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Why ``Buy American'' is a Bad Idea but Politicians Still Like it

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Abstract:

When the world economy was recently hit by a severe recession, governments all over the world reacted by initiating stimulus packages. Some countries (among them, most notably, China and the US) tried to put special emphasis on their home industries by including ``Buy local'' clauses into the stimulus package. By analyzing the dynamics of transitory changes of trade barriers as a short-run response to an economic downturn, we show that beggar-thy-neighbor policy does not work. We then come up with two rationales that help to understand why countries nevertheless consider protectionism to be a good response to a recession: (i) the relationship between vulnerability and the degree of openness to trading partner countries, and (ii) the lobbying of domestic, non-exporting firms.

Keywords: Protectionism; trade liberalization; short term shocks

JEL classification: F11, F12, F16

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1 Introduction

During the great depression of the 1930s many countries tried to protect their economies by building up trade barriers. Today there is widespread agreement that these measures contributed importantly to the depth and persistence of the crisis. Nevertheless, there has been a worrisome, though still small, increase in protectionist measures as response to the latest global financial and economic crisis that started in 2008.

This is manifested in the latest figures about the world trade development. In the course of the current crisis world trade has suffered tremendous decreases over the last few months. Over the first six month of 2009 world trade has seen an unprecedented slump of approximately 20% and was almost back to the level it had at the beginning of 2005. This phenomenon is not restricted to just a few countries, but has hit most economies around the globe.

As noted by Baldwin and Evenett (2009), so far this reduction is mainly due to the recession and not (yet) due to protectionist measures. Nevertheless, there has already been an increase in protectionist measures as documented, e.g., by IMF and World Bank (2009) or Erixon (2009). At the beginning of 2009, the US-congress seriously wanted to incorporate "Buy American" clauses in the huge stimulus package. After an outcry of policy-makers and economists around the globe, these measures have been cut down by a considerable degree. More recently China shocked the world community by announcing that it would use similar clauses for their stimulus package,[1] while in September the Economist articulated in a leading article concerns about a new trade war following an announcement that the US wanted to raise tariffs on Chinese tyres.[2]

One may think that there is relatively little room for increasing protectionism due to the rules of the WTO. However, as argued for example in Bouet and Laborde (2008), there is currently still much room for raising tariffs without violating WTO law. Most developed countries could increase tariffs by as much as 100%, because they already set their tariffs lower than obliged. For low-income countries this margin is even higher.

Given the latest political debates about the "Buy American" clause and similar ambitions in China, one may ask if such policies really help countries to dampen the negative effects of economic crises and mitigate economic downturns.

Richard Baldwin and Simon Evenett (2009) brought together well-renowned researches to contribute to a recent VoxEU- E-book entitled "The collapse of global trade, murky protectionism and the crisis: Recommendations for the G20" in order to propose steps to counteract recent protectionist tendencies. Specifically, they suggest to: (i) Follow Keynes at home and Smith abroad: Fiscal stimulus packages are fine, but it should be taken care that the measures do

[1] See e.g. the report in the Wall Street Journal of June 18, 2009, available online at http://online.wsj.com/article/SB124520724753222171.html.

[2] See http://www.economist.com/printedition/displayStory.cfm?story_id=14450332.

not harm trade. Spill-overs to other countries are explicitly encouraged, or as Simon Crean put it: "nurture-thy-neighbor" instead of "beggar-thy-neighbor". (ii) Introduce a global surveillance mechanism: Assemble a team of independent experts to track protectionism and issue warnings in real-time. (iii) Agree on a temporary, legal-binding standstill on protection: Government leaders should commit on not to raise trade barriers for the duration of the global economic downturn. (iv) Don't abandon developing nations. (v) Facilitate trade as foundation for export-led recovery: Use the momentum of the crisis to accelerate the completion of the WTO's current negotiations on trade facilitation.

Especially the first point is criticized by Fredrik Erixon (2009). He argues that "higher government spending means more discretionary powers for politicians and bureaucrats, indiscriminate subsidies, rent-seeking and corruption" and "Big Government at home means a new age of protection abroad". Instead he calls for a "coalition of the willing" committing themselves to not raise trade-barriers. Kumar (2009) argues that the main problem lies in the shortage of credit and suggests the foundation of an "International Trade Financing Fund", a new international organization along the lines of IMF and World Bank with the mandate to finance trade of large global firms.

The E-book of Baldwin and Evenett (2009) also discusses some reasons why protectionism would hurt a country rather than protecting it from the global downturn: One argument is that through the global interlinkages and supply chains, import restrictions would harm domestic firms because input-costs are increased. Anne Krueger argues that import-competing goods would have higher prices and thus reduce demand, while Viktor Fung stresses the danger of retaliation from trading partners. In line with this, Hufbauer and Schott (2009) estimate that a "Buy American" clause could gain 10.000 jobs but loose as much as 65.000 through retaliation.

It is the purpose of this paper to thoroughly analyze the effects of protectionism as a short-run response to an economic downturn. In order to capture the short-run effects properly, it is necessary to look at the dynamics out of steady-state. However, most of the literature in international trade focusses on the steady-state effects of trade liberalization. And even though there are some papers dealing with dynamics, none of them has a focus similar to ours. We will briefly summarize these papers here.[3]

Costantini and Melitz (2007) develop a dynamic model of firm-level adjustment to trade liberalization that captures the self-selection of more productive firms into export markets, the joint export market participation and innovation decisions, and the continuing innovation of other firms following their entry into export markets. They compare three scenarios: (i) an unanticipated abrupt lowering of the trade costs; (ii) an abrupt change in trade costs, but anticipated three

[3]We do not survey the trade and growth literature, which also investigates adjustment dynamics. See for a good monograph Grossman and Helpman (1991).

years ahead; (iii) and an anticipated but gradual change in trade costs. One of their main findings is that the anticipation of future liberalization induces many new exporters to innovate already before the actual liberalization, and also before their own entry into the export market.

Ghironi and Melitz (2005) provide in a dynamic general equilibrium model with trade in bonds the effects of a symmetric lowering of variable and fixed trade costs. In both scenarios, trade liberalization induces a substantial increase in the number of exporting firms, along with a decrease in the export productivity cutoff (exporting becomes more profitable for all firms), as in the standard Melitz (2003) framework. In line with many micro-level studies of trade liberalization, a substantial portion of the increase in overall trade comes from the extensive margin (more exporting firms). Brůha and Podpiera (2007) extend the Ghironi and Melitz (2005) framework by endogenizing the vertical investments (investments into quality improvements) in order to replicate the observed pace of the real exchange rate appreciation in Central and Eastern European countries. Concerning trade liberalization, they investigate an exogenous, permanent fall in trade costs at a specific point in time. They find that the smaller country borrows to finance entry of additional firms, i.e., relatively more firms enter in the smaller country because of the export market effect, leading to an increase in GDP and an appreciation of the exchange rate.

Albuquerque and Rebelo (2000) consider reforms with different degrees of permanence and timing and find that even though it is optimal to immediately liberalize international trade, these reforms may not take place because of concern over their impact on the distribution of income. A similar result is obtained by Bacchetta and Dellas (1997), who show that the case for gradualism becomes stronger when there is more emphasis on the longer term allocation of resources. Antras and Caballero (2009a) study in a dynamic general equilibrium model based on Antras and Caballero (2009b) with financial frictions how trade liberalization effects income, consumption and the distribution of wealth in financially underdeveloped economies.

Another part of the literature focusses on reasons for gradual trade reforms. Mussa (1986) and Leamer (1980) show that *unilateral* trade liberalization in the presence of adjustment costs, i.e. costs for workers to move from one industry to another, may make gradualism preferable especially to reduce the pain of workers in the protected sector. Staiger (1995) attributes gradualism in trade liberalization to self-enforceability of agreements. Furusawa and Lai (1999) show that self-enforceability of *bilateral* trade liberalization together with adjustment costs for workers are also sufficient to induce gradualism.

In contrast to all of the above papers which are mainly concerned with the transition from one steady state to another, we extend the current literature by explicitly focussing on the dynamics of transitory changes of trade barriers as a response to economic shocks. In order to capture the relevant transmission mechanisms of changes in trade costs, such as market size and productivity changes

of firms,[4] we build on the work by Melitz (2003) and specifically rely heavily on the dynamic version introduced by Ghironi and Melitz (2005). While the basic Melitz (2003) framework only allows for comparisons of different steady-states, the Ghironi and Melitz (2003) framework is well suited for the analysis of the current crisis since it allows for deviations from the long-run equilibrium, in other words, it allows for recessions.

It is quite obvious that we are currently not in a long-run equilibrium and thus a sensible analysis of protectionism in the current crisis needs to take this into account. We account for this fact by explicitly studying the transitional dynamics of our economies. Here we depart from the large literature of the effects in international trade, which mainly finds that there are gains from trade liberalization when comparing steady-state outcomes (see for a discussion of the "gains form trade" hypothesis for example Feenstra, 2004). Specifically, we are interested in whether it is a good idea to respond with protectionism in the case of a negative productivity shock. We investigate various scenarios, where we distinguish whether the trading partner responds to increased trade barriers or not. The main conclusion is that protectionism hurts all countries, including the country imposing the protectionist measures, even if the other countries do not react with protectionism by themselves. Thus, the results from our model yields a powerful argument against any kinds of protectionism.

Nevertheless, many policy makers seem to like protectionist measures. Is there a way to rationalize this? The answer is yes. There are two rationales that help to understand why countries consider protectionism to be a good idea as a response to a recession: (i) Confusing short-run and long-run effects. It is true that economies with higher (steady-state) trade costs are less vulnerable to foreign shocks but that does not mean that raising trade barriers in response to economic shocks is the right answer. (ii) Firms are hit differently by protectionism. Actually, domestic firms that do not export at all gain in terms of total profits from raising trade barriers. Hence, whenever domestic firms that do not export have a strong lobby, a government may raise trade barriers in order gain political support for the next election.

2 The Model

In this section we describe the model framework introduced in Ghironi and Melitz (2005) allowing for international trade in bonds.

[4]Its popularity stems from the combination of being able to capture important stylized facts, like the fact that only very productive firms export, that exporters are bigger and employ more workers than domestic firms, and that small firms with low productivity are driven out of the market, while it remains still very tractable. See the empirical studies by Dunne, Roberts and Samuelson (1989); Davis and Haltiwanger (1992); Bernard and Jensen (1995, 1999, 2004); Roberts and Tybout (1997); Clerides, Lach and Tybout (1998); and Bartelsman and Doms (2000) for evidence concerning the stylized facts.

2.1 Household Preferences and Intratemporal Choices

We assume two countries, labeled home and foreign. Foreign variables are denoted by an asterisk. Each country is populated by a unit mass of atomistic households. Prices are in nominal terms and flexible. In the following, we only solve for the real variables. However, as the composition of consumption baskets in the two countries changes over time, which affects the definitions of the consumption-based price indexes, money is introduced as a convenient unit of account for contracts. However, as money plays no other role, the demand for cash currency is not modeled, following Ghironi and Melitz (2005).

The representative home (foreign) household supplies L (L^*) units of labor inelastically in each period at the nominal wage rate W_t (W_t^*), denominated in units of the home (foreign) currency. Every household maximizes expected intertemporal utility from consumption (C): $E_t[\sum_{s=t}^{\infty} \beta^{s-t} C_s^{1-\gamma}/(1-\gamma)]$, where $\beta \in (0,1)$ is the subjective discount factor and $\gamma > 0$ is the inverse of the intertemporal elasticity of substitution. At time t, the household consumes the basket of goods C_t, defined over a continuum of goods $\Omega : C_t = \left(\int_{\omega \in \Omega} c_t(\omega)^{(\theta-1)/\theta} d\omega\right)^{\theta/(\theta-1)}$, where $\theta > 1$ is the elasticity of substitution across goods. Note that only a subset of goods $\Omega_t \subset \Omega$ is available at any given time t. We denote $p_t(\omega)$ the home currency price of a good $\omega \in \Omega_t$. The consumption-based price index for the home economy is then $P_t = \left(\int_{\omega \in \Omega_t} p_t(\omega)^{1-\theta} d\omega\right)^{1/(1-\theta)}$, and the household's demand for each individual good ω is given by $c_t(\omega) = \left(p_t(\omega)/P_t\right)^{-\theta} C_t$.

We assume that the foreign country has identical parameters, leading to a similar price index and demand function. However, the subset of goods available for consumption in the foreign economy during period t is $\Omega_t^* \subset \Omega$ and can differ from the subset of goods that are available in the home economy.

2.2 Production, Pricing, and the Export Decision

There is a continuum of firms in each country, each producing a different variety $\omega \in \Omega$. There is only one factor of production, labor. Aggregate labor productivity is indexed by $Z_t(Z_t^*)$, which represents the effectiveness of one unit of home (foreign) labor. Firms are heterogeneous with respect to their unit cost of production, following Melitz (2003), where a home firm with relative productivity z produces $Z_t z$ units of output per unit of labor employed. Hence, the unit cost of production, measured in units of the consumption good C_t, is $w_t/(Z_t z)$, where $w_t \equiv W_t/P_t$ is the real wage. Similarly, unit costs of production for foreign firms are given by $w_t^*/(Z_t^* z)$, where $w_t^* \equiv W_t^*/P_t^*$ is the real wage of foreign workers.

Before entering the market firms have to incur a sunk entry cost of $f_{E,t}(f_{E,t}^*)$ effective labor units, equal to $w_t f_{E,t}/Z_t(w_t^* f_{E,t}^*/Z_t^*)$ units of the home (foreign) consumption good. Upon entry, firms at home and abroad draw their productivity level z from a common distribution $G(z)$ with support on $[z_{\min}, \infty)$, which stays

constant thereafter. In contrast to Melitz (2003) there are no fixed production costs, which implies that all firms produce in every period. Every firm may be hit by a "death" shock, which occurs with probability $\delta \in (0,1)$ in each period. It is assumed that this exit-inducing shock is independent of the firm's productivity level, so $G(z)$ also represents the productivity distribution of all producing firms.

Beside serving the domestic market, a firm may export. Exporting involves variable iceberg trade cost $\tau_t \geq 1 (\tau_t^* \geq 1)$ as well as period-by-period fixed costs $f_{X,t}(f_{X,t}^*)$ (measured in units of effective labor). Both, variable and fixed costs are covered by domestic labor. These costs, in real terms and unit of the home (foreign) consumption good, are then $w_t f_{X,t}/Z_t$ $(w_t^* f_{X,t}^*/Z_t^*)$ for home (foreign) firms.

Given the demand function with constant elasticity (θ) and monopolistic competition, optimal pricing behavior of all firms is given by a constant markup $\theta/(\theta-1)$ over marginal cost. Let $p_{D,t}(z)$ and $p_{X,t}(z)$ denote the nominal domestic and export prices of a home firm, where the export prices are denominated in the currency of the export market. Prices, in real terms relative to the price index in the destination market, are then given by

$$\rho_{D,t}(z) \equiv \frac{p_{D,t}(z)}{P_t} = \frac{\theta}{\theta-1}\frac{w_t}{Z_t z}, \quad \rho_{X,t}(z) \equiv \frac{p_{X,t}(z)}{P_t^*} = Q_t^{-1}\tau_t \rho_{D,t}(z), \tag{1}$$

where $Q_t \equiv \varepsilon_t P_t^*/P_t$ is the consumption-based real exchange rate, i.e., units of home consumption per unit of foreign consumption, where ε_t is the nominal exchange rate in units of home currency per unit of the foreign currency.

Due to the fixed export cost, firms with low productivity levels z may decide not to export. Total profits $d_t(z)(d_t^*(z))$ are distributed to households as dividends and expressed in terms of the home consumption basket. They are given by $d_t(z) = d_{D,t}(z) + d_{X,t}(z)$, where

$$d_{D,t}(z) = \frac{1}{\theta}\left[\rho_{D,t}(z)\right]^{1-\theta} C_t, \tag{2}$$

$$d_{X,t}(z) = \begin{cases} \frac{Q_t}{\theta}\left[\rho_{X,t}(z)\right]^{1-\theta} C_t^* - \frac{w_t f_{X,t}}{Z_t} & \text{if firm } z \text{ exports,} \\ 0 & \text{otherwise.} \end{cases} \tag{3}$$

Foreign firms behave in a similar way. As in Melitz (2003), more productive firms earn higher profits (relative to less productive firms) and set lower prices (see equation (1)). A home (foreign) firm will export when productivity z is above a cutoff level $z_{X,t} = \inf\{z : d_{X,t}(z) > 0\}$ $(z_{X,t}^* = \inf\{z : d_{X,t}^*(z) > 0\})$. The lower bound productivity $z_{\min}$ is assumed to be low enough relative to the export costs so that $z_{X,t}$ and $z_{X,t}^*$ are both above $z_{\min}$. This ensures that firms with productivity levels between $z_{\min}$ and $z_{X,t}$ $(z_{X,t}^*)$ decide not to export. Note that this set of firms as well as $z_{X,t}$ and $z_{X,t}^*$ fluctuates over time with changes in the profitability of the export market.

2.3 Firm Averages

In every period, a mass $N_{D,t}(N^*_{D,t})$ of firms produces in the home (foreign) country. These firms have a distribution of productivity levels over $[z_{\min}, \infty)$ given by $G(z)$. Among these firms, there are $N_{X,t} = [1 - G(z_{X,t})]N_{D,t}$ and $N^*_{X,t} = [1 - G(z^*_{X,t})]N^*_{D,t}$ exporters. Following Melitz (2003), we define two special "average" productivity levels - an average $\tilde{z}_D$ for all producing firms (in each country), and an average $\tilde{z}_{X,t}$ for all home exporters:

$$\tilde{z}_D \equiv \left[\int_{z_{\min}}^{\infty} z^{\theta-1} dG(z)\right]^{\frac{1}{\theta-1}}, \quad \tilde{z}_{X,t} \equiv \left[\frac{1}{1 - G(z_{X,t})}\int_{z_{X,t}}^{\infty} z^{\theta-1} dG(z)\right]^{\frac{1}{\theta-1}}. \quad (4)$$

(The definition of $\tilde{z}^*_{X,t}$ is analogous to that of $\tilde{z}_{X,t}$.) As shown in Melitz (2003), these productivity averages - based on weights proportional to relative firm output shares - summarize all the information about the productivity distributions which is relevant for the macroeconomic variables. In essence, this implies that the model is isomorphic to one where $N_{D,t}(N^*_{D,t})$ firms with productivity level $\tilde{z}_D$ produce in the home (foreign) country and $N_{X,t}(N^*_{X,t})$ firms with productivity level $\tilde{z}_{X,t}(\tilde{z}^*_{X,t})$ export to the foreign (home) market.

In particular, $\tilde{p}_{D,t} \equiv p_{D,t}(\tilde{z}_D)(\tilde{p}^*_{D,t} \equiv p^*_{D,t}(\tilde{z}_D))$ represents the average nominal price of home (foreign) firms in their domestic market, and $\tilde{p}_{X,t} \equiv p_{X,t}(\tilde{z}_{X,t})(\tilde{p}^*_{X,t} \equiv p^*_{X,t}(\tilde{z}^*_{X,t}))$ represents the average nominal price of home (foreign) exporters in the export market. The price index at home reflects the prices of the $N_{D,t}$ home firms (with average price $\tilde{p}_{D,t}$) and the $N^*_{X,t}$ foreign exporters to the home market (with average price $\tilde{p}^*_{X,t}$). The home price index can thus be written as $P_t = \left[N_{D,t}(\tilde{p}_{D,t})^{1-\theta} + N^*_{X,t}(\tilde{p}^*_{X,t})^{1-\theta}\right]^{1/(1-\theta)}$. This is equivalent to $N_{D,t}(\tilde{\rho}_{D,t})^{1-\theta} + N^*_{X,t}(\tilde{\rho}^*_{X,t})^{1-\theta} = 1$, where $\tilde{\rho}_{D,t} \equiv \rho_{D,t}(\tilde{z}_D)$ and $\tilde{\rho}^*_{X,t} \equiv \rho^*_{X,t}(\tilde{z}^*_{X,t})$ represent the average relative prices of home producers and foreign exporters in the home market. Similar equations hold for the foreign price index.

The productivity averages $\tilde{z}_D$, $\tilde{z}_{X,t}$, and $\tilde{z}^*_{X,t}$ are constructed in such a way that $\tilde{d}_{D,t} \equiv d_{D,t}(\tilde{z}_D)(\tilde{d}^*_{D,t} \equiv d^*_{D,t}(\tilde{z}_D))$ represents the average firm profit earned from domestic sales for all home (foreign) producers; and $\tilde{d}_{X,t} \equiv d_{X,t}(\tilde{z}_{X,t})(\tilde{d}^*_{X,t} \equiv d^*_{X,t}(\tilde{z}^*_{X,t}))$ represents the average firm export profits for all home (foreign) exporters. Thus, $\tilde{d}_t \equiv \tilde{d}_{D,t} + [1 - G(z_{X,t})]\tilde{d}_{X,t}$ and $\tilde{d}^*_t \equiv \tilde{d}^*_{D,t} + [1 - G(z^*_{X,t})]\tilde{d}^*_{X,t}$ represent the average total profits of home and foreign firms, since $1 - G(z_{X,t})$ and $1 - G(z^*_{X,t})$ represent the proportion of home and foreign firms that export and earn export profits.

2.4 Firm Entry and Exit

In every period there is an unbounded mass of prospective entrants in both countries. These entrants are forward looking, and correctly anticipate their

future expected profits $\tilde{d}_t(\tilde{d}_t^*)$ in every period (the preentry expected profit is equal to postentry average profit) as well as the probability δ (in every period) of incurring the exit-inducing shock. Entrants at time t only start producing at time $t+1$, which introduces a one-period time-to-build lag in the model. The exogenous exit shock occurs at the very end of the time period (after production and entry). A proportion δ of new entrants will therefore never produce. Home entrants in period t compute their expected postentry value given by the present discounted value of their expected stream of profits $\{\tilde{d}_s\}_{s=t+1}^{\infty}$:

$$\tilde{v}_t = E_t \sum_{s=t+1}^{\infty} [\beta(1-\delta)]^{s-t} \left(\frac{C_s}{C_t}\right)^{-\gamma} \tilde{d}_s. \tag{5}$$

This also represents the average value of incumbent firms after production has occurred, since both new entrants and incumbents then face the same probability $1-\delta$ of survival and production in the subsequent period. Firms discount future profits using the household's stochastic discount factor, adjusted for the probability of firm survival $1-\delta$. Entry occurs until the average firm value is equalized with the entry cost, leading to the free entry condition $\tilde{v}_t = w_t f_{E,t}/Z_t$. This condition holds as long as the mass $N_{E,t}$ of entrants is positive. Following Ghironi and Melitz (2005), it is assumed that macroeconomic shocks are small enough for this condition to hold in every period. Finally, the timing of entry and production we have assumed implies that the number of home-producing firms during period t is given by $N_{D,t} = (1-\delta)(N_{D,t-1} + N_{E,t-1})$. A similar free entry condition, requirements for the size of shocks, and law of motion for the number of producing firms hold in the foreign country.

2.5 Household Budget Constraint and Intertemporal Choices

Households in each country hold two types of assets: shares in a mutual fund of domestic firms and domestic and foreign risk-free bonds. Bonds at home and abroad pay risk-free, consumption-based real returns. x_t denotes the share in the mutual fund of home firms held by the representative home household entering period t. The mutual fund pays a total profit in each period (in units of the home currency) that is equal to the average total profit of all home firms that produce in that period, $P_t\tilde{d}_t N_{D,t}$. During period t, the representative home household buys x_{t+1} shares in a mutual fund of $N_{H,t} = N_{D,t} + N_{E,t}$ home firms (those already operating at time t and the new entrants). Only $N_{D,t+1} = (1-\delta)N_{H,t}$ firms will produce and pay dividends at time $t+1$. Since the household does not know which firms will be hit by the exogenous exit shock δ, it finances the continuing operation of all preexisting home firms and all new entrants during period t. The date t price (in units of home currency) of a claim to the future profit stream of

the mutual fund of $N_{H,t}$ firms is equal to the average nominal price of claims to future profits of home firms, $P_t\tilde{v}_t$.

The home household enters period t with home (foreign) bond holdings B_t ($B_{*,t}$) in units of consumption and mutual fund share holdings x_t. It receives gross interest income on bond holdings, dividend income on mutual fund share holdings and the value of selling its initial share position, and labor income. The household allocates these resources between purchases of bonds and shares to be carried into next period and consumption. Thus, the period budget constraint (in units of consumption) is

$$\begin{aligned} &B_{t+1} + Q_t B_{*,t+1} + \frac{\eta}{2}(B_{t+1})^2 + \frac{\eta}{2} Q_t (B_{*,t+1})^2 \tilde{v}_t N_{H,t} x_{t+1} + C_t = \\ &(1+r_t)B_t + (1+r_t^*)B_{*,t} + (\tilde{d}_t + \tilde{v}_t)N_{D,t}x_t + T_t^f + w_t L, \end{aligned} \tag{6}$$

where r_t is the consumption-based interest rate on holdings of bonds between $t-1$ and t (known with certainty as of $t-1$) and $(\eta/2)(B_{t+1})^2$ ($(\eta/2)(B_{*,t+1})^2$) is the cost of adjusting home (foreign) bonds. The assumption of fees that are quadratic functions of the stock of bonds is sufficient to uniquely pin down the steady state and deliver stationary model dynamics in response to temporary shocks (see for more details Ghironi, 2000). T_t^f is the rebate of fees, taken as given by the household, and equal to $(\eta/2)[(B_{t+1})^2 + Q_t(B_{*,t+1})^2]$ in equilibrium.

A similar constraint holds for the foreign country:

$$\begin{aligned} &\frac{B_{t+1}^*}{Q_t} + B_{*,t+1}^* + \frac{\eta}{2}\frac{(B_{t+1}^*)^2}{Q_t} + \frac{\eta}{2}(B_{*,t+1}^*)^2 \tilde{v}_t^* N_{F,t}^* x_{t+1}^* + C_t^* = \\ &\frac{(1+r_t)}{Q_t} B_t^* + (1+r_t^*)B_{*,t}^* + (\tilde{d}_t^* + \tilde{v}_t^*)N_{D,t}^* x_t^* + T_t^{f*} + w_t^* L^*, \end{aligned} \tag{7}$$

where B_{t+1}^* denotes holdings of the home bond, $B_{*,t+1}^*$ denotes holdings of the foreign bond, and $T_t^{f*} = (\eta/2)[(B_{t+1}^*)^2/Q_t + (B_{*,t+1}^*)^2]$ in equilibrium.

The home and foreign households maximize their expected intertemporal utility subject to (6) and (7), respectively.

The Euler equations for share holdings at home are

$$\tilde{v}_t = \beta(1-\delta)E_t\left[\left(\frac{C_{t+1}}{C_t}\right)^{-\gamma}(\tilde{v}_{t+1} + \tilde{d}_{t+1})\right]. \tag{8}$$

The Euler equations for bond holdings at home are

$$(C_t)^{-\gamma}(1+\eta B_{t+1}) = \beta(1+r_{t+1})E_t[(C_{t+1})^{-\gamma}], \tag{9}$$

$$(C_t)^{-\gamma}(1+\eta B_{*,t+1}) = \beta(1+r_{t+1}^*)E_t\left[\frac{Q_{t+1}}{Q_t}(C_{t+1})^{-\gamma}\right]. \tag{10}$$

Similar relationship for the Euler equations for share and bond holdings apply abroad.

As expected, forward iteration of the equation for share holdings and absence of speculative bubbles yield the asset price solution in equation (5).

2.6 Aggregate Accounting and Labor Market Clearing

Aggregating the budget constraint (6) and (7) across home (foreign) households and imposing the equilibrium conditions under international bond trading ($B_{t+1}+B^*_{t+1} = B_{*,t+1} + B^*_{*,t+1} = 0$ and $x_{t+1} = x_t = 1$) yields the aggregate accounting equation

$$B_{t+1} + Q_t B_{*,t+1} = (1+r_t)B_t + Q_t(1+r^*_t)B_{*,t} + w_t L + N_{D,t}\tilde{d}_t - N_{E,t}\tilde{v}_t - C_t. \quad (11)$$

This condition shows that in equilibrium, the markets for home and foreign bonds clear, and each country's net foreign assets entering period $t+1$ depend on interest income from asset holdings entering period t, labor income, net investment income (where $N_{E,t}\tilde{v}_t$ is the value of home investment in new firms), and consumption during period t. The change in asset holdings between t and $t+1$ is the country's current account. A similar equation holds abroad. Home and foreign current accounts add to zero when expressed in units of the same consumption basket.

To close the model, we have to impose labor market clearing at home and abroad, given for the home country by:

$$L = \frac{\theta - 1}{w_t}(N_{D,t}\tilde{d}_{D,t} + N_{X,t}\tilde{d}_{X,t}) + \frac{1}{Z_t}(\theta N_{X,t} f_{X,t} + N_{E,t} f_{E,t}), \quad (12)$$

and similarly abroad.

3 Calibration

3.1 Parametrization of Productivity Draws

To solve the model numerically, we assume that productivity z is distributed Pareto with lower bound $z_{\min}$ and shape parameter $k > \theta - 1 : G(z) = 1 - (z_{\min}/z)^k$. The assumption of a Pareto distribution for productivity induces a size distribution of firms that is also Pareto, which fits firm-level data quite well. k indexes the dispersion of productivity draws: dispersion decreases as k increases, and the firm productivity levels are increasingly concentrated toward their lower bound $z_{\min}$. Letting $v \equiv \{k/[k-(\theta-1)]\}^{1/(\theta-1)}$, the average productivities $\tilde{z}_D$ and $\tilde{z}_{X,t}$ are given by $\tilde{z}_D = v z_{\min}$ and $\tilde{z}_{X,t} = v z_{X,t}$. The share of home-exporting firms is then $N_{X,t}/N_{D,t} = 1 - G(z_{X,t}) = (v z_{\min}/\tilde{z}_{X,t})^k$, and the zero export profit condition (for the cutoff firm), $d_{X,t}(z_{X,t}) = 0$, implies that average export profits must satisfy $\tilde{d}_{X,t} = (\theta-1)(v^{\theta-1}/k) w_t f_{X,t}/Z_t$. Analogous results hold for $\tilde{z}^*_{X,t}$, $N^*_{X,t}/N^*_{D,t}$, and $\tilde{d}^*_{X,t}$.

3.2 Parametrization of Preferences and Costs

Every period represents a quarter and β is set equal to 0.99 and $\gamma = 2$. δ, the exogenous firm exit shock, is set equal to 0.025, which matches the U.S. empirical

level of 10 percent job destruction per year. θ is set equal to 3.8 following Bernard, Eaton, Jensen, and Kortum (2003). They also report that the standard deviation of log U.S. plant sales is 1.67. As in the given model this standard deviation is equal to $1/(k-\theta+1)$, the choice of $\theta = 3.8$ implies that $k = 3.4$. Relying on Obstfeld and Rogoff (2001) we set the steady-state value of trade costs $\bar{\tau}$ equal to 1.3.

The steady-state fixed export cost f_X is set to 23.5 percent of the per-period, amortized flow value of the entry cost, $[1-\beta(1-\delta)]/[\beta(1-\delta)]f_E$, such that the proportion of exporting plants matches the 21 percent reported in Bernard, Eaton, Jensen, and Kortum (2003). We set the scale parameter for the bond adjustment cost to $\eta = 0.0025$, which is enough to generate stationarity in response to transitory shocks but small enough to avoid overstating the role of this friction in determining the dynamics of the model.

Entry costs f_E are set to 1 without loss of generality, as changing f_E while maintaining the ratio f_X/f_E does not affect any of the impulse responses. For similar reasons, we normalize $z_{\min}$ to 1. Labor endowments are also normalized to 1, i.e., $L = 1$ and $L^* = 1$.

3.3 Parametrization of Shocks

Aggregate labor productivity in steady-state is normalized to one, i.e., $\bar{Z} = 1$ and $\bar{Z}^* = 1$.

In the following, we consider a negative shock to aggregate labor productivity in country one in the order of 1% of the steady-state value. In line with Ghironi and Melitz (2003) (and the business-cycle literature) we assume that the shock has long-lasting effects so that productivity slowly converges back to its steady-state value according to

$$Z_t = \bar{Z}^{1-\rho_z} Z_{t-1}^{\rho_z} e^{-u_t}, \tag{13}$$

where u_t is the shock term and ρ_z is the autocorrelation parameter, set equal to 0.9 if nothing else is mentioned.

How to model trade policy? One of the most important policy variables in a business-cycle model is the interest rate set by the central bank. Usually this interest rate is modeled via a Taylor-rule, describing how strong the central bank reacts to deviations of output and inflation from their long-run values. If policy makers consider trade policy as an instrument to react to economic down-turns it suggests itself to use a similar rule to determine trade costs. Thus, we assume that in case a government decides for active trade policy it uses the following rule:

$$\frac{\tau_t - 1}{\bar{\tau} - 1} = \left(\frac{\bar{Z}}{Z_t}\right) \tag{14}$$

which is a very simplified variation of a Taylor-rule, implying that trade costs increase by one percent whenever productivity decreases by one percent.

4 Protectionism and the Business Cycle

In this section we analyze the consequences of a temporary, asymmetric and negative shock to the productivity of one country and how the depth and persistence of the downturn is affected by the reaction of trade policy. Specifically, we show that protectionism is not apt to avoid the spill-over of a recession from a country to its trading partners. In contrast, protectionism will make matters worse for both countries, even when the trading partner does not react by retaliation and does not increase its trade barriers. We distinguish three different scenarios. First, we show how a productivity shock in country one affects both countries. Next, we show what happens if country two raises trade barriers according to the rule described above. Finally, we consider the case where both countries raise trade barriers.[5]

4.1 Economic Spill-overs

The base-scenario is very simple and similar to the exercises conducted in the business-cycles literature. We start from the stationary steady-state and assume that the aggregate productivity of country one is hit by a negative shock, reducing productivity by 1% on impact. Although the shock is only temporary it takes some time for productivity to recover to its steady state level. In line with Ghironi and Melitz (2005), we assume the coefficient of autocorrelation of the shock process is 0.9. The results are illustrated in Figure 1.

The left-hand panel illustrates the effects for country one, where the shock has occurred. Not very surprisingly, the slump in productivity causes a recession in country one. Consumption, exports and domestic production go down. Note that the impulse response of consumption shows a hump-shaped reaction. This feature is well in line with empirical results but not replicable with the standard New-Keynesian model (see Gali (2008)). Since the profitability of firms is decreased, the number of new firms diminishes and therefore also the total number of firms.

The reduced income in country one has also consequences for country two, because the demand for imports in country one goes down. This reduces returns in the export sector in country two and thus output and production go down there as well - this is how the recession spills over from one country to the other. Note that in the periods right after the shock the real exchange rate of country two depreciates, because its firms are relatively more productive and produce at

[5]For a brief discussion of the isolated effects of temporary changes in trade costs (without shocks to productivity) see the Appendix.

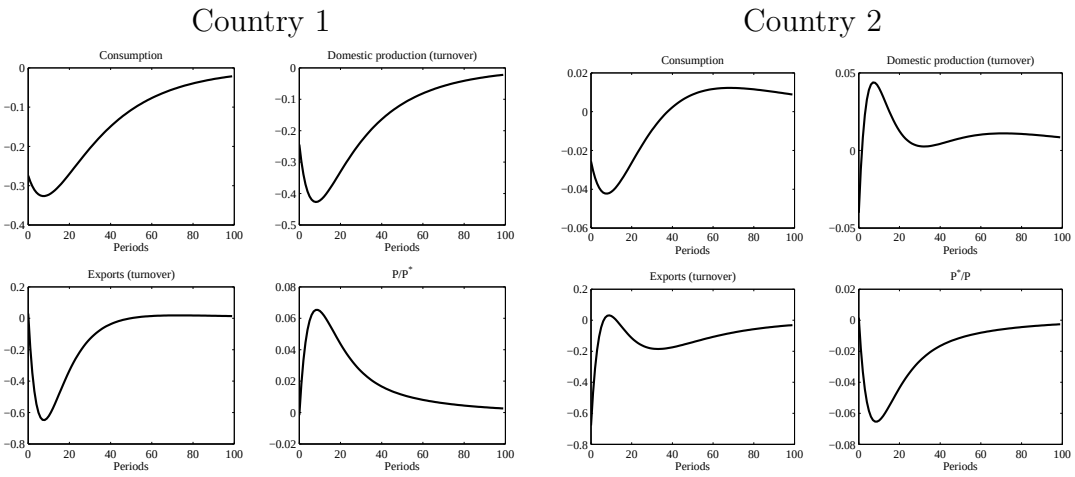

Figure 1: Scenario one: no changes in trade barriers.

lower costs. This induces exports to rise until the real exchange rate reaches its minimum, followed by a second slump in exports.

Hence, through the interlinkages of trade, country two also suffers an economic downturn. It is this phenomenon on which the popular argument is based, that one country is exporting its recession to its trading partners. One might think that raising trade barriers is thus a good way to avoid, or at least dampen, these spill-over effects. However, it will be shown that this view is indeed too shortsighted.

Before we discuss the effects of protectionism, it is worth noting two more facts about the adjustment illustrated in Figure 1: a) the effects are very persistent and in fact much more persistent than the underlying shock process. While productivity returns to its long-run value after 50 periods, for consumption this takes twice as long. The reason for this lies in the sluggish adjustment of the number of firms. b) Note that the effects for country two are quite small. This phenomenon is not new in the literature and therefore it is usually assumed that the productivities of countries are positively correlated.[6]

4.2 The Effects of Protectionism

Next we assume that country two tries to shield itself from the economic downturn of its trading partner and therefore raises import restrictions in order to protect import competing firms from cheap exports. Note that only the costs of exporting

[6]Backus, Kehoe and Kydland (1992) assume that productivity, instead of following equation (13), follows the rule $Z_t^* = \bar{Z}^{1-\rho_z-\tilde{\rho}_z}(Z_{t-1})^{\rho_z}(Z_{t-1}^*)^{\tilde{\rho}_z}e^{-u_t^*}$, where $\tilde{\rho}_z = 0.088$ is a coefficient describing the correlation of productivities between different countries. Doing a similar exercise in our framework does not qualitatively change our results. The results are available upon request.

from country one to country two are affected, while country one does not increase trade barriers, i.e. the costs of exporting from country two remain at their steady-state value. It is assumed that the increase in trade costs does not yield any direct returns to the government. In other words the increase in trade costs is not due to an increase in tariffs but rather due to non-tariff barriers. This is very much in line with the empirical facts of the current crisis, as documented by Baldwin and Evenett (2009).

The results are illustrated in Figure 2, where the solid line repeats the scenario given in the previous subsection in Figure 1 without trade policy response, and the dashed line is the new scenario with a trade policy response of country two. The effects for country one in the left-hand panel are not very surprising. The increase in trade barriers further reduces exports and overturns the increase in the share of exporting firms that would have taken place without a reaction in trade policy into a decrease (not shown in the graph). This further decreases consumption in country one, although the effect is very small.

What is maybe more surprising is the fact that this does not help country two. In sharp contrast, for country two, things get much worse. The decrease in consumption in country two on impact is approximately three times larger. This result is explained by the effects of trade barriers on the real exchange rate. Demand in country one has been further dampened, lowering the price level there and putting downwards pressure on the real exchange rate to counteract the effects of increased trade barriers. Lower income and demand in country one, as well as the accompanying deprecation of the real exchange rate of country one, lead to a sharp decline in exports in country two. Although it is true that import-competing firms in country two are shielded from cheap imports (see the increase in domestic production), the decrease in output of the export-industry far outweighs these effects and implies a strong decline in income. In fact, this kind of trade policy implies that production is shifted from efficient exporting firms to inefficient import-competing firms. On top of the decrease in output, for the consumer this implies unnecessary increases in prices, due to inefficient production.

So far we have assumed that country one does not care about the increase in trade barriers of country two. However, it is much more likely that country one looks for retaliation and therefore also increases trade barriers for imports from country two. This scenario is described in the next section.

4.3 The Effects of Retaliation

During the great depression the attempts of some countries to shield themselves by erecting trade barriers was retaliated by other countries which in turn raised trade barriers and thereby started a vicious cycle that proofed to be disastrous. Therefore we analyze in this subsection a third scenario in which both countries increase trade barriers. For simplicity we assume that both countries set the

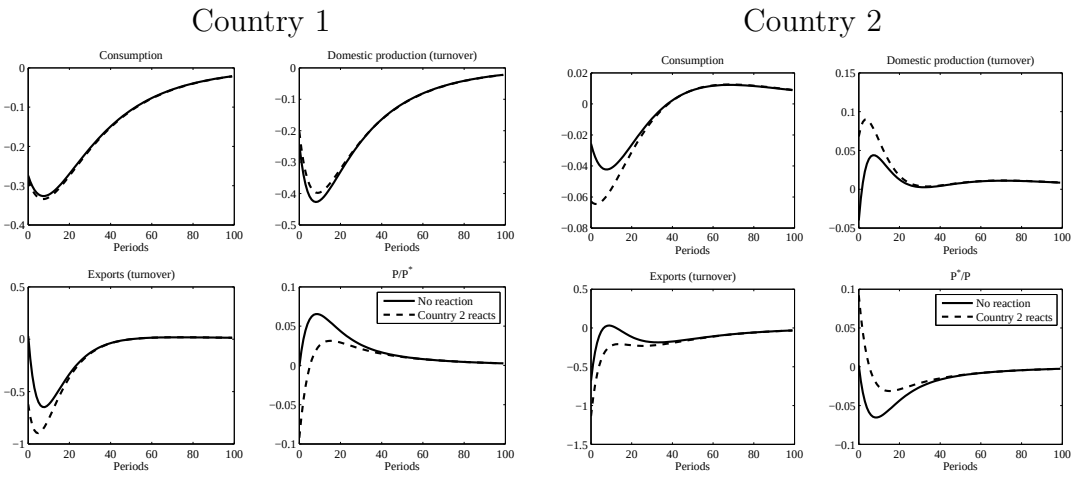

Figure 2: Scenario two: country two raises trade barriers.

same level of trade barriers, mirroring the development of productivity in country one. The resulting effects are illustrated in Figure 3, showing all three scenarios in one graph. In line with the results of the previous section, retaliation only makes matters worth for both parties. The real exchange rate is brought back exactly to the path it had without any changes in trade costs (hence, the lines for the real exchange rate in Figure 3 of "No reaction" and "Both countries react" overlap). So in this sense the two policy reactions offset each other. However, the retaliation of country one deepens the inefficient redistribution of output between relatively unproductive domestic firms and highly productive exporting firms, in this way further wasting resources. This is illustrated by the increased slump in export shares and results in a stronger decline in output and consumption in both countries. Thus, the raising of trade barriers again not only hurts the trading partner but also the country imposing them.

5 Two Rationales for Protectionism

So fare we have seen that both countries are worse off in terms of consumption if they react with increases in trade barriers after a negative productivity shock. However, as discussed in the introduction, the voices for protectionism during the great depression were loud and came up again with the latest downturn of the economy. Hence, one might wonder if it is possible to make a case for protectionism. In other words, is there any chance in our framework to rationalize why countries consider protectionism as a good idea at all? The answer is yes.

In fact, one can come up with at least two rationales that help to understand why countries consider protectionism to be a good idea as a response to a recession: (i) the relationship between vulnerability and the degree of openness to

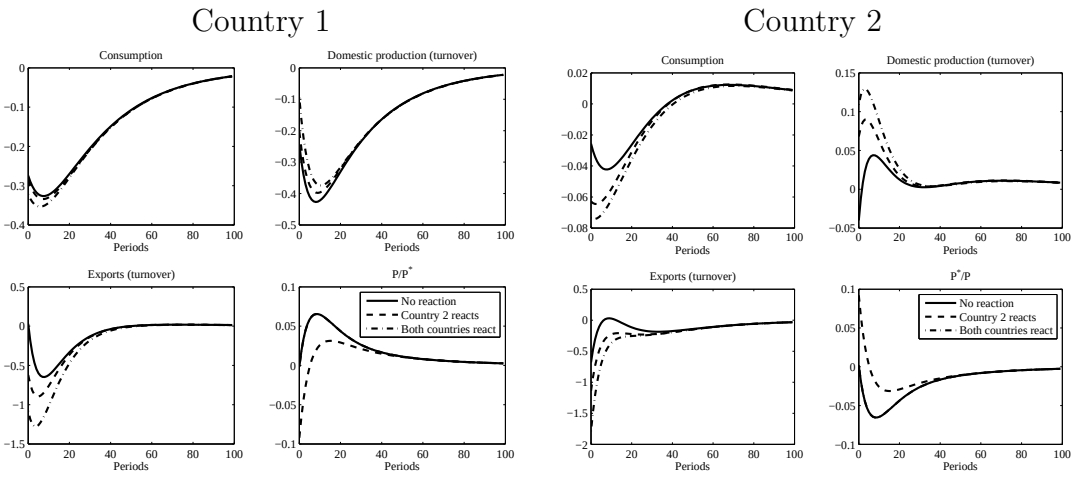

Figure 3: Scenario three: both countries raise trade barriers.

trading partner countries, (ii) the lobbying of domestic, non-exporting firms. We discuss each in turn.

5.1 The Role of Openness

Since the spill-over from country one to country two is caused by international trade, one may conclude that less openness leads to lower spill-overs. This is indeed true, as illustrated by Figure 4, comparing three scenarios with different levels of *steady-state* trade costs. The shock is the same in all scenarios and the same as in the experiments above, i.e. country one is hit by a temporary productivity shock. It can be seen that for country one openness does not matter much. The decrease in consumption is lower when the country is more open, but the effect is very small. For country two things look very different. The decrease in consumption is is much bigger when trade costs are only 10 percent instead of 90 percent.[7]

In the light of these results a policymaker might be tempted to react with protectionism in the wake of a crisis. The argument could go like this: We know that trade liberalization is a good idea, increases output and consumption in the long-run (in the steady state). However, we also know that trade liberalization increases our vulnerability towards shocks from foreign countries. So why not temporarily increase trade costs when our trading partner is in a crisis (thus reducing our own vulnerability) and drive back trade costs once the crisis is over (thus enjoying the gains from liberal trade)? In this way, we could enjoy the advantages of free trade without suffering the disadvantages. Although sounding plausible, this argument does not work, as we have seen in the previous section.

[7]Note that the graph shows deviations from steady-state values.

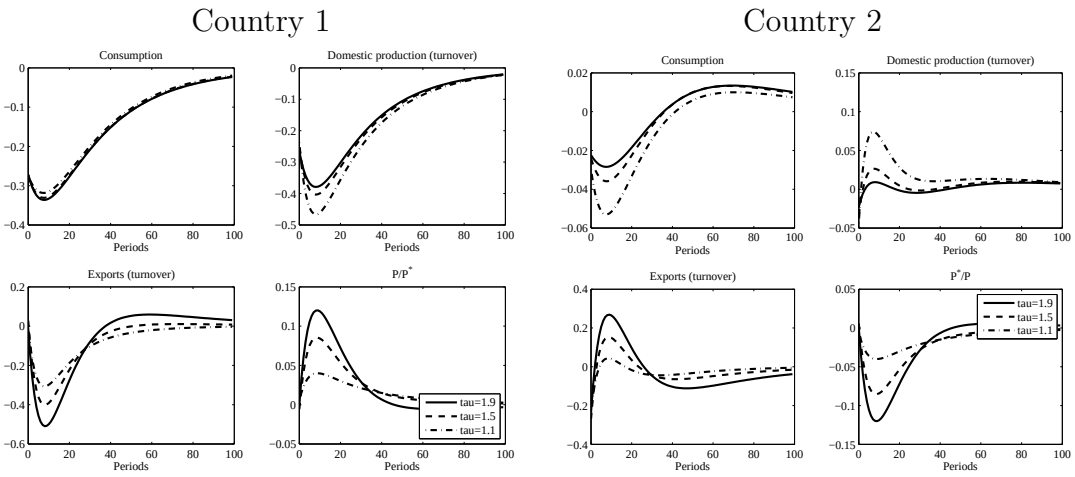

Figure 4: Reactions to a productivity shock in country 1 for different degrees of openness.

The reason is that even temporary increases in trade costs distort production a lot, thereby making the crisis worse rather than dampening it.

5.2 The Effects on Domestic, Non-Exporting Firms

Firms are hit differently by protectionism. In Figure 5 we show total profits for two types of firms: a) a firm with low productivity, only serving the domestic market, and b) a firm with high productivity, also serving the foreign market. As can be seen, profits of purely domestic firms in country two increase when trade barriers are increased, because competition from foreign exporters is lowered. On the contrary, exporting firms total profits in country two are affected negatively by trade barrier increases. The reason is, as is demonstrated in Figure 5 at the bottom, that while domestic profits of exporting firms in country two increase, their exporting profits sharply decrease, which leads to an overall decrease of profits. Hence, domestic firms that do not export at all gain in terms of total profits from raising trade barriers in country two. As a consequence, whenever domestic firms that do not export have a strong lobby, a government may raise trade barriers in order to gain political support for the next election. Due to the different effects of trade barriers for different firms, it depends on the lobbying power and the political support whether a government may find it worthwhile to react to negative productivity shocks with trade barrier increases.

To sum up, even though overall welfare is reduced by increasing protectionism in both countries, whether the other country reacts or not, there are reasons for which politicians might consider increasing trade barriers as a good idea nevertheless, such as overvaluing the effects of openness on vulnerability or (political) pressure from domestic firms.

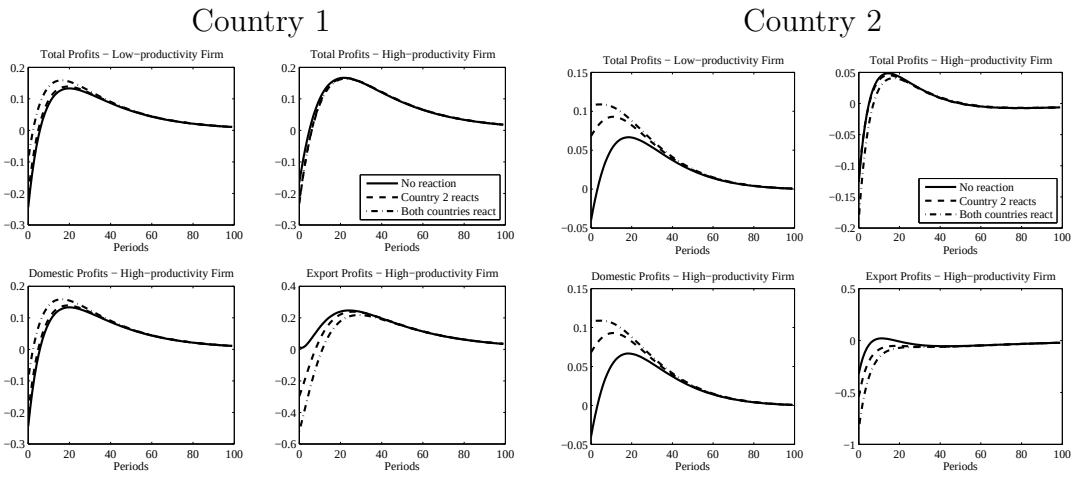

Figure 5: Profits of a low-productivity, domestic, non-exporting firm and a high-productivity, exporting firm as a reaction to a productivity shock in country one, when both countries raise trade barriers.

6 Conclusions

Recently, countries thought about raising trade barriers in order to mitigate the effects of the latest financial crises. Trade flows have already decreased tremendously over the last couple of month, mainly because of the recession and not (yet) due to protectionist measures. However, the IMF and the World Bank have already noticed an increase in protectionist measures.

We thoroughly analyze the dynamics of transitory changes of trade barriers as a short-run response to an economic downturn in a dynamic, general equilibrium new trade theory model with heterogenous firms. We show that the beggar-thy-neighbor policy does not work. A country cannot shield itself from an economic downturn of its trading partners by imposing temporarily higher trade barriers, but rather hurts itself.

The question then remains why politicians consider protectionism at all. We give two reasons for this. Firstly, even though higher trade barriers deter the gains from trade, they mitigate the negative spill-over effects from shocks in other countries. Secondly, firms are hit differently by protectionism. Domestic firms that do not export at all gain in terms of total profits from raising trade barriers, whereas exporting firms loose. Governments may raise trade barriers in order to support local firms, which may be important campaign contributors and voters in the next election.

Appendix

In monetary macro, the consequences of monetary policy are usually illustrated by assuming short-run deviations from the the long-run equilibrium, e.g., it is assumed that the central bank follows a Taylor rule with price stability in the long-run. To illustrate the effects of monetary policy the nominal interest rate is increased and then slowly returns to its steady-state value. In this Appendix we want to follow a similar approach to demonstrate the effects of a temporary increase in trade costs. To this end we assume that trade costs follow the following law of motion:

$$\tau_t - 1 = (\bar{\tau} - 1)^{1-\rho_\tau} (\tau_{t-1} - 1)^{\rho_\tau} e^{u_\tau}, \tag{A1}$$

where u_τ is the change in trade costs and ρ_τ is the speed with which trade barriers are cut down to their initial steady-state value. We consider two different scenarios: a) trade costs are increased for only one period and immediately return to their steady-state value (i.e. $\rho_\tau = 0$) and b) trade costs return slowly to their steady-state value with $\rho_\tau = 0.9$. In both scenarios, we assume that on impact trade costs increase by 3 percentage points from 30 to 33 percent.

A1 One-off shock

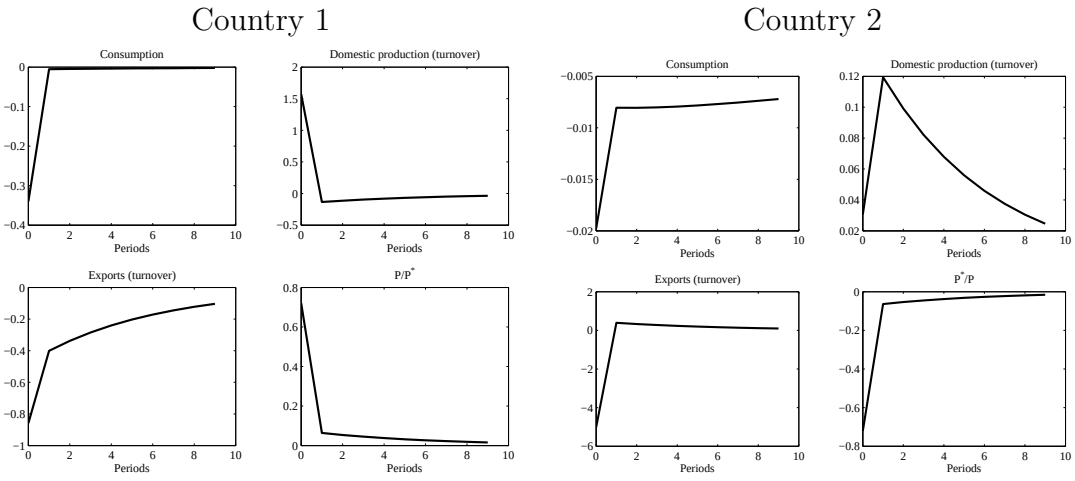

Figure A1: Reactions to a transitory, uncorrelated increase in trade costs.

Figure A1 illustrates the effects of a one-off shock to the trade costs for exports from country two to country one, i.e. country one raises trade barriers. The policy induces a decrease in consumption in both countries, but surprisingly the effect is larger for country one, the country imposing the policy change. On impact exports of country two are dropping by a large degree, inducing a strong depreciation in the real exchange rate. This reaction in the real exchange rate

implies that exports of country two jump upwards (once trade costs have returned to the steady-state value) and are in fact above their steady-state value for a long time. In contrast, country one suffers a less sever but more persistent decline in exports.

A2 Autocorrelated shock

In this section we assume that the trade costs for imports to country one increase by three percentage points, from 30 percent to 33 percent, and then slowly move back to their old level (with a coefficient of autocorrelation of $\rho_\tau = 0.9$). The effects are illustrated in Figure A2. The temporary increase in trade barriers in one country causes a recession in both countries. Note that in contrast to the results above (for the one-off shock), exports of country two do not overshoot but stay below the steady-state value for the entire transition. This is so because the more persistent increase in trade costs counteracts the depreciation of the real exchange rate. Note that in both countries, domestic production increases while exports decrease. This illustrates the shift in production from efficient exporting firms to inefficient import-competing firms, that causes the decline in consumption.

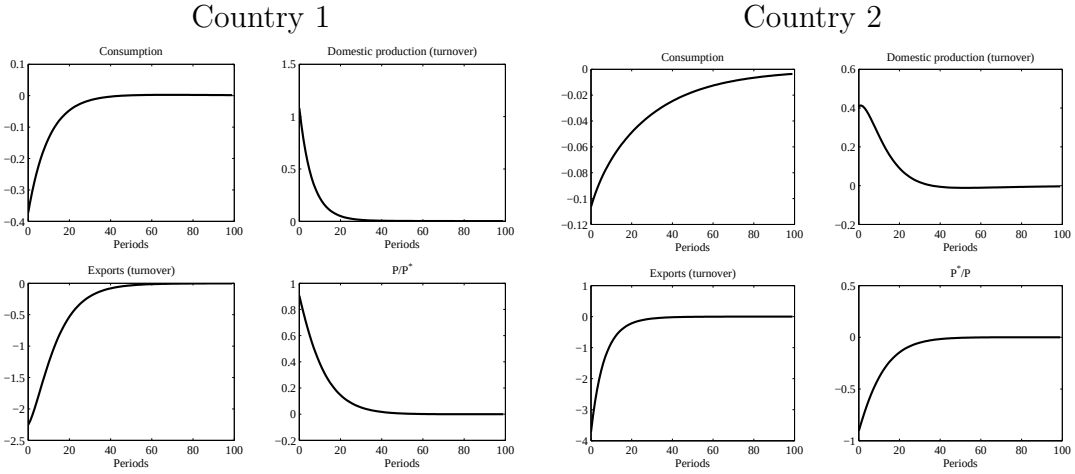

Figure A2: Reactions to a transitory, autocorrelated increase in trade costs.

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