margin) and $\gamma = 12$ (corresponding to the case in which adjustment at the extensive margin accounts for a small fraction of exports). We also consider an (admittedly unrealistic) calibration with $\gamma$ very close to zero, to emphasize the differences between a model in which all adjustment occurs at the extensive margin relative to the conventional models in which all adjustment occurs at the intensive margin.

Finally, most micro studies using microdata on wages, hours worked and various household characteristics, suggest a low estimate of the Frisch elasticity $(1/\xi)$. For men, most

Table 2: Numerical simulations

| | Extensive Margin Model | | | | | | | | Fixed Varieties Model | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $n_D$ | $n_N$ | $n_X$ | $n_X^*$ | $\varepsilon$ | $RER$ | $\ell$ | $C$ | $\varepsilon$ | $RER$ | $\ell$ | $C$ |
| *Benchmark* | 11.5 | −2.1 | 24.4 | −13.1 | 6.4 | 1.1 | 3.3 | −6.8 | 21.9 | 17.0 | 3.3 | −6.2 |
| $\sigma = 5$ | 12.9 | −2.1 | 23.3 | −11.7 | 2.5 | 1.1 | 3.3 | −4.1 | 7.8 | 6.2 | 3.3 | −4.3 |
| $\xi = 0$ | 16.1 | 0 | 26.9 | −12.6 | 7.4 | 4.8 | 6.9 | −1.8 | 25.2 | 19.5 | 6.9 | −3.6 |
| $\xi = 5$ | 8.7 | −3.5 | 22.8 | −13.4 | 5.9 | −1.2 | 1.1 | −9.8 | 19.8 | 15.4 | 1.1 | −2.8 |
| $\xi = 5, \delta = 2/3$ | −0.4 | −3.5 | 18.5 | −15.6 | 4.2 | −2.1 | 1.1 | −9.4 | 15.7 | 12.4 | 1.1 | −7.3 |
| $\gamma = 0$ | 21.6 | −3.2 | 35.5 | −15.8 | 0.0 | −4.4 | 3.3 | −6.3 | 21.9 | 17.0 | 3.3 | −6.2 |
| $\gamma = .35$ | 13.4 | −2.4 | 26.9 | −13.9 | 4.9 | −0.2 | 3.3 | −6.7 | 21.9 | 17.0 | 3.3 | −6.2 |
| $\gamma = 1$ | 7.6 | −1.6 | 18.4 | −10.9 | 9.9 | 4.4 | 3.3 | −6.9 | 21.9 | 17.0 | 3.3 | −6.2 |
| $\gamma = 12$ | 0.8 | −0.2 | 2.9 | −2.2 | 19.9 | 14.8 | 3.3 | −6.4 | 21.9 | 17.0 | 3.3 | −6.2 |

estimates are in the range between 0 and 0.5 (see for example Heckman and McCurdy 1980, McCurdy 1981, Altonji 1986, Blundell and McCurdy 1999). Browning et al. (1999) note however that these microeconomic estimates are often incompatible with real business cycle models that use values in the range of 3 or higher. In our baseline parameterization we choose $\xi = 1$, following Gali, Gertler and López-Salido (2007). In sensitivity analysis we consider the cases $\xi = 0$ (infinite elasticity that corresponds to the Hansen (1985) and Rogerson (1988) model of indivisible labor) and $\xi = 5$.

## 4.2 Numerical results

Table 2 reports our results and compares them with a model in which the allocation of product varieties is unaffected by the transfer, that is, a model in which current account adjustment only occurs at the intensive margin as traditionally considered (last four columns). Each column in Table 2 describes the percentage change in the relevant variable as a result of the adjustment process.

The first row (*Benchmark*) is based on our baseline parameterization. A transfer from the Home country to the rest of the world is associated with an 11.5 percent increase[13] in the import-competing sector $n_D$, a 2.1 percent contraction in the nontradables sector $n_N$ and a 24.4 percent expansion in the export sector $n_X$ (abroad, the export sector $n_X^*$ contracts by 13.1 percent). The terms of trade (and the relative price of labor $\varepsilon$) depreciate by 6.4 percent, while the CPI-based real exchange rate $RER$ depreciates by only 1.1 percent, reflecting the interaction between intensive and extensive margins. In the absence of firms' entry, the adjustment relies exclusively on movements of relative prices: the terms of trade depreciate almost 3.5 times more in the fixed varieties model than in the extensive margin model, and the extent of $RER$ depreciation is more than 15 times!

The transfer is associated with an expansion of employment and GDP in the Home country (labor effort $\ell$ increases by 3.3 percent) but external demand crowds out internal demand and Home consumption $C$ falls by 6.8 percent. As a result, welfare unambiguously falls in the Home country. Welfare also falls in the fixed varieties model, as consumption falls and labor effort increases. It is straightforward to compare welfare losses across models, as the increase in labor effort is exactly the same regardless of whether the extensive margin is operational or not. Thus, what matters is the fall in consumption demand, which in absolute value is larger in the extensive margin model (6.8 percent) than in the fixed varieties model (6.2 percent).

These results suggest that 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. It is certainly possible to envision *soft-landing* scenarios of current account rebalancing involving small exchange rate depreciations and above-average GDP growth, and nevertheless associated with larger welfare losses than alternative scenarios in which relative prices play a much more conspicuous role.[14]

The last result is subject to a number of *caveats*, as our sensitivity analysis reveals. When varieties are relatively more substitutable in global consumption ($\sigma = 5$), the welfare loss is stronger in the fixed varieties model than in our setup. Changes in labor effort are not affected by the parameterization of $\sigma$, but changes in consumption are: in fact, the higher is $\sigma$, the smaller is the loss of consumption, and this is especially relevant in the extensive margin model ($C$ falls now by 4.1 percent in the extensive margin model and 4.3 percent

[13] It is possible to consider scenarios in which $n_D$ actually *falls* per effect of the transfer. For instance, in our case this happens when the Frisch elasticity is sufficiently low *and* the share of tradables is particularly (and implausibly) high: see the results reported in row $\xi = 5, \delta = 2/3$.

[14] These welfare considerations are particularly relevant when $\xi$ is high: see for instance the cosumption losses associated with $\xi = 5$ in Table 2.

in the fixed varieties model). Note that when $\sigma$ is high, relative prices can move little and still have a large impact on trade values. This is true both in the extensive margin and the fixed varieties models, although the reduction in the estimated exchange rate depreciations for $\varepsilon$ and $RER$ is more evident when varieties are constant (in fact, in the extensive margin model the depreciation of $RER$ is the same regardless of the choice of elasticity).

Another scenario in which welfare worsens more in the fixed varieties model than in the extensive margin model is in the presence of a high Frisch elasticity (low $\xi$). Consider the row $\xi = 0$ in Table 2 Now labor supply adjusts effortlessly and the transfer does not require any contraction in the nontradables sector ($\widehat{n_N} = 0$). Exchange rates adjust more than in the *Benchmark* cases across models, and this is especially relevant for the extensive margin model. In both models, labor effort increases more than twice relative to *Benchmark*. Consumption falls 3.6 in the fixed varieties model, but only 1.8 percent in the extensive margin model.

The parameter $\gamma$ is key to our numerical simulations and welfare comparisons. Consider the last four rows of Table 2. Of course the larger the value of $\gamma$, the closer the extensive margin model is to the fixed varieties model. When $\gamma = 0$ the exchange rate does not move at all in the extensive margin model ($\widehat{\varepsilon} = 0$) and all adjustment occurs through the reallocation of product varieties, in strong contrast with the traditional view captured by the fixed varieties model. Interestingly, in terms of *welfare* analysis the polar cases $\gamma = 0$ and $\gamma \to \infty$ yield virtually similar outcomes (compare the consumption losses under the two parameterizations, after noticing that changes in labor effort are unaffected by $\gamma$). Welfare in the extensive margin model is in fact a non-linear function of $\gamma$: when $\gamma = 0$ the Home consumption (and welfare) loss in the extensive margin model is close to the fixed varieties model. When $\gamma$ goes to one, the loss of welfare in the extensive margin model is significantly larger than the alternative model. When $\gamma$ increases above one, the gap between the two welfare losses shrinks, and disappears completely when $\gamma$ is sufficiently high.[15]

# 5 Conclusion

In a world of increasing integration of markets for manufacturing goods and services, a large share of trade in differentiated products should be expected to affect the relation between trade and equilibrium relative price movements. In this paper we have investigated this issue revisiting the classical model of transfer, in light of the current debate on the sustainability of the current account deficits run by the U.S. since the mid 1990s.

[15] In Table 2 our numerical algorithms do not reach convergence for values of $\gamma$ beyond 12.

A transfer-model approach to the analysis of current account re-balancing has many important advantages. It clarifies the macroeconomic implications of intersectoral allocation of resources, as well as of the interplay between domestic and international relative prices. Traditional models that emphasize the role of the elasticities of substitution across goods predict large swings in the domestic relative price of nontradables. In our model, domestic relative prices are pinned down by symmetry in equilibrium marginal costs and markups across sectors. Adjustment thus requires changes in relative sectoral output.

To the extent that market integration is far from perfect, a large transfer does affect the domestic macroeconomic process in fundamental ways. Multisector models encompassing extensive margins, such as ours, call attention to market structure and the costs of product differentiation, as key determinants not only of the type of adjustment (prices vs. quantities) but also of their welfare implications.

The real exchange rate movements predicted by our model, either with or without adjustment at the extensive margin, are nonetheless small compared to historical records. Over time, exchange rates have vastly erred on either side of purchasing power parity across the main currency areas of the world. Large and persistent swings have systematically eluded theoretical explanations stressing fundamentals. Since the multiple role of the exchange rate as equilibrium relative price in both the good and financial markets is not sufficiently understood, mapping the results of a theoretical analysis of transfers into predictions about international price movements cannot but be subject to important caveats, as exchange rates are likely to respond to a variety of shocks.

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