"Beggar-thy-neighbor" or "Beggar-thyself" ? The Income Effect of Exchange Rate Fluctuations.

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Abstract

This paper analyzes the impact of exchange rate fluctuations when they are only partially passed through to consumer prices. We show that an exchange rate depreciation does not necessarily have a beggar-thy-neighbor effect and may in fact have an opposite, or beggar-thyself, effect. The direction of the welfare effect depends on who owns the firms importing goods from producers and selling them to consumers, an issue that has not been explored in the earlier literature.

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1 Introduction

The analysis of the welfare effects of exchange rate fluctuations has recently experienced a renewed interest in the literature, thanks improvements in the analytical framework. The standard '*beggar-thy-neighbor*' inference from the Mundell-Fleming-Dornbusch model is that a country benefits from a depreciation of its currency through higher exports, whereas the other countries are adversely affected.[1] This *welfare* inference however suffers from the lack of a well-grounded welfare metric. Obstfeld and Rogoff (1996, 1995) address this shortcoming in a micro-founded framework which preserves the nominal rigidities that play a central role in the standard analysis. Their framework provides a clear welfare criterion in the form of the utility of the representative household. They find that a currency depreciation stemming from a monetary expansion is equally beneficial to all countries as it moves the world economy away from the suboptimal market equilibrium towards the competitive first best. This 'prosper-thyself' and 'prosper-thy-neighbor' effect stands in sharp contrast to the usual beggar-thy-neighbor / prosper-thyself inference.

The welfare analysis by Obstfeld and Rogoff has been extended in subsequent work.[2] Corsetti and Pesenti (2000) and Tille (2000) show the possibility of a beggar-thyself / prosper-thy-neighbor effect when goods produced in different countries are poor substitutes. In such a case a country can be adversely affected by a depreciation of its currency as the main impact is a deterioration of its terms of trade. Betts and Devereux (2000) stress the central role of exchange rate pass-through to consumer prices. They point that a limited degree of pass-through can result in a beggar-thy-neighbor / prosper-thyself effect where a country benefits from a depreciation of its currency. This occurs because a given price in foreign currency paid by consumers abroad translates into a larger amount of home currency for the shareholders of the exporting firm. Obstfeld and Rogoff (2000) however point that the approach by Betts and Devereux (2000) implies that a country terms of trade improve when its currency depreciates, an implication that is not supported by the empirical evidence.

This paper presents a more general framework that reconciles the works by Betts and Devereux (2000) an Obstfeld and Rogoff (2000). We focus

[1] The standard reference is Nurkse (1944).

[2] For a comprehensive survey of the literature see Lane (2000).

on the intermediaries in the distribution chain between producers and consumers, a dimension that has received little attention in the literature[3] and plays a central role in the debate. The approach by Betts and Devereux (2000) was motivated by empirical findings that exchange rate fluctuations have little impact on consumer prices (Engel (1999), Engel and Rogers (2000, 1996)). By contrast Obstfeld and Rogoff (2000) focus on import prices, measured at the port of entry. The existing models cannot reconcile the two findings as they assume that imported goods are sold *directly* by exporting firms to consumers, so there is no distinction between import and consumer prices. This paper allows for such a distinction by including *intermediaries* between the exporting firms and consumers. It is then possible for exchange rate fluctuations to be passed-through to import prices but not consumer prices.

We explore the implications of intermediaries for the welfare effects of exchange rate fluctuations. Under intermediaries we include all links of the distribution chain between the firm producing the goods and the consumer (importers, shippers, wholesalers, retailers). Our main finding is that the ownership of intermediaries plays a crucial role for the welfare effect. When the pass-through of exchange rate fluctuations to consumer prices is limited, the impact of such fluctuations occurs primarily on the intermediaries' profit margins. A limited exchange rate pass-through to consumer prices does not have any welfare implications per se. Instead, whether a depreciation is beneficial or detrimental depends on whether imported goods are distributed by subsidiaries of the exporting firms whose profits are paid to foreign shareholders, or domestic firms whose profits are paid to domestic shareholders. To keep our focus clear we consider that the intermediaries simply carry the goods from the producer to the consumer at no cost. Our results therefore purely reflect the loosening of the connection between import and consumer prices and the ownership of intermediaries, as opposed for instance to the presence of a non-traded component in imported goods.

The paper is organized as follows. Section 2 reviews the empirical evidence on the degree of exchange rate pass-through and presents some evidence on the ownership of importers. The model is presented in section 3. Section 4 derives the positive and normative solution, with a simple intuitive illustration of the mechanism driving the results. A numerical illustration is

[3]To the knowledge of the author, the only exception is Devereux, Engel and Tille (1999).

presented in Section 5, and section 6 concludes.

2 Empirical motivation

Several empirical studies have looked at the degree of exchange rate pass-through to prices. The general finding of analyses of consumer prices is that the impact of exchange rate fluctuations is limited. Engel and Rogers (2000, 1996) find that the observed deviations from the law of one price across countries reflect the combination of price rigidities in the consumers' currency and the volatility of nominal exchange rates. Engel (1999) similarly finds that most of the real exchange rate volatility stems from the failure of consumer prices in local currency to adjust to exchange rate fluctuations. Other contributions show that the impact of exchange rate fluctuations on import prices is more important, although still limited. Goldberg and Knetter (1997) estimate that on average 50 % of the exchange rate change is reflected in import prices. Baxter and Kouparitsas (2000) find evidence that incomplete exchange rate pass-through accounts for half of the terms of trade volatility for the countries exporting mostly manufactured goods. As mentioned in the introduction, Obstfeld and Rogoff (2000) show that an exchange rate deprecation worsens the terms of trade, indicating that some of the depreciation is passed-through to import prices. The stylized fact emerging from the literature is therefore that the impact of exchange rate fluctuations on import prices exceeds the impact on consumer prices. McCarthy (1999) analyzes the transmission of exchange rate shocks to import and consumer prices and reaches a similar conclusion.

In addition to the degree of exchange rate pass-through, the ownership of intermediaries selling imported goods is a crucial dimension of our model. This aspect has received little attention in the literature, but we can shed some light on it using data on U.S. affiliates published by the Bureau of Economic Analysis[4] and analyzed by Zeile (1999). Table 1 presents the import flows to the U.S. affiliates[5] surveyed by the BEA in 1997. Panel A shows

[4] I thank Carolyn Evans for bringing these data to my attention.

[5] A U.S. affiliate is defined as 'a U.S. business entreprise in which there is a foreign direct investment –that is, in which a single foreign person owns or controls, directly or indirectly, 10 percent or more of the voting securities of an incorporated U.S. business entreprise or an equivalent interest in an unincorporated U.S. business entreprise' (Zeile 1999).

that good imports by U.S. affiliates account for 30 % of total imports in the United States. The weight of foreign affiliates varies across industries: they account for more than 55 % of imports of road vehicles and parts, but only 23 % of fuel imports. Panel B contrasts the situation across different countries of origin.[6] Imports by affiliates represent the bulk of total imports from Japan (80 %) and account for a sizable share of imports from Germany (55 %). The affiliates' share is lower for other industrialized countries, and especially for imports from emerging markets with only less that 4 % of imports from China going to U.S. affiliates.

Overall the stylized fact that emerges from the analysis of imports by U.S. affiliates is that most imports in the United States go to U.S. controlled firms instead of affiliates of foreign firms.[7] Interestingly the situation is different in Canada where foreign controlled-firms accounted for 69 % of all imports in 1986, as shown by Mersereau (1992).

The empirical analysis highlights the central role of intermediaries in the distribution of imports. They absorb some of the exchange rate fluctuations in their profit margins, as indicated by the larger degree of exchange rate pass-through to import prices than to consumer prices. The data for the United States also indicate that most importers are domestically owned businesses.

3 The Model

The framework builds on the models by Obstfeld and Rogoff (1996, 1995), Betts and Devereux (2000) and Tille (2000).[8] The world is made up of two countries, home and foreign, and is populated by a continuum of households. We normalize the worldwide number of households to 1, and consider that households over the $[0, n)$ interval live in the home country, whereas households over the $[n, 1]$ live in the foreign country. The sizes of the home and foreign countries are therefore n and $1 - n$ respectively. There are two *types*

[6]The imports by affiliates in panel B represent the imports from a particular country that go to U.S. affiliates, regardless of the location of their parent company. For example imports from Canada by the U.S. affiliate of a Japanese company are listed under Canada.

[7]Because of the threshold of foreign ownership used by the BEA (10 %), some of the firms listed as affiliates may indeed be mostly owned by U.S. households in which case the value of 30 % of imports going to foreign owned firms in table 1 is an upper bound estimate.

[8]We consider that the reader is familiar with these contributions and focus our analysis on the innovative dimensions of our model.

of goods in the world economy (cars and textiles for example), and each country specializes in the production of one type. For each type of good, there exists a continuum of *brands*. The various brands of a given type are fairly close substitutes, whereas the substitutability between the two types of goods is more limited. For simplicity, we consider that there are n brands of the home good and $1-n$ brands of the foreign good.

3.1 Households

The objective of the representative household in the home country at time t is to maximize:

$$U_t = \sum_{s=0}^{\infty} \beta^s \left\{ \ln\left(C_{t+s}\right) + \gamma \ln\left(\frac{M_{t+s}}{P_{t+s}}\right) - \frac{\kappa}{2} H_{t+s}^2 \right\} \tag{1}$$

where $\beta \in (0,1)$ is the discount rate, and γ, κ are positive scaling parameters. The first term is the utility of consumption, where C is the consumption basket defined below. The second term captures the utility from liquidity services, where M are the nominal balances and P the consumer price index. The last term represents the cost of effort, H being the hours worked.

The overall consumption basket, C, is a CES aggregate of the home and foreign goods:

$$C = \left[n^{\frac{1}{\rho}} \left(C^h\right)^{\frac{\rho-1}{\rho}} + (1-n)^{\frac{1}{\rho}} \left(C^f\right)^{\frac{\rho-1}{\rho}} \right]^{\frac{\rho}{\rho-1}}$$

where C^h and C^f represent the consumption of the home and foreign goods respectively. $\rho > 0$ is the elasticity of substitution between home and foreign goods. C^h and C^f are in turn CES aggregates across brands indexed by z:

$$C^h = \left[n^{-\frac{1}{\theta}} \int_0^n \left(C^h\left(z\right)\right)^{\frac{\theta-1}{\theta}} dz \right]^{\frac{\theta}{\theta-1}} \quad , \quad C^f = \left[(1-n)^{-\frac{1}{\theta}} \int_n^1 \left(C^f\left(z\right)\right)^{\frac{\theta-1}{\theta}} dz \right]^{\frac{\theta}{\theta-1}}$$

where $\theta > 1$ is the elasticity of substitution between two brands produced in the same country. $C^h\left(z\right)$ and $C^f\left(z\right)$ denote the consumption of a particular brand z produced in the home and the foreign country respectively. The assumption that θ is larger than 1 ensures that the equilibrium solution is well defined. We also consider that there is more substitutability across brands than across types: $\theta > \rho$.

The allocation of consumption across the available brands is derived in the usual way and the results are as follows:

$$C^h(z) = \left[\frac{P^h(z)}{P^h}\right]^{-\theta}\left[\frac{P^h}{P}\right]^{-\rho}C \quad , \quad C_k^f(z) = \left[\frac{P^f(z)}{P^f}\right]^{-\theta}\left[\frac{P^f}{P}\right]^{-\rho}C \tag{2}$$

$$C^{*h}(z) = \left[\frac{P^{*h}(z)}{P^{*h}}\right]^{-\theta}\left[\frac{P^{*h}}{P^*}\right]^{-\rho}C^* \quad , \quad C_k^{*f}(z) = \left[\frac{P^{*f}(z)}{P^{*f}}\right]^{-\theta}\left[\frac{P^{*f}}{P^*}\right]^{-\rho}C^*$$

Variables for the foreign country are denoted by asterisks, and are defined in a way similar to their counterparts for the home country. The home currency prices faced by a home household are defined as follows: $P^h(z)$ and $P^f(z)$ are the prices of a home and foreign brand z, respectively, P^h and P^f are the price indexes of home and foreign goods, respectively, and P is the consumer price index. The foreign currency prices faced by a foreign household are similar: $P^{*h}(z)$ and $P^{*f}(z)$ are the prices of a home and foreign brand z, respectively, P^{*h} and P^{*f} are the price indexes of home and foreign goods, respectively, and P^* is the consumer price index. The price indexes represent the minimum expenditure required to purchase one unit of the corresponding basket.

Having derived the intra-temporal allocation of consumption, we now turn to the budget constraint faced by the representative household. The household can hold domestic currency and a nominal bond denominated in home currency, a bond that can be traded with the representative foreign household. Denoting bond holdings at the beginning of period t by B_t and the interest rate paid over period t by i_t, we write the budget constraint as:

$$\frac{B_{t+1}}{P_t} + \frac{M_t}{P_t} + C_t = (1+i_t)\frac{B_t}{P_t} + \frac{M_{t-1}}{P_t} + \frac{W_t}{P_t}H_t + \frac{\Pi_t}{P_t} - T_t \tag{3}$$

where W_t is the wage rate, Π_t the dividends from the shares owned by the household in various firms, and T_t is a lump sum tax. The optimal choices are given by:

$$C_{t+1} = \beta(1+i_{t+1})\frac{P_t}{P_{t+1}}C_t \tag{4}$$

$$\frac{M_t}{P_t} = \gamma C_t \frac{1+i_{t+1}}{i_{t+1}} \tag{5}$$

$$\frac{W_t}{P_t} = \kappa C_t H_t \tag{6}$$

(4) is the Euler condition reflecting the optimal intertemporal allocation of consumption, (5) is the money demand and (6) is the labor supply. Similar conditions can be derived for the foreign representative household:

$$C^*_{t+1} = \beta (1+i_t) \frac{S_t P^*_t}{S_{t+1} P^*_{t+1}} C^*_t \tag{7}$$

$$\frac{M^*_t}{P^*_t} = \gamma C^*_t \frac{(1+i_t) S_{t+1}}{(1+i_t) S_{t+1} - S_t} \tag{8}$$

$$\frac{W^*_t}{P^*_t} = \kappa C^*_t H^*_t \tag{9}$$

where S is the nominal exchange rate defined as units of home currency per unit of foreign currency.

3.2 Government and the current account

For simplicity, we abstract from government spending and assume that the seignorage revenue is repaid to the domestic household in the form of lump sum transfers:

$$\frac{M_t - M_{t-1}}{P_t} + T_t = 0$$

The current account equations are obtained by combining this result with the household budget constraint (3):

$$\frac{B_{t+1}}{P_t} + C_t = (1+i_t) \frac{B_t}{P_t} + \frac{W_t}{P_t} H_t + \frac{\Pi_t}{P_t} \tag{10}$$

We can write a similar equation for the foreign current account, assuming that the nominal bond traded by home and foreign households is in zero net supply worldwide:

$$-\frac{n}{1-n} \frac{B_{t+1}}{S_t P^*_t} + C^*_t = -\frac{n}{1-n} (1+i_t) \frac{B_t}{S_t P^*_t} + \frac{W^*_t}{P^*_t} H^*_t + \frac{\Pi^*_t}{P^*_t} \tag{11}$$

3.3 The production and distribution of goods

The consumption goods are produced by *manufacturers*, each of which is the sole producer of a brand and enjoys a degree of monopoly power. The central innovation of the paper resides in the distribution channel through

which goods reach consumers. By contrast to earlier contributions, manufacturers do not sell their goods directly to consumers. Instead they sell them to *intermediaries* who in turn sell them to consumers. The inclusion of intermediaries allows us to loosen the connection between the price charged by the manufacturer when the goods exit the plant and the price ultimately paid by the consumer. We now turn to a detailed characterization of intermediaries and manufacturers.

3.3.1 Intermediaries

In each country, there is a unit mass of intermediaries, each selling only one brand.[9] For simplicity, we assume that they costlessly ship the goods from the manufacturers to the consumers. This simplification is motivated by our focus on the loosening of the connection between manufacturer prices and consumer prices through the inclusion of an additional step in the distribution chain. We consider that intermediaries behave competitively. Because of perfect competition, intermediaries' expected profits are zero. Actual profits can however be positive or negative following a shock, because of the price rigidities detailed below. This assumption can seem fairly extreme as it implies that ex-post some intermediaries will suffer from losses, in which case they may simply refuse to sell the brand. We consider however that any demand by consumers is met, even if it implies a loss for the intermediary.[10]

We start by analyzing intermediaries in the home country. Using the intratemporal consumption allocation (2) the profit of a home intermediary selling a brand produced in the home country, denoted by $\Phi_t^h(z)$, is:

$$\Phi_t^h(z) = \left[P_t^h(z) - Q_t^h(z)\right] \left[\frac{P_t^h(z)}{P_t^h}\right]^{-\theta} \left[\frac{P_t^h}{P_t}\right]^{-\rho} nC_t$$

where $Q_t^h(z)$ is the wholesale price set by the home manufacturer. The profit for a intermediary selling an imported foreign brand to home consumers, $\Phi_t^f(z)$, is:

$$\Phi_t^f(z) = \left[P_t^f(z) - S_t Q_t^{*f}(z)\right] \left[\frac{P_t^f(z)}{P_t^f}\right]^{-\theta} \left[\frac{P_t^f}{P_t}\right]^{-\rho} nC_t$$

[9] The limitation of one brand per intermediary is done solely for convenience.

[10] We could extend the model by assuming that intermediaries have a degree of monopoly power. Such a step would however make the model more complex, without affecting the results.

where $Q_t^{*f}(z)$ is the foreign currency wholesale price set by the foreign manufacturer. The profits of foreign intermediaries can be written in a similar way:

$$\Phi_t^{*h}(z) = \left[P_t^{*h}(z) - S_t^{-1} Q_t^h(z)\right] \left[\frac{P_t^{*h}(z)}{P_t^{*h}}\right]^{-\theta} \left[\frac{P_t^{*h}}{P_t^*}\right]^{-\rho} (1-n) C_t^*$$

$$\Phi_t^{*f}(z) = \left[P_t^{*f}(z) - Q_t^{*f}(z)\right] \left[\frac{P_t^{*f}(z)}{P_t^{*f}}\right]^{-\theta} \left[\frac{P_t^{*f}}{P_t^*}\right]^{-\rho} (1-n) C_t^*$$

The central aspect of the model is the ownership of the intermediaries. We assume that the intermediaries distributing domestically produced goods are exclusively owned by households in that country.[11] By contrast the intermediaries selling imported goods (referred to as importers for brevity) are not exclusively owned by households of the country of destination. Instead, we assume that a fraction $\phi \in [0,1]$ of the importers in the home country is owned by home households, whereas a fraction $1-\phi$ is owned by foreign households. We can think of the first category, which we refer to as the *domestically owned importers*, as local retail stores, whereas the remaining importers, referred to as *exporters' subsidiaries*, can be thought of as local subsidiaries of the exporting firms. As the empirical evidence discussed in section 2 points to different situations across countries, we do not restrict ϕ to be identical in the home and foreign country. Instead, we consider that a fraction ϕ^* of the importers in the foreign country is owned by foreign households, with a fraction $1-\phi^*$ owned by home households. Throughout the text we refer to the parameters ϕ and ϕ^* as the extent of domestic ownership of importers.

Figure 1 illustrates the structure of ownership, focusing on the trade flows between the two countries. The upper half of the figure represents the flow of home goods sold in the foreign country. There are n manufacturers who produce these goods and ship them across the border to importers in the foreign country. As the border is crossed at this point, the import prices measured at the port of entry are the prices charged by the manufacturers to the importers. A fraction $1-\phi^*$ of imports go to subsidiaries of the home manufacturers,[12] with the rest going to importers that are foreign firms. In

[11] In equilibrium, these intermediaries always make zero profits as they are unaffected by exchange rate fluctuations and the nationality of their stockholders is irrelevant.

[12] As all home manufacturers ship the same amount in equilibrium, the fraction of imports going to exporters' subsidiaries is $(1-\phi^*)\, n/n$.

the second stage the goods are shipped from intermediaries to consumers. Figure 1 also illustrates the ownership frontier as the thick vertical line: all agents to the left of the frontier are owned by home households, whereas all agents to the right are owned by foreign households. The central point of figure 1 is that the border between the two countries, represented by the double dotted line, does not coincide with the ownership frontier as some of the importers in the foreign country are owned by home households. A similar structure holds for the flow of foreign goods sold in the home country, a fraction $1-\phi$ of which go through exporters' subsidiaries.

3.3.2 Manufacturers

Manufacturers produce the consumption goods using a constant return to scale technology with one unit of labor yielding one unit of output. The manufacturers located in a country are exclusively owned by the households of that country.[13] We denote the output of a home [foreign] manufacturer of brand z by $Y_t(z)$ $[Y_t^*(z)]$. The demand for a particular brand is obtained by aggregating (2) across the home and foreign households:

$$\begin{aligned} Y_t(z) &= \left[\frac{P_t^h(z)}{P_t^h}\right]^{-\theta}\left[\frac{P_t^h}{P_t}\right]^{-\rho} nC_t \\ &\quad + \left[\frac{P_t^{*h}(z)}{P_t^{*h}}\right]^{-\theta}\left[\frac{P_t^{*h}}{P_t^*}\right]^{-\rho}(1-n)C_t^* \end{aligned} \tag{12}$$

$$\begin{aligned} Y_t^*(z) &= \left[\frac{P_t^f(z)}{P_t^f}\right]^{-\theta}\left[\frac{P_t^f}{P_t}\right]^{-\rho} nC_t \\ &\quad + \left[\frac{P_t^{*f}(z)}{P_t^{*f}}\right]^{-\theta}\left[\frac{P_t^{*f}}{P_t^*}\right]^{-\rho}(1-n)C_t^* \end{aligned} \tag{13}$$

The profits for a home and foreign manufacturer, denoted by $\Psi_t(z)$ and $\Psi_t^*(z)$ respectively, are then written as:

$$\Psi_t(z) = \left[Q_t^h(z) - W_t\right] Y_t(z) \quad , \quad \Psi_t^*(z) = \left[Q_t^{*f}(z) - W_t^*\right] Y_t^*(z)$$

[13] We abstract from cross-border equity holdings to keep the model simple and similar to the previous contributions to the literature. Given the extent of observed home bias in asset holdings this assumption is not too restrictive.

3.4 Price setting under flexible prices

Before solving the model under sticky prices, we present the solution prevailing under flexible prices, or a steady state. The perfect competition among intermediaries drives their profits to zero by equalizing consumer and wholesale prices:

$$Q_t^h(z) = P_t^h(z) = S_t P_t^{*h}(z) \quad , \quad Q_t^{*f}(z) = S_t^{-1} P_t^f(z) = P_t^{*f}(z) \tag{14}$$

This relationship between the consumer and wholesale prices is taken into account by manufacturers who maximize their profits taking the impact on demand (12)-(13) into account. The monopoly power of manufacturers leads them to charge a markup over the marginal cost:

$$Q^h(z) = \frac{\theta}{\theta - 1} W \quad , \quad Q^{*f}(z) = \frac{\theta}{\theta - 1} W^* \tag{15}$$

In the flexible price case, or a steady state, intermediaries are irrelevant as they costlessly transfer the goods from the manufacturers to the consumers and make zero profits.

4 The impact of monetary shocks under sticky prices

4.1 Methodology

Our model being nonlinear, we first derive the solution for a symmetric steady state, and then analyze the model in terms of percentage deviations around it. In the symmetric steady state, no country has any net claims on the other: $B = B^* = 0$, the interest rate reflects the discount factor, and is equal to $\beta^{-1} - 1$. All households worldwide are identical and consume and produce an amount C_0 that is suboptimally low as the marginal utility of consumption exceeds the marginal cost of production because of monopolistic competition. Our analysis is undertaken in terms of log linear approximations around the symmetric steady state with lowercase letters denoting percentage deviations from the symmetric steady state: $x = (X - X_0)/X_0$. Bond holdings are the only exception as they are scaled by nominal consumption: $b = B/(P_0 C_0)$.

We consider that the economy is initially at the symmetric steady state. At time t, it is affected by a permanent monetary shock ($m_{t+s} = \bar{m}$, $m^*_{t+s} = \bar{m}^* \ \forall s \geq 0$).[14] The economy is characterized by nominal rigidities, as wholesale and consumer prices cannot instantaneously adjust to the shock. Instead, we consider that prices are set for period t (the *short run*), and can be adjusted only at period $t+1$. Due to the presence of price rigidities in the short run, the optimal price setting equations (15) do not necessarily hold. Instead output is demand determined by (12)-(13). From period $t+1$ on, the economy is in a new steady state we refer to as the *long run*. The long run values are denoted by an upper bar. For example, c^* and $\bar{c}^*$ denote foreign consumption in the short and the long run respectively. We find it convenient to present some of our results in terms of the overall discounted effect over the short and long run. We therefore define overall (net present value) variables as: $x_{npv} = x + \beta (1-\beta)^{-1} \bar{x}$. We also define the worldwide value of a variable as a weighted sum of the values in the home and foreign countries: $x^w = nx + (1-n) x^*$.

A central dimension of the model is the currency in which prices are set. For simplicity we assume that manufacturers set their wholesale prices, $Q^h_t(z)$ and $Q^{*f}_t(z)$, in their own currency, and charge the same price for domestic shipments as for exports. Any exchange rate fluctuation is then completely passed-through to import prices, but not necessarily to consumer prices.

Intermediaries on the other hand can choose whether to set the price they charge either in the consumer currency or the manufacturer currency. Such a distinction is of course irrelevant for domestic sales, but matters for sales of imported goods. We assume that an exogenous share of importers, $1-\delta$, set the consumer prices in the consumers' currency and do not pass any of the exchange rate fluctuations through. The remaining share of importers, δ, set the consumer prices in the manufacturers' currency and pass exchange rate fluctuations through. The parameter δ, that we assume to be the same in both countries for simplicity, captures the degree of exchange rate pass-through to consumer prices.

The three main parameters of the model, namely the degree of exchange rate pass-through δ, and the extent of domestic ownership of importers ϕ and ϕ^*, are taken as exogenous parameters. The focus of our analysis is to highlight how different combinations of these parameters significantly impact

[14] We focus on monetary shock for comparability with earlier contributions. In addition Rogers (1997) point that they account for a sizable share of exchange rate fluctuations.

the welfare results and contrast them with earlier contributions to the literature. We leave the endogeneization of these parameters as optimal choices for future work.

4.2 A simple illustration of the income effect of exchange rate fluctuations

Before deriving the complete analytical solution of the model, we present a simple intuitive illustration of the mechanism at work. The role of intermediaries can be illustrated by considering the short run impact of a devaluation of the home currency (an increase in the exchange rate S).

We first point out that only the importers can play a role, whereas the intermediaries selling domestically produced goods are irrelevant as they always make zero profits. In the Obstfeld and Rogoff (1996, 1995) setup with complete exchange rate pass-through ($\delta = 1$) all importers make exactly zero profits as they pay a set wholesale price in the manufacturer's currency and charge a consumer price that is also set in the manufacturer's currency. The introduction of intermediaries is therefore irrelevant under complete exchange rate pass-through.

If we allow for an incomplete exchange rate pass-through ($\delta < 1$), the situation changes however. For simplicity we focus on the case with zero exchange rate pass-through ($\delta = 0$). Our first point is that the main impact of the depreciation is on the importers' profit margins. The importer selling home brand z to foreign consumers makes a profit. In terms of foreign currency her unit revenue, $P^{*h}(z)$, is fixed and her unit cost, $Q^h(z)/S$, is reduced thanks to the depreciation of the home currency. By contrast the importer selling foreign brand z in the home country makes a loss. Her unit revenue, $P^f(z)$, is set but she faces a higher unit cost in home currency, $Q^{*f}(z) \cdot S$.

Our second point is that the extent of domestic ownership of importers plays a central role as it determines who gets the profits and bears the losses of the importers. Figure 2 illustrates the case where all importers are exporters' subsidiaries ($\phi = \phi^* = 0$). The profits of the importers selling home goods in the foreign country are paid to home households, whereas foreign households bear the losses of the importers selling foreign goods in the home country. The depreciation of the home currency has a beneficial income effect for home households, and a mirror adverse effect for foreign households. This pattern

leads to a beggar-thy-neighbor / prosper-thyself effect, as found by Betts and Devereux (2000).[15]

Figure 3 presents the opposite case where all importers are domestically owned firms ($\phi = \phi^* = 1$), in which case the ownership frontier corresponds to the border between the two countries. The profits of the importers selling home goods in the foreign country are now paid to foreign households, and home households bear the losses of the importers selling foreign goods in the home country. There is then a beggar-thyself / prosper-thy-neighbor pattern as the depreciation of the home currency has an adverse income effect for home households and a beneficial effect for foreign households.

Figures 2 and 3 illustrate the central mechanism of our model. The absence of exchange rate pass-through to consumer prices leads to an income effect of exchange rate fluctuations, but does not per se have any implications for welfare. It is the ownership of importers that determines how the income effect is allocated and which country benefits from the change in the exchange rate.

4.3 Solution of the model

Having presented the intuition driving the model, we derive the solution. The steps are similar to Tille (2000) and we focus on how the ownership of intermediaries affect the results. A more detailed derivation is provided in the Appendix.

In the long run prices are adjusted and the economy reaches a new steady state. As intermediaries are competitive they make zero profits and are irrelevant. The long run solution is identical to Tille (2000): monetary shocks have no real effect worldwide ($\bar{c}^w = \bar{y}^w = 0$), and a wealth transfer towards the home country ($b > 0$) leads home households to consume more and work less than their foreign counterparts ($\bar{c} - \bar{c}^* > 0$, $\bar{y} - \bar{y}^* < 0$) thanks to more favorable terms of trade ($\bar{p}^h - \bar{p}^{*f} - \bar{s} > 0$).

In the short run neither manufacturers nor intermediaries can adjust their prices. Consumer prices can however change to the extent that fluctuations in the exchange rate are passed-through:

$$p = (1 - n)\,\delta s \quad , \quad p^* = -n\delta s$$

[15] Betts and Devereux do not include intermediaries in their analysis. From a welfare point of view however their model is equivalent to the case where all importers are exporters' subsidiaries.

From the Euler equations (4) and (7) and the money demands (5) and (8) we show that the worldwide real effect is equal to the worldwide monetary expansion ($c^w = \bar{m}^w$). Furthermore the exchange rate immediately reaches its long run value:

$$s = \bar{s}$$

Output being demand determined in the short run, the cross-country output difference is driven by the consumption switching effect. A depreciation of the home currency reduces the price of home goods compared to foreign goods, to the extent that it is passed-through to consumer prices, and induces consumers to purchase more home goods:

$$y - y^* = \rho\delta s \tag{16}$$

The ownership of intermediaries affects the solution through the current account equations (10)-(11). The home current account is linearized as:

$$\begin{aligned} b + p + c &= y + (1-\delta)\,\phi\,(1-n)\,(-s) \\ &\quad + \frac{1-n}{n}\,(1-\delta)\,(1-\phi^*)\,ns \end{aligned}$$

The left hand side reflects the allocation of income changes between nominal consumption and savings. y indicates the change in the revenue of manufacturers that home households own and work for. The next term, $(1-\delta)\,\phi\,(1-n)\,(-s)$, reflects the home households' share of the losses incurred by the importers selling foreign goods in the home country. The home residents own a total mass $\phi\,(1-n)$ of these importers, of which only a fraction $1-\delta$ is affected by changes in the exchange rate. The last term, $\frac{1-n}{n}\,(1-\delta)\,(1-\phi^*)\,ns$, indicates the home households' share of the profits by the importers selling home goods in the foreign country, $(1-\phi^*)\,n$ of which are owned by home residents. The home current account can be further simplified as:

$$b + p + c = y + (1-\delta)\,(1-n)\left(1 - 2\phi^{AVG}\right)s$$

where $\phi^{AVG} = (\phi + \phi^*)/2$ is the unweighted average extent of domestic ownership of importers.

We can similarly linearize the foreign current account as:

$$\begin{aligned} -\frac{n}{1-n}b + p^* + c^* &= y^* + (1-\delta)\,\phi^* ns \\ &\quad + \frac{n}{1-n}\,(1-\delta)\,(1-\phi)\,(1-n)\,(-s) \end{aligned}$$

The left hand side reflects the allocation of income changes across consumption and savings. y^* is the change in foreign manufacturers' sales revenue. The next term, $(1-\delta)\,\phi^* n s$, is the foreign households' share of the profits by importers selling home goods in the foreign market, $\phi^* n$ of which are owned by foreign residents. The last term, $\frac{n}{1-n}(1-\delta)(1-\phi)(1-n)(-s)$, reflects the losses by the $(1-\phi)(1-n)$ importers selling foreign goods in the home market that are owned by foreign residents. The foreign current account can be further simplified as:

$$-\frac{n}{1-n}b + p^* + c^* = y^* - (1-\delta)\,n\left(1-2\phi^{AVG}\right)s$$

We can combine the home and foreign current accounts and rewrite them in terms of cross country differences:

$$\frac{b}{1-n} + (p-p^*) + (c-c^*) = (y-y^*) + (1-\delta)\left(1-2\phi^{AVG}\right)s \qquad (17)$$

(17) shows how importers ownership enters the model. If importers are predominantly exporters' subsidiaries ($\phi^{AVG} < 0.5$) a depreciation of the home currency tends to generate a current account surplus for the home country as its residents receive the additional profits of the importers selling home goods in the foreign country. By contrast, if importers are mostly domestically owned businesses ($\phi^{AVG} > 0.5$), home residents bear the losses of the importers selling foreign goods in the home country, which tends to generate a current account deficit for the home country.

Combining the short run relations with the long run results, we can derive the solution for the model. The results for the exchange rate, the short run cross-country consumption difference, the short run output difference and the current account are as follows (the details of the solution can be found in the Appendix):

$$s = D^{-1}\left[1+\frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\right](\bar{m}-\bar{m}^*) \qquad (18)$$

$$c-c^* = D^{-1}\left[\begin{array}{c}(1-\delta)\left(1-2\phi^{AVG}+\frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\right)\\ +(\rho-1)\,\delta\end{array}\right](\bar{m}-\bar{m}^*) \qquad (19)$$

$$y-y^* = D^{-1}\rho\delta\left[1+\frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\right](\bar{m}-\bar{m}^*) \qquad (20)$$

$$\frac{b}{1-n} = D^{-1}\frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\left[(\rho-1)\,\delta - 2\phi^{AVG}(1-\delta)\right](\bar{m}-\bar{m}^*) \qquad (21)$$

where $D = 1 - 2\phi^{AVG}(1-\delta) + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta} + (\rho - 1)\delta > 0$.[16]

4.4 Positive Results

Before turning to the welfare analysis, we discuss some of the positive results of the model. (18)-(21) show that the average extent of domestic ownership of importers, ϕ^{AVG}, affects the short run solution of the model in a complex way. The expressions can however be simplified by recalling that the discount rate, β, is close to 1. We can then write the following approximations:[17]

$$\begin{aligned} s &\simeq (\bar{m} - \bar{m}^*) \\ c - c^* &\simeq (1-\delta)(\bar{m} - \bar{m}^*) \\ y - y^* &\simeq \rho\delta(\bar{m} - \bar{m}^*) \\ \frac{b}{1-n} &\simeq \left[(\rho - 1)\delta - 2\phi^{AVG}(1-\delta)\right](\bar{m} - \bar{m}^*) \end{aligned}$$

where $\simeq$ indicates that the left and right hand side are approximately equal. The ownership of importers matters little for the exchange rate and the short run consumption and output gaps. However the impact on the current account is significant when the degree of exchange rate pass-through is limited. As the current account impact feeds into the long term solution, the ownership of importers affects consumption and output in the long run. Intuitively this reflects an optimal consumption smoothing. The income effect of the exchange rate change is limited to the short run, as in the long run intermediaries adjust their prices and their profits are zero. The optimal allocation of such a short term income effect is to spread it across the short and long run. Our results indicate that a monetary expansion in the home country, and the ensuing depreciation of the home currency, do not necessarily result in a current account surplus for the home country. For example if consumer prices are entirely insulated from exchange rate fluctuations ($\delta = 0$), the current account is not affected when importers are exporters' subsidiaries ($\phi^{AVG} = 0$), but the home country runs a current account deficit when at

[16] D is positive for most combinations of the parameters. It can be negative only if $\phi^{AVG} > 0.5$ *and* ρ is extremely small (lower than 0.04).

[17] A numerical analysis with $\beta < 1$ but close to 1 shows that the approximations are valid.

least some importers are domestically owned firms ($\phi^{AVG} > 0$).[18]

Turning to employment, a monetary expansion in the home country clearly increases home employment in the short run. It boosts worldwide employment and generates a consumption switching effect towards home goods through the depreciation of the exchange rate. In the long run, home employment may decrease. The decrease cannot be large enough to offset the initial increase however, and in overall terms home employment unambiguously increases:

$$\begin{aligned} y^w_{npv} &= n\bar{m} > 0 \\ y_{npv} - y^*_{npv} &= \left[\begin{array}{c} \rho\delta \left[1 + \frac{\rho}{1+\rho}\frac{\beta}{1-\beta}\right] \\ + \frac{\rho}{1+\rho}\frac{\beta}{1-\beta}\left[\delta + 2\phi^{AVG}(1-\delta)\right] \end{array} \right] D^{-1}\bar{m} > 0 \end{aligned}$$

Turning to the foreign country, employment may increase or decrease following a monetary expansion in the home country. In the short run, we write:

$$\begin{aligned} y^* &= \left[-2\phi^{AVG}(1-\delta) + (\rho-1)\delta + (1-\rho\delta)\left[1 + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\right]\right] D^{-1} n\bar{m} \\ &\simeq (1-\rho\delta)\, n\bar{m} \end{aligned}$$

where the last approximation uses the fact that β is close to 1. The impact on the short run foreign output reflects two opposite channels. First, the home monetary expansion boosts worldwide demand which ceteris paribus increases foreign output. Second, the devaluation of the home currency leads to a consumption switching away from foreign goods, which reduces foreign output. Note that the consumption switching effect is proportional to the degree of exchange rate pass-through. If $\delta = 0$, consumer prices are not affected by the exchange rate fluctuations and there is no consumption switching effect. The model is therefore consistent with the usual setup in which a devaluation boosts domestic employment, while possibly lowering employment abroad.

[18] Our assumption of a log utility for consumption limits the response of the current account. Devereux (2000) analyzes the current account for a more general specification for the case $\phi = \phi^* = 0$.

4.5 Welfare results

We now analyze the welfare impact of monetary shocks by balancing the effects on consumption and output through a welfare metric.[19] Our setup provides us with an explicit criterion in the form of the representative consumer's utility. Taking a linear approximation of (1) we write the welfare effect for the home household as:

$$u_{npv} = U - U_0 = c_{npv} - \frac{\theta - 1}{\theta} y_{npv} \tag{22}$$

(22) shows that the determinants of welfare are overall consumption, which is beneficial, and overall output, which reduces welfare. Intuitively, a welfare effect of x can be interpreted as an $x\%$ increase in short run consumption. The negative impact of output (employment) can seem odd if we think of an economy experiencing unemployment.[20] Note however that higher employment is not valued per se, but because it allows workers to consume more. In a closed economy consumption and employment are equal, hence an increase in employment is mirrored by a beneficial increase in consumption. In an open economy however consumption and employment can differ due to changes in the terms of trade. It is therefore important to distinguish their specific impacts on welfare.

In terms of cross country differences, we can write the welfare effect as:

$$u_{npv} - u^*_{npv} = \left(c_{npv} - c^*_{npv}\right) - \frac{\theta - 1}{\theta} \left(y_{npv} - y^*_{npv}\right) \tag{23}$$

Following steps presented in the Appendix, we use the current account relations to write:

$$u_{npv} - u^*_{npv} = \frac{\rho - \theta}{\rho\theta} \left(y_{npv} - y^*_{npv}\right) + \left(1 - 2\phi^{AVG}\right)(1 - \delta)\, s \tag{24}$$

[19] Including the direct welfare impact of real balances would only have a small impact on the results.

[20] Our setup considers a monopolistic distortion instead of unemployment. The interpretation is however similar. The market allocation under monopolistic competition is suboptimal as an additional unit of employment generates more benefit through consumption than cost through effort. This is close to an unemployment allocation, where the value of the output produced by an additonal worker exceeds the opportunity cost of her work. Of course, unemployment also entails a redistibutive issue, but its main cost is the suboptimal equilibrium allocation in aggregate terms.

(24) illustrates the two mechanisms underlying the welfare effect. The first mechanism reflects the impact on the output expansion following a positive monetary shock in the home country.[21] The increase in home output generates additional export revenue that can be use to purchase more imports and increase consumption. However, producing the output requires a costly effort. Whether the home output expansion is beneficial then depends on how the change in export revenue compensates for the extra effort. This interaction is captured by the $\rho - \theta$ term. The impact of the output expansion on the export revenue reflects the sensitivity of net exports vis-a-vis the terms of trade, which is captured by ρ. If ρ is high, an increase in net exports does not require a sharp worsening of the terms of trade and the export revenue increases substantially. The impact through the cost of effort reflects the initial markup between effort and consumption, captured by θ. When θ is high, the economy already operates close to the competitive equilibrium where the marginal utility of consumption is equal to the marginal cost of effort. The benefit from reducing the small monopolistic distortion through an increase in output is then small. When $\rho < \theta$, (24) shows that the home country can be adversely affected by its own monetary expansion as shown in Tille (2000). This beggar-thyself effect occurs because the output expansion requires such a large worsening of the terms of trade that it does not generate enough revenue to compensate for the cost of effort.

The second mechanism in (24) reflects the income effect of exchange rate fluctuations through the ownership structure of importers. If most importers are exporters' subsidiaries ($\phi^{AVG} < 0.5$), as in Betts and Devereux (2000), a devaluation has a beggar-thy-neighbor / prosper thyself effect. The extra profits of the importers selling home goods in the foreign country are paid mostly to the home households, whereas the foreign households bear most of the losses of the importers selling foreign goods in the home country. The situation is reverted if most importers are domestically owned ($\phi^{AVG} > 0.5$) where the depreciation of the home country currency has a beggar-thyself / prosper-thy-neighbor effect.

Our results clearly highlight that the beggar-thy-neighbor effect in Betts and Devereux (2000) does not reflect the incomplete exchange rate pass-through per se, but instead reflects the allocation of the resulting income effect. The second term of (24) shows that a given degree of limited pass-through ($\delta < 1$) can lead to a beggar-thy-neighbor or a beggar-thyself effect,

[21] As shown above, $y_{npv} - y^*_{npv} > 0$ when $\bar{m} - \bar{m}^* > 0$.

depending on the ownership structure of importers. As indicated in our positive analysis, the impact of ϕ^{AVG} on the short run consumptions and outputs is limited. ϕ^{AVG} then affects the welfare results primarily through the long-run component, highlighting the need to assess welfare over the entire horizon and not just the short run.

5 A numerical example

We now illustrate our results by mean of a numerical example. Following Betts and Devereux (2000), we consider prices to be set for a year and choose $\beta = 0.94$, leading to a steady state real interest rate of 6%. The value of the elasticity of substitution within a country, θ, is set at 6, which implies a markup of 20%, following Rotemberg and Woodford (1992). We consider that the home and foreign country are of equal size ($n = 0.5$), and analyze the impact of a unit monetary expansion in the home country ($\bar{m} = 1$, $\bar{m}^* = 0$). For brevity, we focus on two possible values for the elasticity of substitution between home and foreign goods. We first consider the case where $\rho = 1$, as it corresponds to the case analyzed in Corsetti and Pesenti (2000). As shown in Tille (2000), the Marshal-Lerner-Robinson condition just holds when ρ is equal to unity and there is complete exchange rate pass through ($\delta = 1$). As a result, an expansion of home exports is exactly offset by a worsening of the terms of trade and does not generate any additional export revenue. We also consider the case of $\rho = 6$, as in Obstfeld and Rogoff (1996, 1995) and Betts and Devereux (2000). In such a case a welfare gap between the home and foreign countries can emerge only when there is incomplete pass-through ($\delta < 1$), both countries being equally well off under complete pass-through.

To illustrate the impact of the extent of domestic ownership of importers, we consider two possible values for ϕ^{AVG}:

- $\phi^{AVG} = 0$, and all importers are exporters' subsidiaries. This case corresponds to the model by Betts and Devereux (2000), and we denote it by **FOR**.
- $\phi^{AVG} = 1$, and all importers are owned by domestic residents, a case referred to as **DOM**.

In terms of empirical relevance, our analysis of the U.S. affiliates data in section 2 suggest that the **DOM** model is closer to the actual situation than

the **FOR** model is. Table 2 presents the results for the exchange rate, s, the short run difference for consumption, $c - c^*$, and output, $y - y^*$, the current account, $b/(1-n)$, the overall welfare effects for the home country, u_{npv}, the foreign country, u^*_{npv}, and the relative welfare effect, $u_{npv} - u^*_{npv}$. The top half of the table indicates the results when home and foreign goods are poor substitutes ($\rho = 1$), with the lower half showing the results when the substitutability is larger ($\rho = 6$). For each value of ρ we consider the cases where exchange rate fluctuations are not passed-through ($\delta = 0$), partially passed-through ($\delta = 0.5$) or entirely passed-through ($\delta = 1$). The results for the **FOR** and the **DOM** models are presented alongside to facilitate the comparison.

The first point is that both models are identical when there is complete exchange rate pass-through ($\delta = 1$) as intermediaries always make zero profit then. The exchange rate response tends to be higher in the **DOM** model than in the **FOR** model, but the difference remains small. The short run consumption and output differences are nearly identical in the two models, as indicated in our analysis of the positive results. Looking at the current account, a smaller degree of substitutability between home and foreign goods translates into a smaller current account surplus (or a larger deficit) as the output expansion is then significantly offset by a worsening of the terms of trade. Furthermore the ownership of importers plays a central role for the current account. The surplus is significantly smaller (or the deficit larger) in the **DOM** model than in the **FOR** model.

In terms of welfare a smaller degree of substitutability between home and foreign goods is detrimental for the home country and beneficial for the foreign country. Intuitively the output expansion in the home country is offset by a significant worsening of the terms of trade. The ownership of importers significantly affects the welfare results. In the **DOM** model the benefit, if any, in the home country is reduced compared to the **FOR** model, the opposite being true for the foreign country. Consider for instance the case where home and foreign goods are good substitutes ($\rho = 6$) and exchange rate fluctuations are not passed-through ($\delta = 0$). The **FOR** model is characterized by a beggar-thy-neighbor / prosper-thyself pattern as the benefit for home residents is equivalent to a 0.58% increase in short run consumption, while foreign residents suffer from the equivalent of a 0.42% decrease. By contrast, the **DOM** model exhibits a beggar-thyself / prosper-thy-neighbor pattern where home residents bear the equivalent of a 0.46% reduction in short run consumption, whereas the gain for foreign residents is

equivalent to a 0.62% increase. The magnitude of these effects exceeds the gain in the baseline Obstfeld and Rogoff (1996, 1995) model ($\rho = 6$, $\delta = 1$) where both countries benefit from the equivalent of a 0.08% increase in short run consumption.[22]

Next we evaluate the interaction between the degree of exchange rate pass-through δ and the average extent of domestic ownership of importers ϕ^{AVG}. Following steps presented in the Appendix, we can derive three thresholds for ϕ^{AVG}, for a given value of δ:

$$\phi^{AVG}\left[u^*_{npv}=0\right] < \phi^{AVG}\left[u_{npv}=u^*_{npv}\right] < \phi^{AVG}\left[u_{npv}=0\right]$$

The interpretation of these thresholds is as follows. If $\phi^{AVG} < \phi^{AVG}\left[u^*_{npv}=0\right]$, the foreign country is adversely affected by a home monetary expansion ($u_{npv} > 0 > u^*_{npv}$). If $\phi^{AVG}\left[u^*_{npv}=0\right] < \phi^{AVG} < \phi^{AVG}\left[u_{npv}=u^*_{npv}\right]$ both countries benefit, although the home country benefits by more ($u_{npv} > u^*_{npv} > 0$). If $\phi^{AVG}\left[u_{npv}=u^*_{npv}\right] < \phi^{AVG} < \phi^{AVG}\left[u_{npv}=0\right]$ the foreign country is the one with the larger benefit ($u^*_{npv} > u_{npv} > 0$). If $\phi^{AVG}\left[u_{npv}=0\right] < \phi^{AVG}$ the home country is adversely affected by its own monetary expansion ($u^*_{npv} > 0 > u_{npv}$).

Table 3 indicates the values of the three thresholds for different degrees of exchange rate pass-through. Panel A illustrates the case where home and foreign goods are poor substitutes ($\rho = 1$). In such a case the home country suffers from its own monetary expansion in most cases. Only when there is little exchange rate pass through and importers are mostly exporters' subsidiaries does a beggar-thy-neighbor / prosper-thyself pattern emerge. In addition there is only a limited range of cases where both countries benefit. For instance if 20% of exchange rate fluctuations are passed-through to consumer prices ($\delta = 0.2$), the home country is adversely affected if the average extent of domestic ownership of importers exceeds 36% ($\phi^{AVG}\left[u_{npv}=0\right] = 0.36$), whereas the foreign country is adversely affected if that extent is lower than 21% ($\phi^{AVG}\left[u^*_{npv}=0\right] = 0.21$). Panel B presents the situation when home and foreign goods are closer substitutes ($\rho = 6$). In such a case the range of cases where both countries benefit is larger. Looking again at the case where $\delta = 0.2$, we see that the home [foreign] country looses only if the extent of domestic ownership of importers exceeds 61% [is lower than 39%].

[22] For reference, the gain in a closed economy ($n = 1$) is equivalent to a 0.17% increase.

6 Conclusion

This paper revisits the welfare effects of exchange rate fluctuations. It builds on earlier studies that have pointed to the possibility of beggar-thyself / prosper-thy-neighbor effects due to the deterioration of the terms of trade, as well as beggar-thy-neighbor / prosper-thyself effects due to incomplete exchange rate pass-through. The analysis reconciles earlier contributions by introducing intermediaries between manufacturers and consumers, thereby loosening the link between import and consumer prices. We show that the main impact of exchange rate fluctuations is on the margin of importers, when these fluctuations are only partially passed-through to consumer prices. We then highlight the central role played by the ownership structure of importers, an aspect that has received little attention so far. A limited degree of exchange rate pass-through does not by itself generate a beggar-thy-neighbor / prosper-thyself feature. Instead the welfare results are driven by the ownership structure of importers (exporters' subsidiaries vs. domestically owned businesses) as it drives the allocation of the income effect of exchange rate fluctuations. We show that a limited exchange rate pass-through to consumer prices can result in either a beggar-thy-neighbor / prosper-thyself when importers are exporters' subsidiaries, or a beggar-thyself / prosper-thy-neighbor pattern when importers are domestic firms.

Although the ownership of importers has not been the object of extensive empirical studies, a first look at the evidence from U.S. affiliates of foreign firms suggests that importers are predominantly domestic businesses. The central role of this aspect in our model points to the need for more thorough empirical studies. Furthermore a limitation of our model is that the degree of exchange rate pass-through and the extent of domestic ownership of importers are taken as exogenous parameters. Our focus is to assess the impact of the ownership structure of importers on the results from earlier contributions, while keeping the model as simple as possible. A setup where the degree of exchange rate pass-through and the ownership of intermediaries are derived from optimal decisions by firms clearly constitutes a promising avenue for further research.

7 Appendix: Solution of the model

7.1 The long run

In the long run prices adjust and the economy reaches a new steady state, and intermediaries become irrelevant as they all make zero profits. The long run situation is then identical to Tille (2000) and monetary shocks have no real worldwide effects:

$$\bar{c}^w = \bar{y}^w = 0$$

In terms of cross-country differences, the solution is given by the following system:

$$\begin{aligned} \bar{p}^h - \bar{p}^{*f} - \bar{s} &= (\bar{c} - \bar{c}^*) + (\bar{y} - \bar{y}^*) && (25) \\ \bar{y} - \bar{y}^* &= -\rho\left(\bar{p}^h - \bar{p}^{*f} - \bar{s}\right) && (26) \\ \bar{c} - \bar{c}^* &= \frac{1-\beta}{\beta}\frac{b}{1-n} + (\bar{y} - \bar{y}^*) + \left(\bar{p}^h - \bar{p}^{*f} - \bar{s}\right) && (27) \end{aligned}$$

(25) reflect the optimal price setting by manufacturers (15) along with the labor supply (6) and (9). (26) is the demand equation based on (12)-(13) and shows the consumption switching effect of a change in the terms of trade. (27) reflects the current account equations (10)-(11). The solution of the system is given by:

$$\begin{aligned} \bar{c} - \bar{c}^* &= \frac{1+\rho}{2\rho}\frac{1-\beta}{\beta}\frac{b}{1-n} && (28) \\ \bar{p}^h - \bar{p}^{*f} - \bar{s} &= \frac{1}{2\rho}\frac{1-\beta}{\beta}\frac{b}{1-n} \\ \bar{y} - \bar{y}^* &= -\frac{1}{2}\frac{1-\beta}{\beta}\frac{b}{1-n} \end{aligned}$$

A cross-country real effect in the long run reflects changes in wealth, in the form of net claims from one country on the other. Home residents consume more, work less and enjoy favorable terms of trade if they hold claims on foreign residents.

7.2 The short run

In the short run, neither manufacturers nor intermediaries can adjust their prices. Consumer prices can however change to the extent that fluctu-

ations in the exchange rate are passed-through:

$$p = (1-n)\,\delta s \quad , \quad p^* = -n\delta s \quad , \quad p - p^* = \delta s \quad , \quad p^w = 0$$

Defining the real exchange rate as the nominal exchange rate times the ratio of consumer price indexes, we write the real exchange rate effect rs as:

$$rs = s + p^* - p = (1-\delta)\,s$$

An incomplete extent of pass-through leads to deviations from the purchasing power parity in the short run. The Euler equations (4) and (7) are linearized as:

$$\bar{c} = c + \beta di + p - \bar{p} \quad , \quad \bar{c}^* = c^* + \beta di + s + p^* - \bar{s} - \bar{p}^*$$

As the purchasing power parity holds in the long run, this implies:

$$\begin{aligned} (\bar{c} - \bar{c}^*) &= (c - c^*) - rs \\ 0 &= c^w + \beta di - \bar{p}^w + (1-n)\,(s - \bar{s}) \end{aligned} \tag{29}$$

In order to solve for the exchange rate dynamics, we turn to the money demands (5) and (8). In the short run, they are linearized as:

$$\bar{m} - p = c - \frac{\beta}{1-\beta}\beta di,\; \bar{m}^* - p^* = c^* - \frac{\beta}{1-\beta}\,(\beta di + s - \bar{s}) \tag{30}$$

with the equivalent long run relations being:

$$\bar{m} - \bar{p} = \bar{c},\; \bar{m}^* - \bar{p}^* = \bar{c}^*$$

Combining the Euler equations and the money demands, expressed in terms of cross-country differences, we can show that the nominal exchange rate immediately reaches its long run value and there is no over-shooting:

$$s = \bar{s}$$

Combining worldwide averages of the Euler equations and the money demands, we show that the short run worldwide effect on consumption is equal to the worldwide monetary expansion:

$$c^w = \bar{m}^w$$

We next turn to the solution in terms of cross-country differences. Output is demand determined and given by (12)-(13). Taking a per capita average

across all manufacturers in a country, we can express the output demands as:

$$y = c^w + \rho\left(1-n\right)\delta s \quad , \quad y^* = c^w - \rho n \delta s$$

Output changes reflect the worldwide expansion of consumption, along with any consumption switching due to the impact of exchange rate fluctuations on consumer prices. In terms of cross-country differences, we write:

$$y - y^* = \rho \delta s \tag{31}$$

The final element of the short run solution is given by the current account equations (10)-(11). The home current account is linearized as:

$$\begin{aligned} b + p + c &= c^w + \rho\left(1-n\right)\delta s \\ &\quad + \left(1-\delta\right)\phi\left(1-n\right)\left(-s\right) \\ &\quad + \frac{1-n}{n}\left(1-\delta\right)\left(1-\phi^*\right)ns \end{aligned}$$

The left hand side reflects the allocation of income changes between nominal consumption and savings. The first two terms on the right hand side reflects the change in the revenue of manufacturers that home households own and work for. The third term reflects the home households' share of losses incurred by importers selling foreign goods in the home country following a devaluation of the home currency. The detailed derivation of the term is as follows:

$$\begin{aligned} & \phi \frac{1}{P_0 C_0} \frac{1}{n} \int_n^1 d\Phi_t^f\left(z\right) dz \\ = \; & \phi \frac{1}{P_0 C_0} \frac{1}{n} \int_n^1 \left[P_0 p^f\left(z\right) - S_0 Q_0^{*f} s\right] n C_0 dz \\ = \; & \phi \frac{1}{n} \int_n^1 \left[p^f\left(z\right) - s\right] n dz = \phi \frac{1}{n} \int_n^1 \left[\delta s - s\right] n dz \\ = \; & \phi\left(1-\delta\right)\frac{1-n}{n} n\left(-s\right) \end{aligned}$$

as $Q_0^{*f} = P_0^* = P_0/S_0$ and $p^f\left(z\right) = s$ for the fraction δ of importers that pass the exchange rate fluctuations through to consumers. The $\frac{1}{n}$ term is included as the equation is expressed in per capita terms. The last term reflects the home households' share of profits by importers selling home goods in the

foreign country. The detailed derivation is given by:

$$\begin{aligned}
& (1-\phi^*)\frac{S_0}{P_0C_0}\frac{1}{n}\int_0^n d\Phi_t^{*h}(z)\,dz \\
= \; & (1-\phi^*)\frac{S_0}{P_0C_0}\frac{1}{n}\int_0^n \left[P_0^* p^{*h}(z) + S_0^{-1}Q_0^h s\right](1-n)\,C_0 dz \\
= \; & (1-\phi^*)\frac{1}{n}\int_0^n \left[p^{*h}(z)+s\right](1-n)\,dz \\
= \; & (1-\phi^*)\frac{1}{n}\int_0^n \left[-\delta s+s\right](1-n)\,dz = (1-\phi^*)(1-\delta)\frac{1-n}{n}ns
\end{aligned}$$

as $p^{*h}(z) = -s$ for the importers that pass the exchange rate fluctuations through. As $y = c^w + \rho(1-n)\delta s$, the home current account can be further simplified as:

$$b + p + c = y + (1-\delta)(1-n)\left(1-2\phi^{AVG}\right)s$$

where $\phi^{AVG} = (\phi+\phi^*)/2$ is the unweighted average extent of domestic ownership of importers.

We can similarly linearize the foreign current account as:

$$\begin{aligned}
-\frac{n}{1-n}b + p^* + c^* \; = \; & c^w - \rho n\delta s \\
& + (1-\delta)\phi^* ns \\
& + \frac{n}{1-n}(1-\delta)(1-\phi)(1-n)(-s)
\end{aligned}$$

The left hand side reflects the allocation of income changes across consumption and savings. The first term on the right hand side is the change in foreign manufacturers' sales revenue. The second term captures the foreign households' share of profit by importers selling home goods sold in the foreign market. The detailed derivation of the term is:

$$\begin{aligned}
& \phi^*\frac{1}{P_0^*C_0}\frac{1}{1-n}\int_0^n d\Phi_t^{*h}(z)\,dz \\
= \; & \phi^*\frac{1}{P_0^*C_0}\frac{1}{1-n}\int_0^n \left[P_0^* p^{*h}(z) + S_0^{-1}Q_0^h s\right](1-n)\,C_0 dz \\
= \; & \phi^*\frac{1}{1-n}\int_0^n \left[p^{*h}(z)+s\right](1-n)\,dz \\
= \; & \phi^*\frac{1}{1-n}\int_0^n \left[-\delta s+s\right](1-n)\,dz = \phi^*(1-\delta)ns
\end{aligned}$$

The last term, which reflects the share of losses by importers selling foreign goods in the home market, is derived as:

$$\begin{aligned}
& (1-\phi)\frac{1}{S_0 P_0^* C_0}\frac{1}{1-n}\int_n^1 d\Phi_t^f(z)\,dz \\
= \;& (1-\phi)\frac{1}{P_0 C_0}\frac{1}{1-n}\int_n^1 \left[P_0 p^f(z) - S_0 Q_0^{*f} s\right] nC_0 dz \\
= \;& (1-\phi)\frac{1}{1-n}\int_n^1 \left[p^f(z) - s\right] n dz \\
= \;& (1-\phi)\frac{1}{1-n}\int_n^1 [\delta s - s]\, n dz = (1-\phi)(1-\delta)\frac{n}{1-n}(1-n)(-s)
\end{aligned}$$

Further simplifications lead to:

$$-\frac{n}{1-n}b + p^* + c^* = y^* - (1-\delta)\,n\left(1-2\phi^{AVG}\right)s$$

In terms of cross country differences, the short run current account is:

$$\frac{b}{1-n} + (p-p^*) + (c-c^*) = (y-y^*) + (1-\delta)\left(1-2\phi^{AVG}\right)s \qquad (32)$$

The cross country solution is derived by combining the Euler equation (29), the output demand (31), the short run current account (32) and the long run solution for consumption (28) to get

$$(c-c^*)\left[1+\frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\right] = \left[\begin{array}{c}(\rho-1)\,\delta + \left(1-2\phi^{AVG}\right)(1-\delta) \\ +\frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}(1-\delta)\end{array}\right] s$$

Combining with the money demand (30), we obtain the short run solution presented in the main text (18)-(21).

7.3 The sign of D

This appendix shows that the denominator D in (18)-(21) is positive. Recall that:

$$\begin{aligned}
D &= 1 - 2\phi^{AVG}(1-\delta) + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta} + (\rho-1)\,\delta \\
&= \left(1 - 2\phi^{AVG} + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\right) + \left(\rho - 1 + 2\phi^{AVG}\right)\delta
\end{aligned}$$

Start with the case where $0 \leq \phi^{AVG} < 0.5$. If $\rho - 1 + 2\phi^{AVG} > 0$, $D > 0$ implies that:

$$\delta > -\frac{1 - 2\phi^{AVG} + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}}{\rho - 1 + 2\phi^{AVG}}$$

Since $1-2\phi^{AVG} \geq 0$, we infer that $-\left[1 - 2\phi^{AVG} + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\right]\left[\rho - 1 + 2\phi^{AVG}\right]^{-1}$ is negative. The inequality is then satisfied for any $\delta \geq 0$ and $D > 0$. If $\rho - 1 + 2\phi^{AVG} < 0$, $D > 0$ requires:

$$\begin{aligned} \delta &< -\frac{1 - 2\phi^{AVG} + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}}{\rho - 1 + 2\phi^{AVG}} = \frac{\rho + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta} - \left(\rho - 1 + 2\phi^{AVG}\right)}{-\left(\rho - 1 + 2\phi^{AVG}\right)} \\ &= 1 + \frac{\rho + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}}{-\left(\rho - 1 + 2\phi^{AVG}\right)} \end{aligned}$$

a condition that is clearly satisfied for any $\delta \leq 1$. If $\rho \to 1 - 2\phi^{AVG}$, the condition for $D > 0$ implies that either $\delta > -\infty$ or $\delta < \infty$, which is always the case. Therefore, D is unambiguously positive if $0 \leq \phi^{AVG} < 0.5$.

If $\phi^{AVG} = 0.5$, we write:

$$D = \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta} + \rho\delta > 0 \Leftrightarrow \delta > -\frac{2}{1+\rho}\frac{\beta}{1-\beta}$$

which is always true as $\delta \geq 0$. Hence, D is unambiguously positive if $\phi^{AVG} = 0.5$.

If $0.5 < \phi^{AVG} \leq 1$, we see that $\rho - 1 + 2\phi^{AVG} > 0$, and the condition for $D > 0$ is:

$$\delta > \bar{\delta} = -\frac{1 - 2\phi^{AVG} + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}}{\rho - 1 + 2\phi^{AVG}} = 1 - \rho\frac{1 + \frac{2}{1+\rho}\frac{\beta}{1-\beta}}{\rho - 1 + 2\phi^{AVG}}$$

D is positive as long as δ exceeds a threshold $\bar{\delta}$ that is smaller than 1. In addition, as the discount rate β is close to 1, $\bar{\delta}$ is smaller than zero, except for very small values of ρ. Assuming that $\beta = 0.94$, the values of $\bar{\delta}$ are given

below:

ρ	0	0.01	0.02	0.03	0.04	0.05
$\bar{\delta}\left(\phi^{AVG}=0.6\right)$	1	−0.52	−1.88	−3.10	−4.19	−5.17
$\bar{\delta}\left(\phi^{AVG}=0.7\right)$	1	0.22	−0.51	−1.19	−1.83	−2.43
$\bar{\delta}\left(\phi^{AVG}=0.8\right)$	1	0.48	−0.02	−0.50	−0.95	−1.37
$\bar{\delta}\left(\phi^{AVG}=0.9\right)$	1	0.61	0.23	−0.14	−0.48	−0.81
$\bar{\delta}\left(\phi^{AVG}=1\right)$	1	0.68	0.38	0.08	−0.20	−0.47

We see that $\bar{\delta} < 0$ except for very small values of ρ. As δ is never negative, the condition that $\delta > \bar{\delta}$ is met for most parameter values, and $D > 0$.

7.4 Welfare analysis

It is straightforward to show that a monetary expansion is beneficial for the world as a whole, independent of the ownership of intermediaries: $u^w_{npv} = \theta^{-1}\bar{m}^w$. In terms of cross country differences, the welfare effect is written as (23). We complete it by using the short and long run current account equations which can be written as:

$$\begin{aligned} c - c^* &= (y - y^*)\frac{\rho - 1}{\rho} - \frac{b}{1-n} + (1-\delta)\left(1 - 2\phi^{AVG}\right)s \\ \bar{c} - \bar{c}^* &= (\bar{y} - \bar{y}^*)\frac{\rho - 1}{\rho} + \frac{1-\beta}{\beta}\frac{b}{1-n} \end{aligned}$$

Combining the current account relations with (23) leads to:

$$\left(c_{npv} - c^*_{npv}\right) = \frac{\rho - 1}{\rho}\left(y_{npv} - y^*_{npv}\right) + (1-\delta)\left(1 - 2\phi^{AVG}\right)s \qquad (33)$$

A higher overall consumption by home households relative to foreign households has to be financed by a higher income. This income can be in the form of higher export sales, including the impact of the worsening of the terms of trade, or a net profit from the ownership of importers. Combining (23) and (33) leads to (24).

In terms of country specific effects, we use our solution for the output differences and the exchange rate to write that:

$$u_{npv} - u^*_{npv} = D^{-1}\left\{\begin{array}{c} \frac{\rho-\theta}{\rho\theta}\left(\rho\delta + \frac{\rho}{1+\rho}\frac{\beta}{1-\beta}\left[(1+\rho)\,\delta + 2\phi^{AVG}\,(1-\delta)\right]\right) \\ + \left(1 - 2\phi^{AVG}\right)(1-\delta)\left[1 + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\right] \end{array}\right\}(\bar{m} - \bar{m}^*)$$

Since $D > 0$, this implies that a monetary expansion in the home country benefits home residents more than foreign residents ($u_{npv} > u^*_{npv}$) as long as:

$$\phi^{AVG} < \phi^{AVG}\left[u_{npv} = u^*_{npv}\right] = \frac{\frac{\rho-\theta}{\theta}\frac{1}{1-\beta}\delta + (1-\delta)\left[1 + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\right]}{2(1-\delta)\left[1 + \frac{\rho}{1+\rho}\frac{\beta}{1-\beta}\left(2 - \frac{\rho-\theta}{\rho\theta}\right)\right]}$$

To establish the country specific welfare impacts we combine the cross-country difference with the worldwide effect using the following rules:

$$u_{npv} = u^w_{npv} + (1-n)\left(u_{npv} - u^*_{npv}\right) \quad , \quad u^*_{npv} = u^w_{npv} - n\left(u_{npv} - u^*_{npv}\right)$$

For simplicity we focus on a home monetary expansion ($\bar{m} > 0$, $\bar{m}^* = 0$). After some algebra, we establish that the home households are adversely affected in absolute terms ($u_{npv} < 0$) when the following condition is met:

$$\begin{aligned}\phi^{AVG} &> \phi^{AVG}\left[u_{npv} = 0\right] \\ &= \frac{n\left\{1 + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta} + (\rho-1)\delta\right\} + (1-n)\left\{\frac{\rho-\theta}{1-\beta}\delta + (1-\delta)\theta\left[1 + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\right]\right\}}{2(1-\delta)\left\{n + (1-n)\left[\theta + \frac{\rho}{1+\rho}\frac{\beta}{1-\beta}\left(2\theta - \frac{\rho-\theta}{\rho}\right)\right]\right\}}\end{aligned}$$

Similarly, we can show that the foreign residents suffer in absolute terms ($u^*_{npv} < 0$) when:

$$\begin{aligned}\phi^{AVG} &< \phi^{AVG}\left[u^*_{npv} = 0\right] \\ &= \frac{\left\{1 + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta} + (\rho-1)\delta\right\} - \left\{\frac{\rho-\theta}{1-\beta}\delta + (1-\delta)\theta\left[1 + \frac{2\rho}{1+\rho}\frac{\beta}{1-\beta}\right]\right\}}{2(1-\delta)\left\{1 - \left[\theta + \frac{\rho}{1+\rho}\frac{\beta}{1-\beta}\left(2\theta - \frac{\rho-\theta}{\rho}\right)\right]\right\}}\end{aligned}$$

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TABLE 1
IMPORTS BY U.S. AFFILIATES IN THE UNITED STATES

A. BY INDUSTRY

1997, MILLIONS OF DOLLARS	TOTAL IMPORTS [1]	IMPORTS BY AFFILIATES [2]	SHARE OF AFFILIATES [2] / [1]
ALL IMPORTS	870,213	261,482	**30.05%**
FOOD, BEVERAGE AND TOBACCO	39,845	12,193	30.60%
NON-FOOD AND FUEL CRUDE MATERIALS	22,030	5,575	25.31%
MINERAL FUELS AND LUBRICANTS	78,178	18,278	23.38%
CHEMICALS	50,326	20,877	41.48%
MACHINERY	271,325	84,407	31.11%
- INDUSTRIAL MACHINERY AND EQUIPMENT	79,322	21,087	26.58%
- OFFICE MACHINES AND AUTOMATIC DATA PROCESSING MACHINES	75,001	13,940	18.59%
- TELECOMMUNICATIONS AND OTHER ELECTRICAL MACHINERY	117,002	49,380	42.20%
ROAD VEHICLES AND PARTS	112,767	62,479	55.41%
OTHER TRANSPORTATION EQUIPMENT	11,856	3,697	31.18%
OTHER PRODUCTS	283,886	53,976	19.01%

B. BY COUNTRY OF ORIGIN

1997, MILLIONS OF DOLLARS	TOTAL IMPORTS [1]	IMPORTS BY AFFILIATES [2]	SHARE OF AFFILIATES [2] / [1]
ALL COUNTRIES	870,213	261,482	30.05%
CANADA	168,201	22,773	13.54%
JAPAN	121,663	97,670	80.28%
GERMANY	43,122	23,892	55.41%
UNITED KINGDOM	32,659	10,722	32.83%
FRANCE	20,636	6,260	30.34%
MEXICO	85,938	11,351	13.21%
CHINA	62,558	2,342	3.74%
KOREA	23,173	10,651	45.96%

SOURCE: ZEILE (1999)

NOTES:

(1) A U.S. affiliate is a business enterprise in which there is a foreign direct investment -- that is, in which a single foreign person owns or controls, directly or indirectly, 10 percent or more of the voting securities or an equivalent interest.

(2) Column [2] in panel B indicates the imports from the country by all U.S. affiliates, including those with a parent company in a different country. For example imports from Canada by the U.S. affiliate of a Japanese company are listed under Canada in column [2].

TABLE 2
IMPACT OF A UNIT MONETARY SHOCK IN THE HOME COUNTRY

CROSS COUNTRY DIFFERENCES: SHORT RUN AND WELFARE RESULTS

			s	c - c*	y - y*	b / (1-n)	u (npv)	u* (npv)	u - u*
ρ = 1	δ = 0	FOR	1.00	1.00	0.00	0.00	0.58	-0.42	1.00
		DOM	1.14	1.00	0.00	-2.14	-0.93	1.10	-2.03
	δ = 0.5	FOR	1.00	0.50	0.50	0.00	0.13	0.04	0.08
		DOM	1.06	0.47	0.53	-1.00	-0.61	0.78	-1.39
	δ = 1	FOR	1.00	0.00	1.00	0.00	-0.33	0.50	-0.83
		DOM	1.00	0.00	1.00	0.00	-0.33	0.50	-0.83
ρ = 6	δ = 0	FOR	1.00	1.00	0.00	0.00	0.58	-0.42	1.00
		DOM	1.08	1.00	0.00	-2.08	-0.46	0.62	-1.08
	δ = 0.5	FOR	0.92	0.54	2.75	2.21	0.31	-0.15	0.46
		DOM	0.95	0.53	2.85	1.37	-0.15	0.32	-0.47
	δ = 1	FOR	0.85	0.15	5.09	4.09	0.08	0.08	0.00
		DOM	0.85	0.15	5.09	4.09	0.08	0.08	0.00

TABLE 3
THRESHOLDS FOR THE EXTENT OF DOMESTIC OWNERSHIP

A. $\rho = 1$

	$\delta = 0$	$\delta = 0.1$	$\delta = 0.2$	$\delta = 0.3$	$\delta = 0.4$	$\delta = 0.5$	$\delta = 0.6$	$\delta = 0.7$	$\delta = 0.8$
ϕ^{AVG} [u* (npv) = 0]	0.30	0.26	0.21	0.15	0.06	0.00	0.00	0.00	0.00
ϕ^{AVG} [u (npv) = u* (npv)]	0.36	0.33	0.28	0.23	0.16	0.06	0.00	0.00	0.00
ϕ^{AVG} [u (npv) = 0]	0.42	0.39	0.36	0.32	0.26	0.18	0.07	0.00	0.00

B. $\rho = 6$

	$\delta = 0$	$\delta = 0.1$	$\delta = 0.2$	$\delta = 0.3$	$\delta = 0.4$	$\delta = 0.5$	$\delta = 0.6$	$\delta = 0.7$	$\delta = 0.8$
ϕ^{AVG} [u* (npv) = 0]	0.42	0.41	0.39	0.38	0.35	0.32	0.27	0.18	0.01
ϕ^{AVG} [u (npv) = u* (npv)]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
ϕ^{AVG} [u (npv) = 0]	0.58	0.59	0.61	0.62	0.65	0.68	0.73	0.82	0.98

INTERPRETATION:

$\phi^{AVG} < \phi^{AVG}$ [u* (npv) = 0] -------> u (npv) > 0 > u* (npv)

$\phi^{AVG} = \phi^{AVG}$ [u* (npv) = 0] -------> u (npv) > 0 = u* (npv)

ϕ^{AVG} [u* (npv) = 0] < $\phi^{AVG} < \phi^{AVG}$ [u (npv) = u* (npv)] -------> u (npv) > u* (npv) > 0

$\phi^{AVG} = \phi^{AVG}$ [u (npv) = u* (npv)] -------> u (npv) = u* (npv) > 0

ϕ^{AVG} [u (npv) = u* (npv)] < $\phi^{AVG} < \phi^{AVG}$ [u (npv) = 0] -------> u* (npv) > u (npv) > 0

$\phi^{AVG} = \phi^{AVG}$ [u (npv) = 0] -------> u* (npv) > 0 = u (npv)

$\phi^{AVG} > \phi^{AVG}$ [u (npv) = 0] -------> u* (npv) > 0 > u (npv)

FIGURE 1: TRADE FLOWS AND IMPORTERS' OWNERSHIP

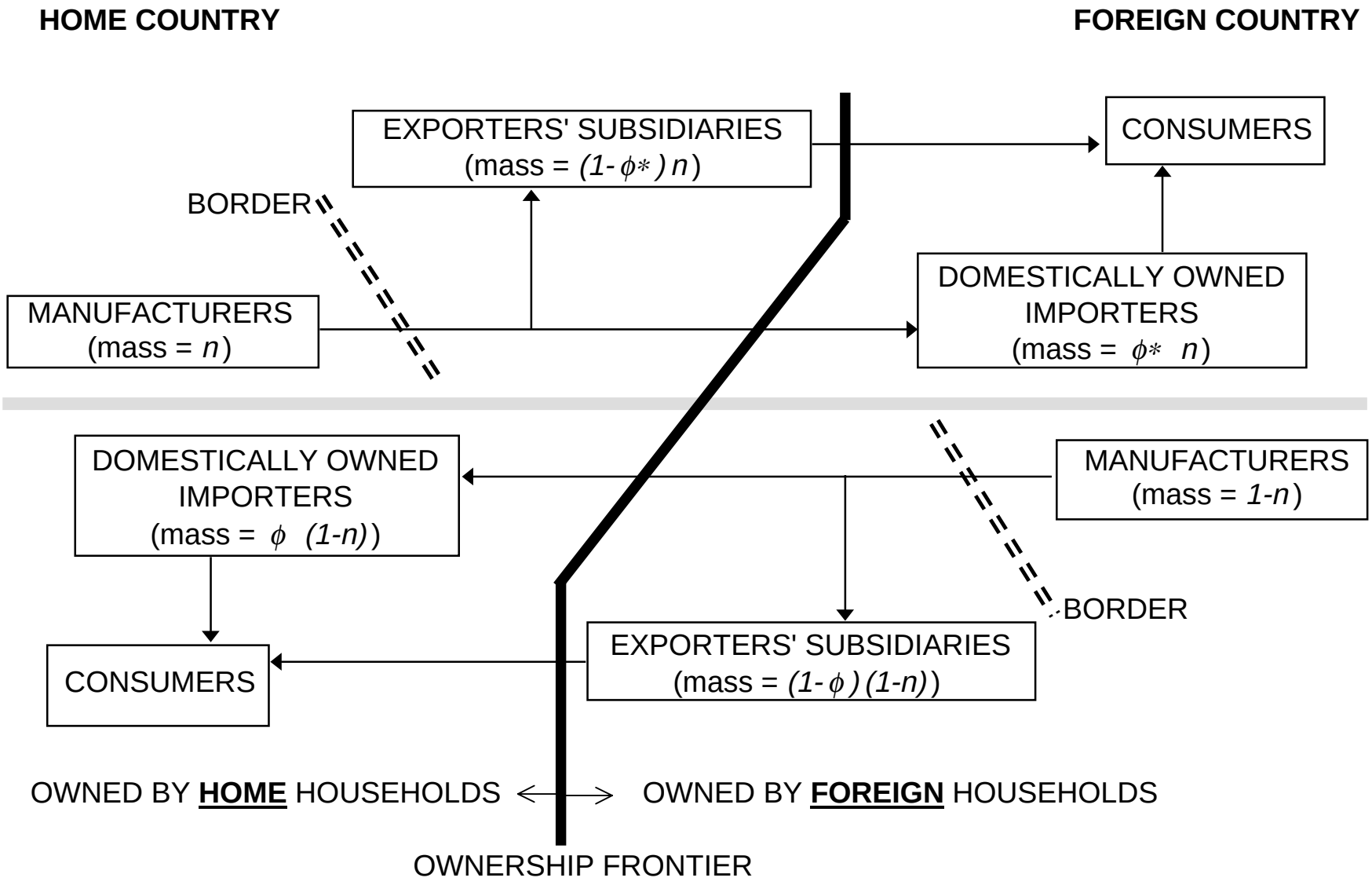

FIGURE 2: IMPACT OF A HOME CURRENCY DEPRECIATION

IMPORTERS ARE EXPORTERS' SUBSIDIARIES
($\phi = \phi^* = 0$)

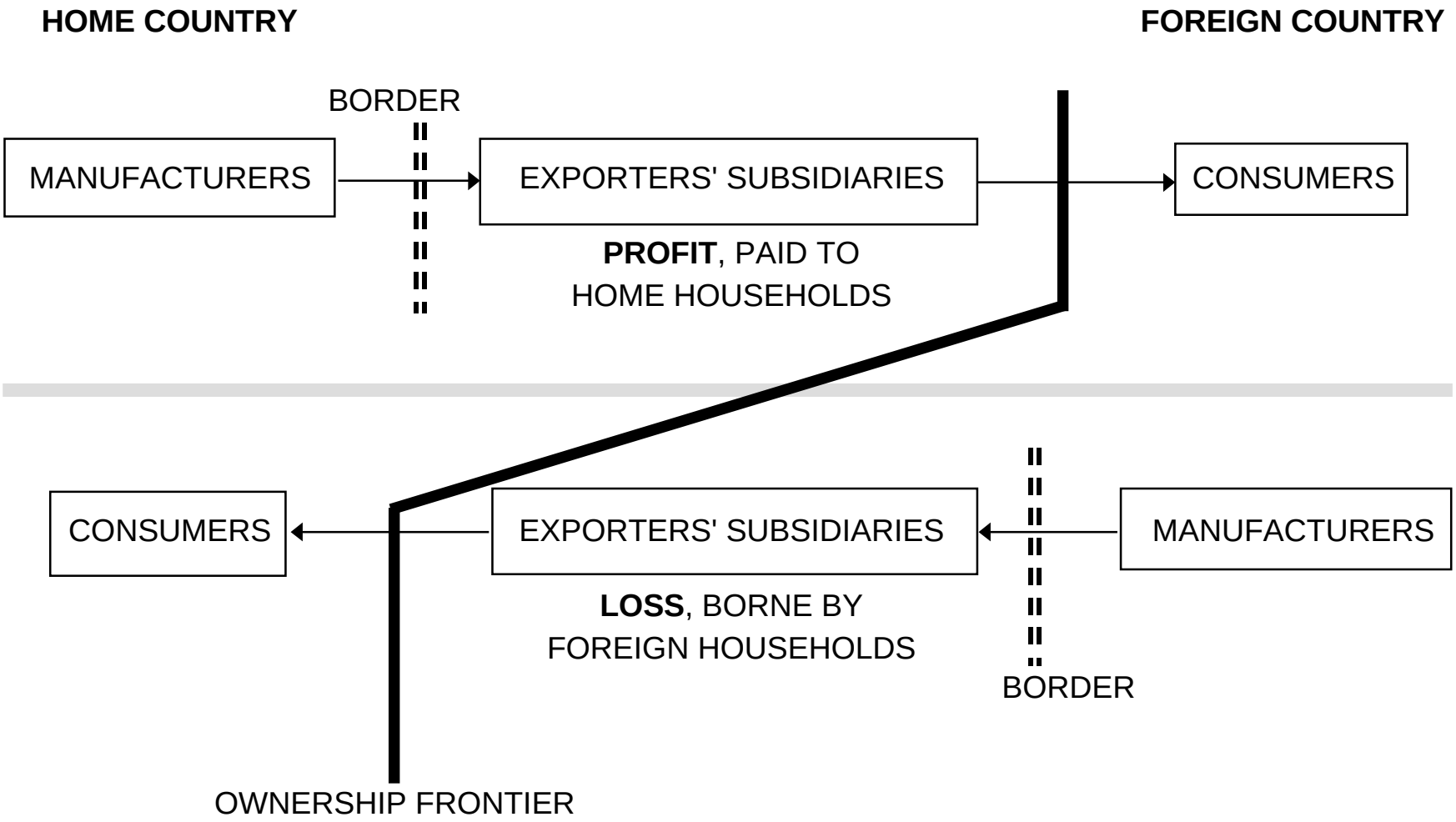

FIGURE 3: IMPACT OF A HOME CURRENCY DEPRECIATION

IMPORTERS ARE DOMESTICALLY OWNED
($\phi = \phi^* = 1$)