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No. 1717 | July 2011

Web: www.ifw-kiel.de

Kiel Working Paper No. 171 | July 2011

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Mario Larch[†] and Wolfgang Lechthaler[‡]

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Recently, the world economy has seen its greatest down turn since World War II. Although not as bad as during the Great Depression, there was still a worrisome increase in protectionist measures, in an attempt to mitigate the economic downturn. Protectionism can have many different faces. It can come in the form of Buy-American clauses of stimulus packages, as an increase in trade barriers or tariffs, or as an increase in export subsidies. In this paper, we show that none of these measures constitutes an effective response to economic downturns. Although Buy-American clauses and export subsidies stimulate output in the short run, they are less effective than general government spending impulses. Raising tariffs or trade barriers even decreases output.

Keywords: Business cycle policy, Protectionism, Buy-American, Tariffs, Export subsidies

JEL classification: E13, E60, F11, F12, F13.

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**Acknowledgements*: To be added.

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Mario Larch[†], Wolfgang Lechthaler[‡]

July 1, 2011

Abstract

Recently, the world economy has seen its greatest down turn since World War II. Although not as bad as during the Great Depression, there was still a worrisome increase in protectionist measures, in an attempt to mitigate the economic downturn. Protectionism can have many different faces. It can come in the form of Buy-American clauses of stimulus packages, as an increase in trade barriers or tariffs, or as an increase in export subsidies. In this paper, we show that none of these measures constitutes an effective response to economic downturns. Although Buy-American clauses and export subsidies stimulate output in the short run, they are less effective than general government spending impulses. Raising tariffs or trade barriers even decreases output.

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1 Introduction

Every time the economy is hit by a crisis, voices are raised calling for the protection of local jobs and enterprises from foreign competition. Usually, these calls come from policy makers, import-competing enterprises, or the public, but sometimes even from prominent economists. In February, 2009, Paul Krugman wrote in his New York Times column that “*there is a short-run case for protectionism.*”¹ Figure 1 shows that a surge in protectionism was also experienced in the recent financial crisis: the number of protectionist measures increased considerably since the beginning of 2009. This trend began to slow down only in the beginning of 2011. Evenett (2010) documents that the lion’s share of these protectionist measures were implemented by OECD-countries.

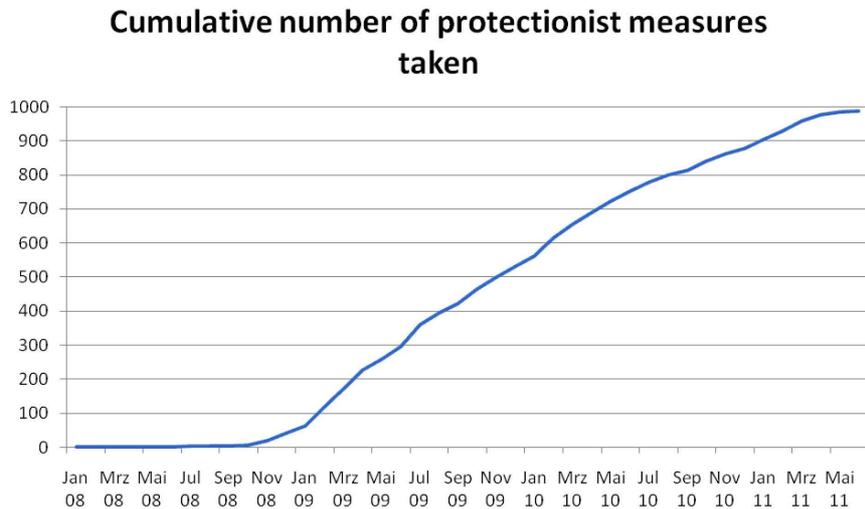


Figure 1: Cumulative number of protectionist measures taken. Data source: <http://www.globaltradealert.org/>.

Note that these increases are not against WTO rules, which leave a lot of room for tariff increases for most developed and even more so for developing countries. Some countries could raise tariffs by as much as 100% (see Bouet and Laborde (2008)). Current WTO rules also leave potential for another, very popular form, of protectionism: clauses which restrict stimulus packages to domestic products. These measures were recently used by the US and China.

In this paper, we show that protectionist measures are not a suitable instrument to stimulate the output of an economy. The model framework we use is the one proposed by Ghironi and Melitz (2005), featuring heterogeneous firms

¹Available at <http://krugman.blogs.nytimes.com/2009/02/01/protectionism-and-stimulus-wonkish/>.

and endogenous firm entry. Basically, Ghironi and Melitz (2005) is a dynamic version of Melitz (2003), the now seminal model in the trade literature. It offers the advantage of being able to capture the relevant transmission mechanisms of changes in trade costs, such as changes in the market size and the productivity of firms.

The measures we use include Buy-American² (government spending concentrated on domestic products), tariffs, non-tariff trade barriers, and export subsidies, and we compare these measures with general government spending. We show that protectionism is not a suitable instrument to smooth business cycle fluctuations. Buy-American, by ignoring cheap foreign products, concentrates the stimulus on relatively expensive domestic products, which makes the stimulus more expensive, or smaller in real terms, compared to general government spending employing the same amount of money. Even more importantly, by concentrating the stimulus on domestic products, Buy American considerably increases the price of domestic goods relative to the price of foreign goods. This not only leads to increased crowding out of consumption but also reduces the demand for domestic goods abroad. As a consequence, Buy-American raises GDP by less than general government spending.

While tariffs and non-tariff trade barriers increase domestic production, they decrease exports through their effects on the real exchange rate. The latter effect dominates the former and, thus, GDP goes down. The only trade policy instrument capable of increasing GDP is export subsidies, which directly increase production for the export market. At the same time, through movements in the real exchange rate, imports become cheaper, crowding out domestic production.³ Nevertheless, the increase in exports dominates the decrease in domestic production and GDP goes up. However, this effect is relatively small, so that traditional government spending yields a considerably higher multiplier. To sum up, protectionism is not a good way to stimulate the economy.

These theoretical results are especially interesting in the light of the recent surge in protectionist measures brought about by the last financial crisis. As demonstrated in figure 1, at the beginning of the crisis, it seemed that policy makers were able to resist the temptation of protectionism when in November the G-20 signed a pledge to avoid protectionist measures (see Baldwin and Evenett (2008)). However, only four months later, Gamberoni and Newfarmer (2009) documented that 17 of the G20 countries have implemented measures to restrict trade since the beginning of the crisis. Similarly, a rise in protectionist measures was reported by IMF and World Bank (2009), and GlobalTradeAlert.org.

²The term Buy-American goes back at least to the 1930's when president Roosevelt signed the Buy American Act. The act required the US-government to prefer American products over foreign products.

³Here and in the remainder of the paper, the term domestic production denotes the production of domestic firms designated for the domestic market.

One view common to most proponents of protectionism is the view that protectionism should be used only as a short-term measure. As an example, Paul Krugman still believes in the virtues of free trade but thinks that Buy-American could help to internalize the positive externality of fiscal stimulus packages on trading partners. Similarly, a poll by WorldPublicOpinion.org showed that in 16 of 19 nations, a majority of people feels that globalization is mostly good, but at the same time a majority of 11 nations is in favor of protectionist measures in the current crisis.⁴

Thus, it is surprising how little research there is on the effects of trade-policy as a business cycle instrument. There have been lively discussions in newspapers and Internet forums, but the academic discussion has been mostly limited to the international spillovers of fiscal policy (see, e.g., Monacelli and Perotti (2010)). The reason might be that trade economists typically are not interested in dynamics, and if they are, they mostly look at the interaction between trade and growth (see Grossman and Helpman (1991)). On the other hand, the core fields of interest for macroeconomists are monetary and fiscal policy and not trade policy. In this paper, we are trying to close this gap by analyzing various forms of protectionism, like Buy-American, tariffs, or export subsidies, as business-cycle instruments. By this we mean that we look at short-run deviations from the long-run level of a specific instrument.

Most of the macro models that analyze transitional dynamics assume either closed economies or trade based on the assumption of Armington (1969) preferences. The latter does not allow to distinguish firm dynamics based on adjustments at the extensive margin, i.e., the number of firms, and the intensive margin, i.e., the size of firms. However, recent empirical work reveals that the extensive margin is an important adjustment margin and that the intensive and extensive margins' sensitivity to policy interventions such as trade liberalization is different.⁵ In line with these recent findings, we allow for adjustments along both margins. Further, our approach offers the advantage of being able to allow endogenous changes in the average productivity of exporting firms.

As already stated above, the academic literature on the effects of protectionism in the times of crisis is very scarce. One notable exception is the E-book by Baldwin and Evenett (2009) which, among other things, discusses some reasons why protectionism would hurt a country rather than protecting it from the global downturn. They state that import restrictions may harm domestic firms due to increased input-costs. In the same volume, Anne Krueger argues that import-competing goods have higher prices, leading to a decrease in demand. Her informal argument is close to our formal results pertaining to Buy-American

⁴<http://www.worldpublicopinion.org/pipa/articles/btglobalizationtradera/626.php>.

⁵See, e.g., Chaney (2008), Ghironi and Melitz (2007), Helpman, Melitz and Rubinstein (2008), and Bernard, Jensen, Redding and Schott (2007, 2009).

clauses. Viktor Fung points to the possibility of retaliation of trading partners. This last argument is supported by findings of Hufbauer and Schott (2009), who find that a Buy-American clause could lead to more job losses due to retaliations than initial job gains through the clause.

In the macroeconomic literature the recent financial crisis has initiated new interest in the effects of government spending. However, this research mainly discusses whether the fiscal multiplier of government spending is larger than one. For example, Uhlig (2010), using an RBC model, finds a multiplier smaller than one. Cogan (2009) compare various models and find large multipliers only for models with backwards looking agents. Christiano, Eichenbaum and Rebelo (2009) find large multipliers when the zero lower-bound of interest rates is hit. However, the focus of these models is on closed economies and thus they cannot address issues of protectionism. Monacelli and Perotti (2010) use an open economy model but only analyze general government spending and do not address issues of protectionism. Faruqee et al. (2008) use a large-scale DSGE model to answer the question whether increases in tariffs could be used to reduce global imbalances but they are not interested in business-cycle effects. Most closely related to our paper is Larch and Lechthaler (2011), who show that a temporary increase in trade barriers as a response to an economic downturn does not increase GDP. However, their analysis is restricted to non-tariff trade barriers. While this is a useful exercise, it fails to take account of Krugman's argument, which is related to government spending. Government spending is not modeled at all in Larch and Lechthaler (2011). Further, we take account of issues of financing by allowing for distortionary labor taxation. Finally, we also consider changes in tariffs, a measure considered to be very relevant (see, e.g., Evenett (2010)).

2 A Dynamic Trade Model with Tariffs

In this section we describe our model framework which extends the Ghironi and Melitz (2005) model in several ways. While in Ghironi and Melitz (2005) the labor input is given exogenously, we endogenize it to allow for distortionary taxation. We introduce government spending, which can be general, consuming the same mix of domestic and foreign varieties as consumers or Buy-American, consuming only domestic varieties. Furthermore, we allow for income-generating tariffs and income-consuming export subsidies.

As already stated in the introduction, the model by Ghironi and Melitz (2005) is based on Melitz (2003), the now most widely used theoretical model among trade economists. 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 firms selling only domestically, and that small firms with low productivity are driven out of

the market after trade liberalization) while still remaining 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 Households

We assume two countries, labeled home and foreign. In the steady state the two countries are symmetric but we allow for differences in policy out of the steady state. Foreign variables are denoted by an asterisk. In the following we only describe the equations for the home country, equivalent equations hold for the foreign country.

The representative household gains utility from consuming the aggregate consumption good C and suffers disutility from labor L . It has a standard utility function of the form

$$U_t = E_t \left[\sum_{s=t}^{\infty} \beta^{s-t} \left(\frac{C_s^{1-\gamma}}{(1-\gamma)} - \frac{L_s^{1+\phi}}{(1+\phi)} \right) \right] \quad (1)$$

where β is the subjective discount factor, γ is the inverse of the intertemporal elasticity of substitution and ϕ is the inverse of the Frisch-elasticity of labor supply. The household seeks to maximize its utility subject to the budget constraint

$$\begin{aligned} B_{t+1} + Q_t B_{*,t+1} + \frac{\eta}{2}(B_{t+1})^2 + \frac{\eta}{2}Q_t(B_{*,t+1})^2 + \tilde{v}_t N_{H,t} x_{t+1} + C_t = \\ (1+r_t)B_t + Q_t(1+r_t^*)B_{*,t} + (\tilde{d}_t + \tilde{v}_t)N_{D,t}x_t + T_t^f + \frac{W_t}{P_t}L_t - T_t, \end{aligned} \quad (2)$$

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. The household invests in domestic and foreign bonds, B and B_* respectively, and buys x 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) at a price \tilde{v} . Bonds earn a risk-free interest rate (r and r_*), while private firms pay a dividend \tilde{d} . Note, however that the number of firms diminishes from one period to the other due to an exogenous risk of firm breakdown: $N_{D,t+1} = (1-\delta)N_{D,t}$. To assure that temporary shocks do not have permanent consequences and that the trade balance is always zero in the steady state, we assume quadratic adjustment costs in the holding of bonds, which depend on the parameter η (for more details see Ghironi, 2006). These fees are then rebated to the households (T^f), who take the rebate as given exogenously. Finally, the household (potentially) receives lump-sum transfers T and earns labor income W/PL , where W is the wage and

P the price index. All values are denoted in real terms (except for the nominal wage).

Maximizing the utility function (1) with respect to the budget constraint (2) yields four first order conditions: one Euler equation for share holdings

$$\tilde{v}_t = \beta(1 - \delta)E_t \left[\left(\frac{C_{t+1}}{C_t} \right)^{-\gamma} (\tilde{v}_{t+1} + \tilde{d}_{t+1}) \right], \quad (3)$$

two Euler equations for bond holdings

$$(C_t)^{-\gamma} (1 + \eta B_{t+1}) = \beta(1 + r_{t+1})E_t[(C_{t+1})^{-\gamma}], \quad (4)$$

$$(C_t)^{-\gamma} (1 + \eta B_{*,t+1}) = \beta(1 + r_{t+1}^*)E_t \left[\frac{Q_{t+1}}{Q_t} (C_{t+1})^{-\gamma} \right]. \quad (5)$$

and the labor supply curve

$$L_t^\phi = C_t^{-\gamma} W_t / P_t. \quad (6)$$

The aggregate consumption good is defined over a continuum of goods Ω including both domestic and foreign varieties: $C_t = \left(\int_{\omega \in \Omega} c_t(\omega)^{(\theta-1)/\theta} d\omega \right)^{\theta/(\theta-1)}$, where $\theta > 1$ is the elasticity of substitution across goods. Each variety is produced by a single firm and sold under monopolistic competition. Since the number of firms is endogenous, the number of varieties is also endogenous and, thus, can change from one period to the other. The government consumes g of the exact same varieties as the households and am of domestic varieties.⁶ Let $p_{D,t}(\omega)$ and $p_{X,t}^*(\omega)$ denote the domestic price of domestically produced and imported goods, respectively. It follows that the domestic demand for domestic and foreign products is given by:

$$c_{D,t}(\omega) = (p_{D,t}(\omega)/P_t)^{-\theta} (C_t + g_t + am_t), \quad (7)$$

$$c_{X,t}(\omega) = (p_{X,t}^*(\omega)/P_t)^{-\theta} (C_t + g_t). \quad (8)$$

2.2 Firms

2.2.1 Production, Pricing, and the Export Decision

There is a continuum of firms in each country, each producing a different variety $\omega \in \Omega$. Labor is the only factor of production. The productivity of a firm depends on an aggregate component Z and idiosyncratic component z , which, following Melitz (2003), is heterogenous among firms. Hence, the unit cost of production

⁶See Lewis (2009) for more details on how to model government spending in a model with endogenous firm entry.

is $w_t/(Z_t z)$, where $w_t \equiv W_t/P_t(1 + \chi_t)$ is the real wage paid by firms, including the labor tax χ .

Before entering the market, firms have to pay a sunk entry cost $f_{E,t}$, measured in terms of effective labor units, i.e., the sunk entry cost equals $w_t f_{E,t}/Z_t$. Upon entry, firms draw their productivity level z from a common distribution $G(z)$ with support $[z_{\min}, \infty)$. The idiosyncratic productivity stays constant thereafter. In contrast to Melitz (2003) there are no fixed production costs. Every firm may be hit by a “death” shock, which occurs with probability δ 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.

Besides serving the domestic market, a firm may export. Exporting involves variable iceberg trade cost $\tau_t^* \geq 1$ as well as period-by-period fixed costs $f_{X,t}$ (measured in units of effective labor). Additionally, countries levy revenue-generating import tariffs on goods from abroad $t_t \geq 1$, and subsidize exports of domestic firms at a rate $s_t \geq 0$.

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. Prices, in real terms relative to the price index in the destination market, are then given by

$$\rho_{D,t}(z) \equiv \frac{p_{D,t}(z)}{P_t} = \frac{\theta}{\theta - 1} \frac{w_t}{Z_t z}, \quad \rho_{X,t}(z) \equiv \frac{p_{X,t}(z)}{P_t^*} = Q_t^{-1} \tau_t^* t_t^* \frac{1}{1 - s_t} \rho_{D,t}(z). \quad (9)$$

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

$$d_{D,t}(z) = \frac{1}{\theta} [\rho_{D,t}(z)]^{1-\theta} (C_t + g_t + am_t), \quad (10)$$

$$d_{X,t}(z) = \begin{cases} \frac{Q_t}{\theta t_t^*} [\rho_{X,t}(z)]^{1-\theta} (C_t^* + g_t^*) - \frac{w_t f_{X,t}}{Z_t} & \text{if firm } z \text{ exports,} \\ 0 & \text{otherwise.} \end{cases} \quad (11)$$

As in Melitz (2003), more productive firms earn higher profits and set lower prices (see equation (9)). A firm will export when productivity z is above a cutoff level $z_{X,t} = \inf\{z : d_{X,t}(z) > 0\}$. The lower bound productivity z_{\min} is assumed to be low enough relative to the export costs so that $z_{X,t}$ is above z_{\min} . This ensures that firms with productivity levels between z_{\min} and $z_{X,t}$ decide not to export. Note that this set of firms as well as $z_{X,t}$ fluctuates over time with changes in the profitability of the export market.

2.2.2 Firm Averages

In every period, a mass $N_{D,t}$ of firms produces in the home country. These firms have a distribution of productivity levels over $[z_{\min}, \infty)$ given by $G(z)$. Among

these firms, there are $N_{X,t} = [1 - G(z_{X,t})]N_{D,t}$ exporters. Following Melitz (2003), we define two “average” productivity levels - an average \tilde{z}_D for all producing firms, and an average $\tilde{z}_{X,t}$ for all exporters:

$$\tilde{z}_D \equiv \left[\int_{z_{\min}}^{\infty} z^{\theta-1} dG(z) \right]^{\frac{1}{\theta-1}}, \quad \tilde{z}_{X,t} \equiv \left[\frac{1}{1 - G(z_{X,t})} \int_{z_{X,t}}^{\infty} z^{\theta-1} dG(z) \right]^{\frac{1}{\theta-1}}. \quad (12)$$

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 firms with productivity level \tilde{z}_D produce for the home market and N_X firms with productivity level \tilde{z}_X export to the foreign market.

In particular, $\tilde{p}_D \equiv p_D(\tilde{z}_D)$ represents the average nominal price of domestic firms in their domestic market, and $\tilde{p}_X \equiv p_X(\tilde{z}_X)$ represents the average nominal price of domestic exporters in the foreign market. The price index reflects the prices of the N_D home firms and the N_X^* foreign exporters to the home market. The home price index can thus be written as $P_t = [N_{D,t}(\tilde{p}_{D,t})^{1-\theta} + N_{X,t}^*(\tilde{p}_{X,t}^*)^{1-\theta}]^{1/(1-\theta)}$. This is equivalent to

$$N_{D,t}(\tilde{p}_{D,t})^{1-\theta} + N_{X,t}^*(\tilde{p}_{X,t}^*)^{1-\theta} = 1. \quad (13)$$

The productivity averages \tilde{z}_D , and $\tilde{z}_{X,t}$ are constructed in such a way that $\tilde{d}_{D,t} \equiv d_{D,t}(\tilde{z}_D)$ represents average profits earned from domestic sales, and $\tilde{d}_{X,t} \equiv d_{X,t}(\tilde{z}_{X,t})$ represents average profits from exports. Thus, $\tilde{d}_t \equiv \tilde{d}_{D,t} + [1 - G(z_{X,t})]\tilde{d}_{X,t}$ represents average total profits.

2.2.3 Firm Entry and Exit

In every period there is an unbounded mass of prospective entrants. These entrants are forward looking, and correctly anticipate their future expected profits \tilde{d}_t in every period (the preentry expected profit is equal to postentry average profit) as well as the probability δ 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 $\{\tilde{d}_s\}_{s=t+1}^{\infty}$:

$$\tilde{v}_t = E_t \sum_{s=t+1}^{\infty} [\beta(1 - \delta)]^{s-t} \left(\frac{C_s}{C_t} \right)^{-\gamma} \tilde{d}_s. \quad (14)$$

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 implies that the number of producing firms in period t is given by $N_{D,t} = (1 - \delta)(N_{D,t-1} + N_{E,t-1})$.

2.3 The Government Sector

The government earns income through the tariff on imports, the tax on labor income and, potentially, a lump-sum tax. Its consumption is distinguished between general government spending g and Buy-American am . General government spending consumes the exact same varieties as private households consume, i.e., general government spending also includes foreign varieties. In contrast, Buy-American only consumers domestic varieties. Furthermore, the government pays export subsidies. We assume that the government always has a balanced budget and thus, the budget constraint reads

$$T_t + \chi_t W_t / P_t L_t + (t_t - 1) / t_t (\tilde{\rho}_{x,t}^*)^{1-\theta} (C_t + g_t) N_{X,t}^* = s_t / t_t^* (1 - s_t) (\tilde{\rho}_{x,t})^{1-\theta} (C_t^* + g_t^*) N_{X,t} + g_t + am_t, \quad (15)$$

where the last term on the left-hand side of the equation is the income through tariffs and the first term on the right-hand side of the equation are the expenses through export subsidies. In our numerical simulations we will distinguish two scenarios. One in which additional expenses are financed via the lump sum tax and one in which additional expenses are financed via the distortionary labor tax.

2.4 Aggregation and Labor Market Clearing

Aggregating the budget constraint (2) across all 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

$$B_{t+1} + Q_t B_{*,t+1} = (1 + r_t) B_t + Q_t (1 + r_t^*) B_{*,t} + w_t L + N_{D,t} \tilde{d}_t - T_t - N_{E,t} \tilde{v}_t - C_t. \quad (16)$$

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, 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

$$\frac{B_{t+1}^*}{Q_t} + B_{*,t+1}^* = \frac{(1 + r_t)}{Q_t} B_t^* + Q_t(1 + r_t^*)B_{*,t}^* + w_t^* L^* + N_{D,t}^* \tilde{d}_t^* - T_t^* - N_{E,t}^* \tilde{v}_t^* - C_t^*. \quad (17)$$

Multiplying (17) with Q_t and subtracting the resulting equation from (16) yields an expression for home net foreign asset accumulation as a function of interest income and of the cross-country differentials between labor income, net investment income, and consumption

$$B_{t+1} + Q_t B_{*,t+1} = (1 + r_t)B_t + Q_t(1 + r_t^*)B_{*,t} + \frac{1}{2}(w_t L - Q_t w_t^* L^*) + \quad (18)$$

$$\frac{1}{2}(N_{D,t} \tilde{d}_t - N_{D,t}^* Q_t \tilde{d}_t^*) - \frac{1}{2}(T_t - Q_t T_t^*) - \frac{1}{2}(N_{E,t} \tilde{v}_t - N_{E,t}^* Q_t \tilde{v}_t^*) - \frac{1}{2}(C_t - Q_t C_t^*).$$

To close the model, we have to impose labor market clearing

$$L = \frac{\theta - 1}{w_t} (N_{D,t} \tilde{d}_{D,t} + N_{X,t} \tilde{d}_{X,t}) + \frac{1}{Z_t} (\theta N_{X,t} f_{X,t} + N_{E,t} f_{E,t}). \quad (19)$$

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

et al. (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 $k = 3.4$. Consistently with Obstfeld and Rogoff (2001) we set the steady state value of trade costs $\bar{\tau}$ equal to 1.2.

The steady state fixed export cost f_X is set to 10.9 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 firms matches the 21 percent reported in Bernard et al. (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. The inverse of the Frisch-elasticity of labor supply ϕ is set to the standard value 1 (see Gali (2008)).

3.3 Parametrization of the Government Sector

We set steady state tariffs and subsidies to the Nash-equilibrium value of a game played between the two countries, i.e., tariffs and subsidies are set in such a way that no country has an incentive to persistently deviate from this equilibrium. In doing so, we calculate the net-present value of consumption over all periods, including the periods of transition to the new steady state. We then look for the pair of tariffs and subsidies that leads to the highest net-present value of consumption for each possible pair of tariffs and subsidies of the trading partner. In other words, we simulate the best-response functions based on the net-present value of consumption. Afterwards we calculate the Nash-equilibrium pair of tariffs and subsidies by intersecting the best-response functions of the two countries.⁷ This results in a steady state subsidy of 5.5% and a tariff of 42%. The latter value is arguably quite large. Therefore, we will also report results for lower steady state tariffs.

Following Trabandt and Uhlig (2009) we set the ratio of government spending to GDP to 18%. We assume that in steady state all government spending is general, i.e. Buy-American is only used temporarily, as a business cycle instrument. Lump sum taxes are set to zero. Labor taxes are set in such a way that the government budget is balanced. This yields a labor tax rate of 18%.

When we simulate the temporary change in general government spending, Buy-American or export subsidies, we assume that on impact the change in the

⁷For a detailed description of this approach in a static framework see Demidova and Rodríguez-Clare (2009).

policy instrument costs the equivalent of one percent of steady state GDP, i.e., if we simulate the increase in government spending, we assume that government spending is increased by an amount equivalent to one percent of steady state GDP. Since an increase in tariffs does not cost income but instead generates income, we choose the size of the shock such that it generates an income equivalent to one percent of GDP. When we simulate the increase in non-tariff trade barriers we use the same size of the shock as for the increase in tariffs. In each case, we assume that the policy instrument jumps during the first period and then slowly converges back to its steady state value, following an autoregressive process with a coefficient of autocorrelation of 0.95.

4 Protectionism and the Business Cycle

In this section we analyze the consequences of four different kinds of protectionism: Buy-American, an increase in tariffs, and increase in non-tariff trade barriers and an increase in export subsidies. In each case we assume that the policy instrument jumps up in the first period and then slowly converges back to its steady state value.⁸ To get familiar with the mechanisms of the model it is useful to start off with a discussion of general government spending, i.e., an increase in government spending that does not discriminate between foreign and domestic products. In order to avoid mixing up the effects of the instrument and the effects of financing the instrument, we start by assuming that the lump sum tax adjusts to assure that the government budget is balanced at any time. Later we will release this assumption and assume instead that the labor tax has to adjust to balance the government budget.

4.1 General Government Spending

The effects of a temporary increase in government spending are illustrated in figure 2. As common in business-cycle models with forward looking agents,⁹ government spending makes private households poorer because taxes have to be increased. This crowds out private consumption but increases output, because households are willing to provide more labor. Note, that in this framework government spending could increase output even without endogenous labor supply due to the possibility of adjustments via the intensive and extensive margins. Because private consumption is reduced the multiplier is smaller than one.

The increase in demand does not only increase domestic production but also imports, since the government consumes both domestic and foreign varieties. This

⁸For further details see the section on the calibration of the government sector.

⁹See, e.g., Uhlig (2010).

induces the real exchange rate to depreciate, implying an increase in exports. The trade balance turns negative. This is in line with Monacelli and Perotti (2010) who, using a VAR, find that after a fiscal stimulus the real exchange rate depreciates while the trade balance turns negative. Since one country cannot permanently build up debt towards other countries, the trade balance has to turn positive eventually, in order to pay back the debt. Note, however, that the movements in the trade balance are relatively small compared to the movements in imports and exports. The reason is that imports and exports move in the same direction, offsetting each others impact on the trade balance to a large extent.

Maybe surprising at a first glance is the result that the number of firms goes down. But this is easily explained. Both, the production of a given variety and the creation of a new variety, i.e., a new firm, consume labor input. But the latter is rather a long-term investment, since the creation of a new firm leads to a new variety until the firm dies. If output shall be increased quickly and temporarily, it pays off to reduce long-term investments to produce more of the existing varieties. This explains why the number of firms goes down.

4.2 Buy-American versus General Government Spending

In his New York Times column cited in the introduction, Krugman argues that “... one part of the problem facing the world is that there are major policy externalities. My fiscal stimulus helps your economy, by increasing your exports — but you don’t share in my addition to government debt. [...], this means that the bang per buck on stimulus for any one country is less than it is for the world as a whole. And this in turn means that if macro policy isn’t coordinated internationally — and it isn’t — we’ll tend to end up with too little fiscal stimulus, everywhere.”

He goes on “Now ask, how would this change if each country adopted protectionist measures that ‘contained’ the effects of fiscal expansion within its domestic economy? Then everyone would adopt a more expansionary policy — and the world would get closer to full employment than it would have otherwise. Yes, trade would be more distorted, which is a cost; but the distortion caused by a severely underemployed world economy would be reduced.”

The question to investigate is therefore: How do the effects of government spending change if the stimulus is directed towards domestic varieties and ignores foreign varieties? According to Krugman this should increase the multiplier (at the cost of distorting trade). We find support for the assessment of distorted trade but we do not find support for an increased multiplier.

Figure 3 compares the effects of general government spending and Buy American. The effect on domestic production is as expected. Buy-American increases domestic production (i.e., production designated for the home market) by more

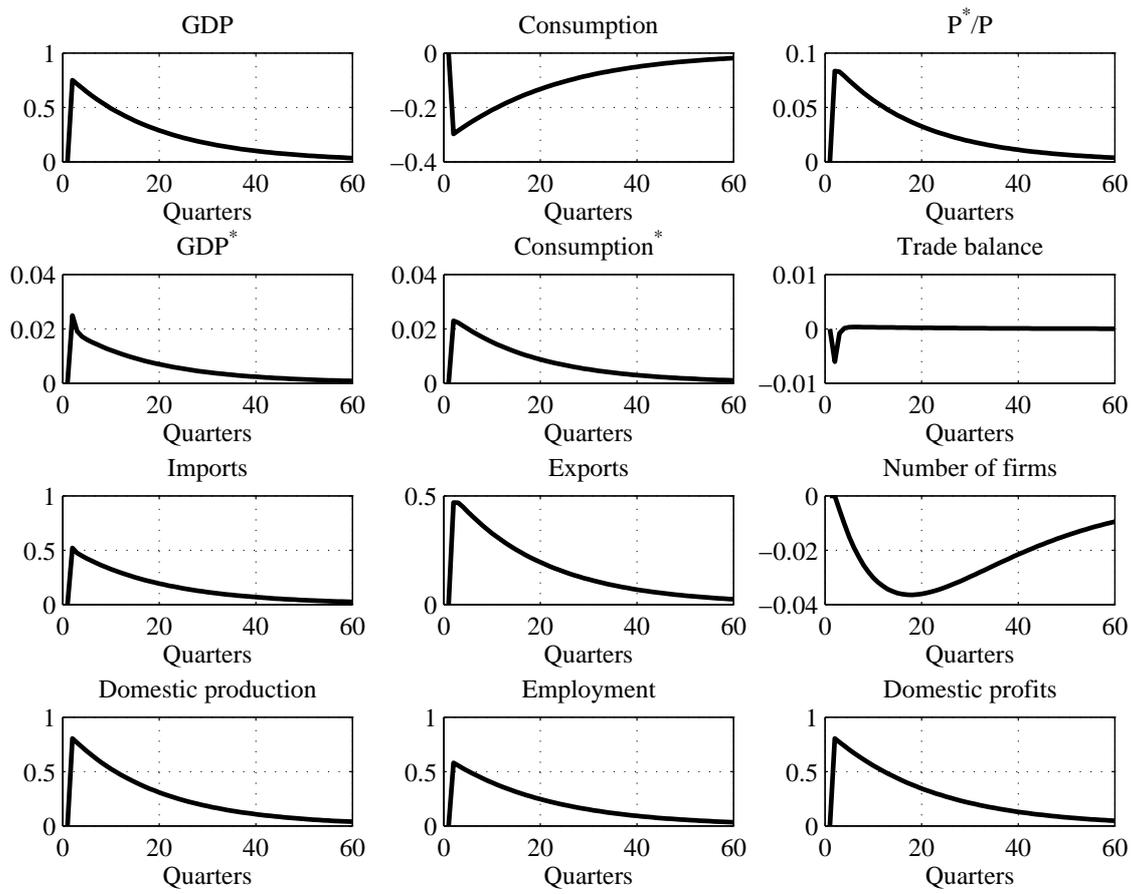


Figure 2: General government spending

than general government spending but the effect is very small. The reason for this lies in the fact that the stimulus becomes more expensive, since cheap foreign goods are ignored. Thus, in real terms the stimulus has to become smaller. Additionally, the crowding out of consumption is slightly increased, because a stimulus concentrated on domestic varieties has a larger impact on the price of domestic varieties. Nevertheless, domestic production increases. So if this were the end of the story, Paul Krugman would be right.

However, Krugman seems to have underestimated the effects on trade. While general government spending increases imports, Buy-American actually reduces imports. While the government only consumes domestic varieties, private consumers reduce their consumption for both, domestic and foreign, varieties. Consequently, aggregate demand for foreign varieties drops and thus the real exchange rate appreciates. It follows that exports decrease, too.

While the level of trade decreases significantly, the trade balance is not affected much, since both exports and imports drop by about the same amount. Considering the effects on GDP, the negative effects on exports outweigh the positive effects on domestic production, so that Buy-American actually implies a smaller impulse on GDP than general government spending, although the difference is very small. Notable is also the effect on the trading partner. While general government spending increases GDP and consumption in the foreign country, Buy-American decreases GDP and consumption.

Concerning the employment effects two things are noteworthy. First, there is a positive employment effect. Second, Buy-American leads to less additional employment than general government spending, but the difference to general government spending is very small.

To sum up: The argument of Krugman has to be fully refuted. General government spending has a larger multiplier than Buy-American due to spending on cheaper foreign varieties, due to less crowding out of private consumption and due to positive effects on the terms-of-trade. Hence, general government spending leads to larger effects on GDP and employment. In contrast to the statement of Krugman, protectionism in the form of a Buy-American clause does not make anyone better off. Note that this argument does not rely on any kind of retaliation.

Why then are these measures still so popular? One answer to this question might be that there are still some special interest groups which gain from this kind of policy. In our model, it is the group of firms serving only the domestic market whose profits are increased by Buy-American and which, therefore, has an incentive to lobby for this kind of policy.

For our baseline scenario we have assumed that the share of exporting firms is 21%. This choice is motivated by empirical evidence on the US-economy.

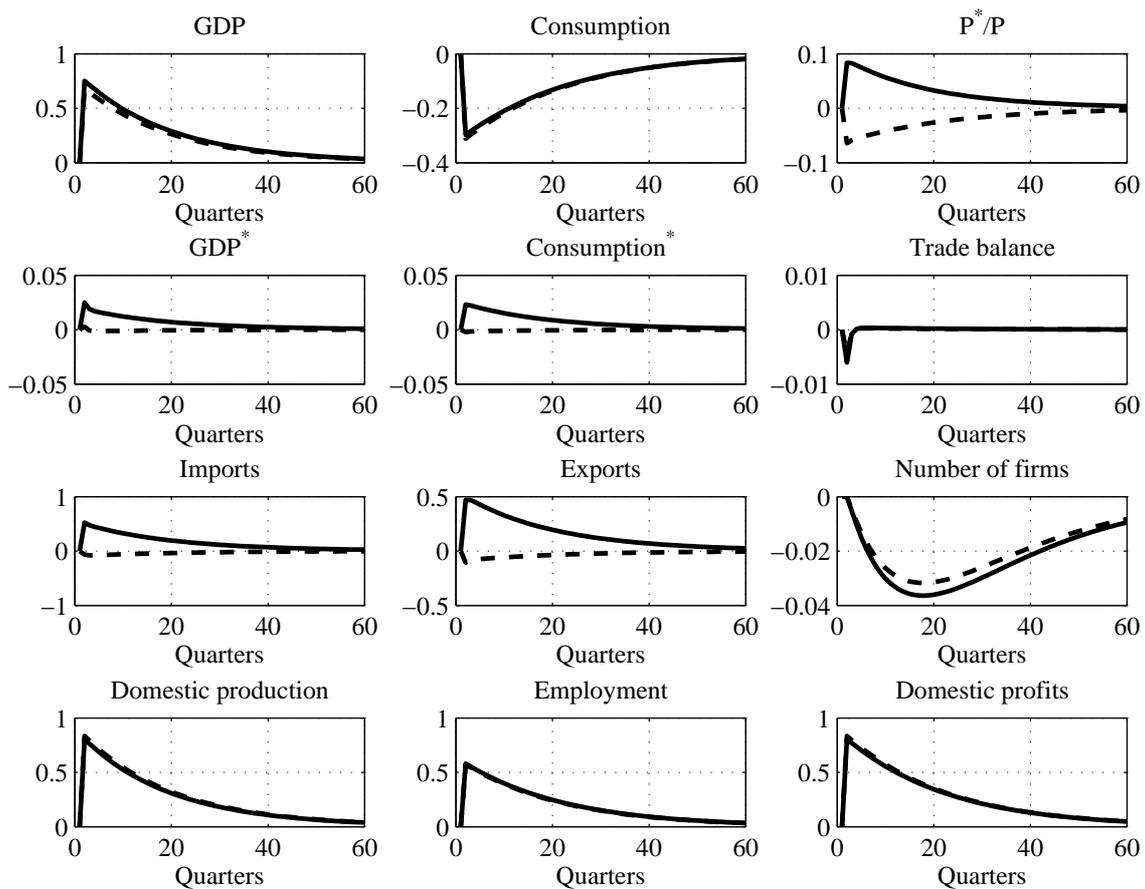


Figure 3: General government spending (solid line) versus Buy-American (dashed line)

However, one might think that this relatively low share of exporting firms is responsible for the weak impulse of Buy-American. Therefore, and because it also helps to better understand some implications of government spending, we repeat the exercise for the most extreme case: an economy in which there are no obstacles to international trade whatsoever, i.e., trade costs, tariffs, export subsidies and fixed costs of exporting are all set to zero. This implies that all firms export, i.e., the share of exporting firms is 100%, that one half of GDP is exported and that one half of aggregate consumption is imported. It should be noted that this also implies that the price index of domestic goods and foreign goods is the same, i.e., the Buy-American stimulus is no longer more expensive than general government spending.

Taking all this together implies that in the Buy-American scenario the increase in demand for domestic products is twice as large as in the case of general government spending. However, figure 4 illustrates that this does not change the results qualitatively. Domestic production is now visibly more affected by Buy-American but still the difference is relatively small. Part of this is explained by the fact that the huge push in domestic demand increases prices considerably, which crowds out private consumption. Roughly speaking, one third of the stimulus is lost to the decrease in domestic consumption so that only two thirds of the stimulus leads to increased domestic production.

Another noteworthy result illustrated by figure 4 is the relatively large impact of general government spending on domestic production. Remember that the increase in government demand for domestic products is only half as large as under Buy American. Nevertheless, the increase in domestic production is almost equally large. In fact, the increase in domestic production is almost one percent, implying that virtually nothing of the stimulus of domestic production is lost to crowding out of consumption. There is still crowding out of consumption, but it goes almost entirely at the cost of imports. This is the reason why imports go up by only 0.5%, only by half as much as domestic production.

Thus, through terms of trade effects general government spending already puts more emphasis on stimulating domestic production than on stimulating foreign production. In other words, there is no need to concentrate the stimulus on domestic varieties since the adjustment of the terms of trade assures that this happens automatically even if the stimulus does not discriminate between domestic and foreign varieties. In contrast, explicitly concentrating the stimulus on only domestic varieties has huge adverse terms of trade effects, which trigger a decrease in private demand both from home and abroad.

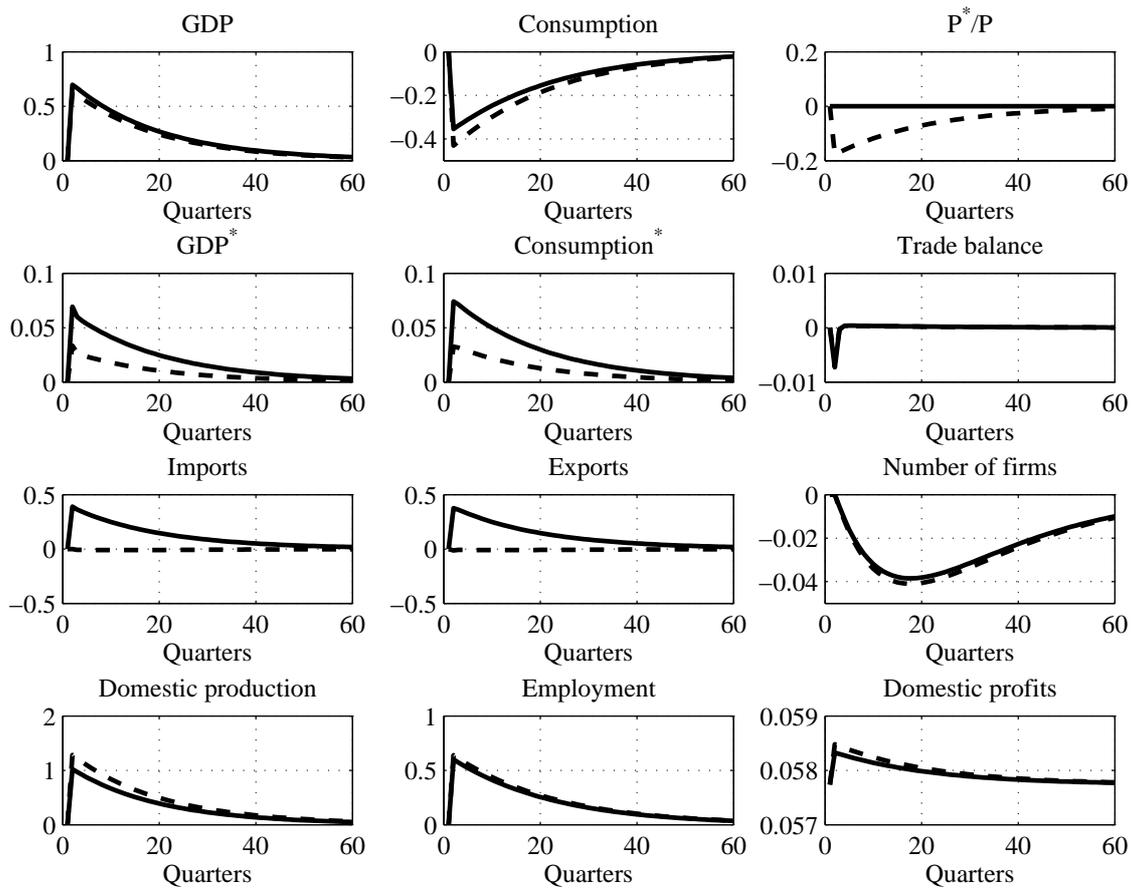


Figure 4: General government spending (solid line) versus Buy-American (dashed line) under free trade

4.3 Tariffs and Non-Tariff Trade Barriers

Figure 5 compares the effects of an increase in tariffs and in non-tariff trade barriers. It can be seen that both policies, although they generate a trade surplus, are not apt to increase GDP. Similar to Buy-American, tariffs and trade barriers increase domestic production but at the same time decrease exports and consumption. The former effect outweighs the second and thus production goes down. Note also that this kind of protectionism has severe negative consequences for the trading partner.

The effects of increases in tariffs and non-tariff trade barriers are remarkably similar, with the main difference being that the drop in consumption and GDP is much smaller in the case of an increase in tariffs. The reason is that tariffs, while harming trade, at least generate income which can be redistributed to consumers or used to decrease taxes. On the other hand, tariff increases are more harmful than trade barriers for the trading partner. This reflects the fact that part of the tariff revenues are paid by foreign producers through the terms-of-trade externality.

Not surprisingly, there is again the group of domestic firms which gains from protectionism. Higher tariffs and trade barriers protect them from foreign competition, increasing their profits. This also explains the increase in the number of firms. Note, however, that these results are not beneficial for the economy as a whole, since they reflect a redistribution of production from efficient exporters to relatively inefficient domestic firms.

4.4 Export Subsidies

Figure 6 illustrates the effects of an increase in export subsidies. This policy is widely considered as protectionism because it gives domestic firms an advantage over foreign firms on the foreign market (and, thus, leads to a trade surplus). However, not very surprisingly, the policy increases trade considerably. It does not only increase exports through the direct effect of the subsidy but it also increases imports through the implied terms-of-trade effects.

Subsidizing exports is the only policy considered which does not reduce consumption in the short run. This is implied by the terms-of-trade effect. The terms-of-trade improve because net export prices are not lowered by the full amount of the subsidy. This makes imports relatively cheaper. The surge in trade implies a decrease in domestic production but this effect is not large enough to overturn the positive effects of increased exports on GDP. The reason for the decrease in the number of firms is the same as for government spending. To increase production quickly it is necessary to put resources into the production of existing varieties, reducing long-term investments in new firms.

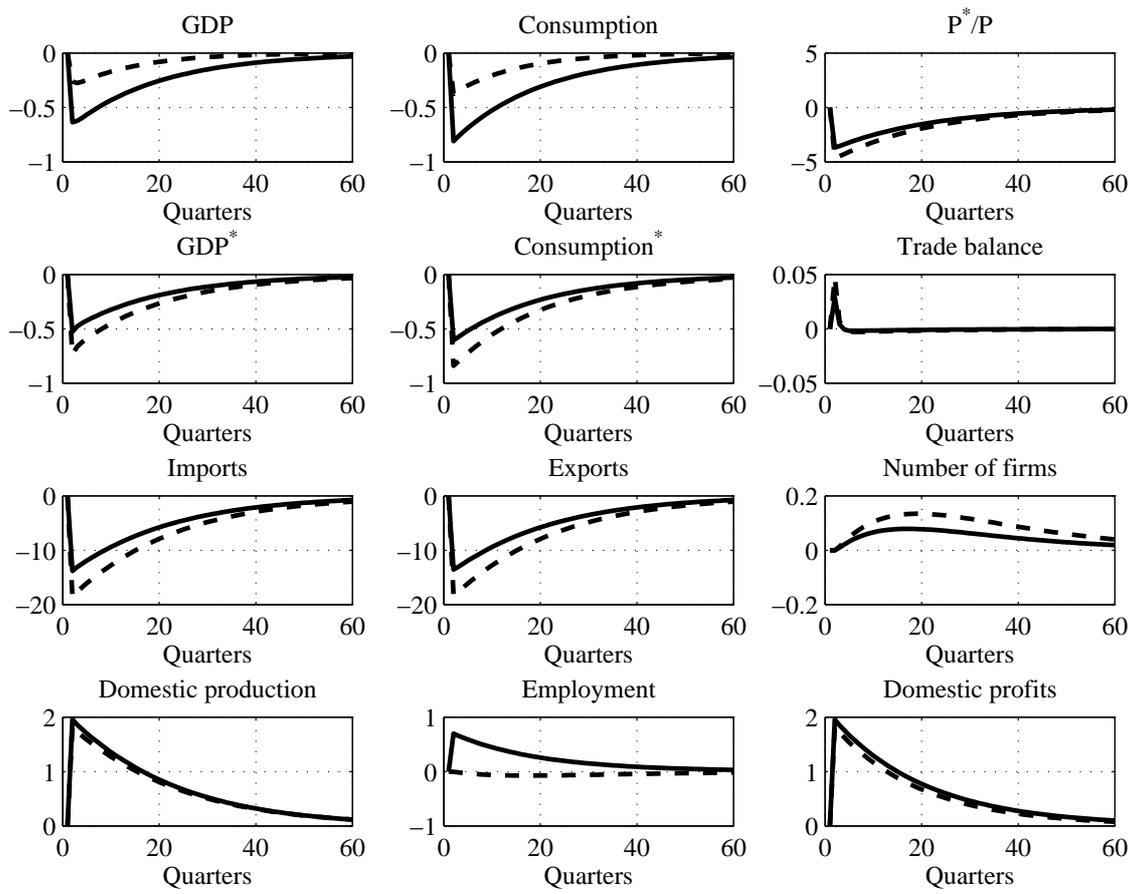


Figure 5: Increase in tariffs (dashed line) vs. increase in trade barriers (solid line)

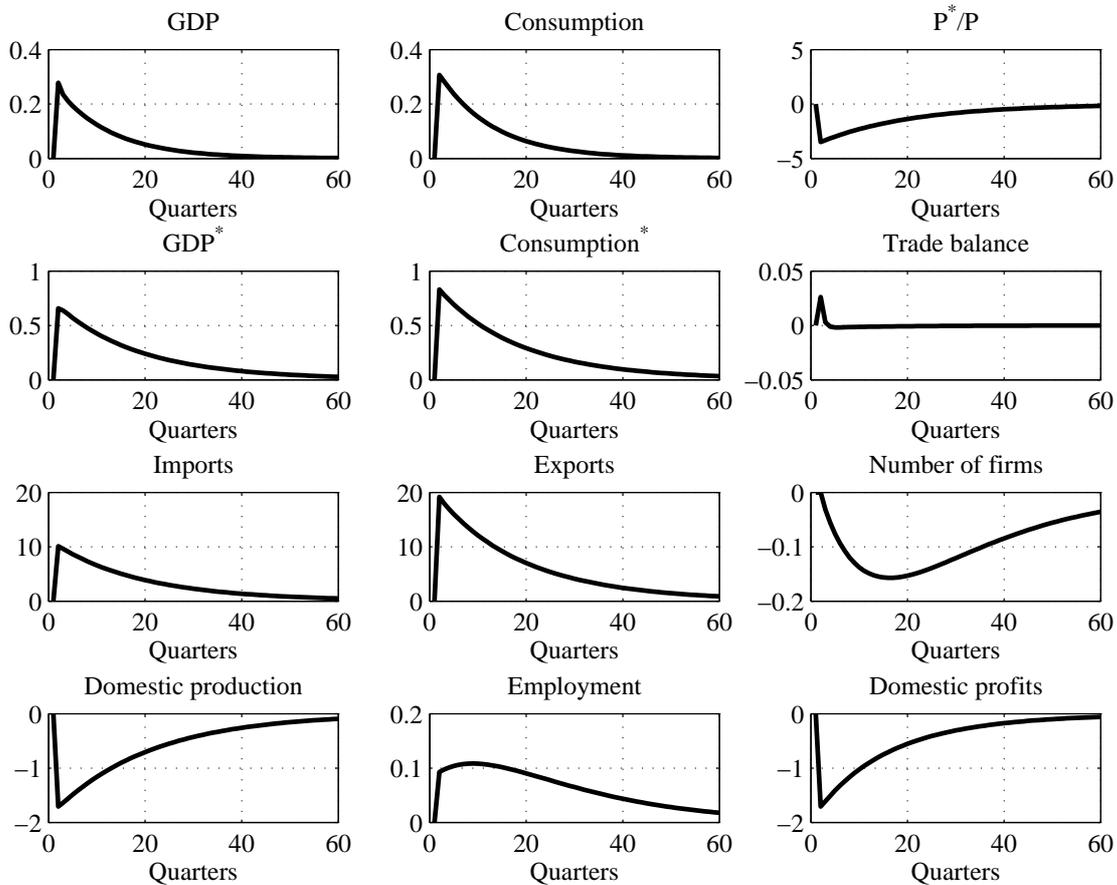


Figure 6: Export subsidies

Note that the effects on foreign GDP and consumption are not only positive but even larger than for the home country. The reason is that the policy stimulates production in both countries but only the domestic country has to bear the cost of financing the policy. In fact, an export subsidy subsidizes the consumption of imported goods in the foreign country, thus making foreign households better off.

The results of this experiment have to be taken with care. It has to be noted that the steady state subsidy is based on distortionary taxation while for this experiment we have assumed that the change in the export subsidy is financed via lump-sum taxation. While this serves the purpose of isolating the effects of changes in export subsidies and the effects of financing the measure, it is of course not very realistic. Note, however, that the same financing assumption is also used for the other stimuli. Further below it will be shown how the effects of export subsidies are altered if they are financed via distortionary taxes.

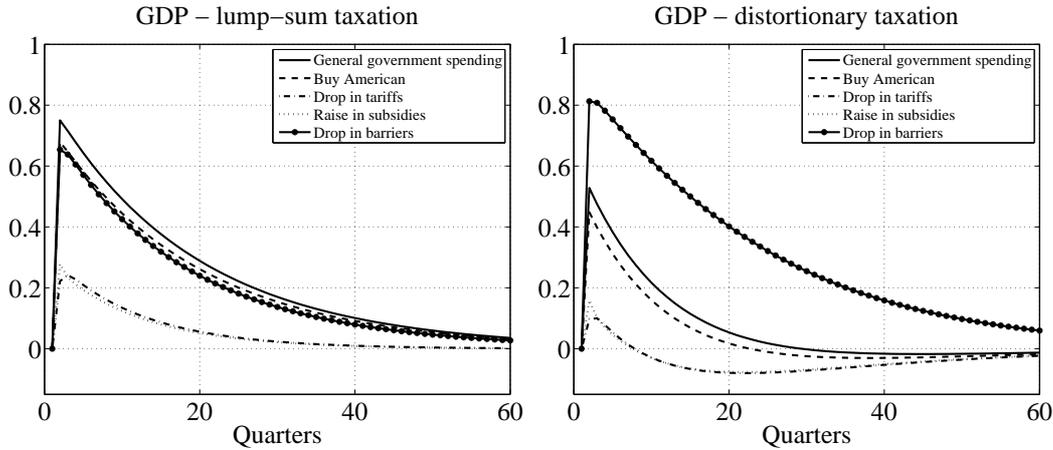


Figure 7: Comparison

4.5 Comparison of all measures

The left-hand panel of figure 7 compares the effects of general government spending and the four trade policies for GDP in the home country, i.e., the country initiating the policy change. As illustrated above, raising tariffs or raising trade barriers doesn't make any sense, since the policy decreases output and consumption. Therefore, we illustrate the effects of a drop in trade barriers or tariffs instead. The latter policy would be able to stimulate the economy but only very little.

In general, it is true that general government spending is the best instrument when it comes to stimulating output, although it leads to the familiar crowding out of consumption. If one wants to use trade policy as business cycle instrument, one should use it in such a way as to stimulate trade and not harm trade. However, the effects are smaller than the effects of general government spending.

5 Alternative Scenarios

5.1 Distortionary Taxation

So far we have assumed that all additional expenses are financed by a lump-sum tax. While this exercise is useful in isolating the effects of the single measures it is of course not very realistic. Therefore, we now assume that the all expenses are financed by the distortionary labor tax. From this exercise one would expect the output-effects of increases in government spending and export subsidies and decreases in tariffs to be reduced since these policies imply an increase in the

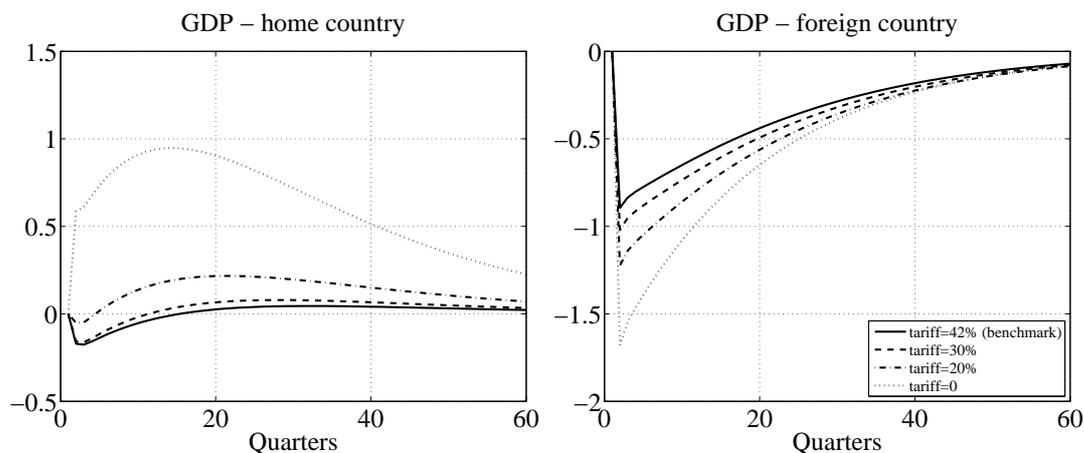


Figure 8: Different levels of steady state tariffs

labor tax and thereby have an additional negative effect on employment. This is exactly what we see in the right-hand panel of figure 7. On impact, the effect of general government spending is reduced from almost 0.8 to slightly above 0.5 and similarly for Buy-American. The effect of an increase in export subsidies and a decrease in tariffs is reduced from around 0.3 to 0.2 on impact. Furthermore, after eight periods the effect even becomes negative. These results are in sharp contrast to the effect of decreases in trade barriers which become even more beneficial. The effect on impact increases from 0.8 to 1. This is so because the decrease in trade barriers stimulates the economy without any direct cost. To the contrary, the increased production allows distortionary taxes to be reduced enhancing the positive effects on output even further. Overall, this experiment confirms our earlier assessment that trade policy can only stimulate output if it stimulates trade.

5.2 Lower Steady State Tariffs

So far we have assumed that tariffs in the steady state are set in such a way that no economy has an incentive to deviate from this equilibrium. In other words, we have assumed that the steady state is described by the Nash-equilibrium played between the two countries in the setting of their tariffs and export subsidies. While being plausible to start from a stable equilibrium, we often observe tariffs which are much lower. Therefore, we simulate what happens when the steady state tariff is at a lower level in the steady state and we increase the tariff in each case by the same amount. For this exercise we use the model with distortionary taxation, i.e., the income from tariff increases is used to reduce the distortionary tax. The result is illustrated in figure 8.

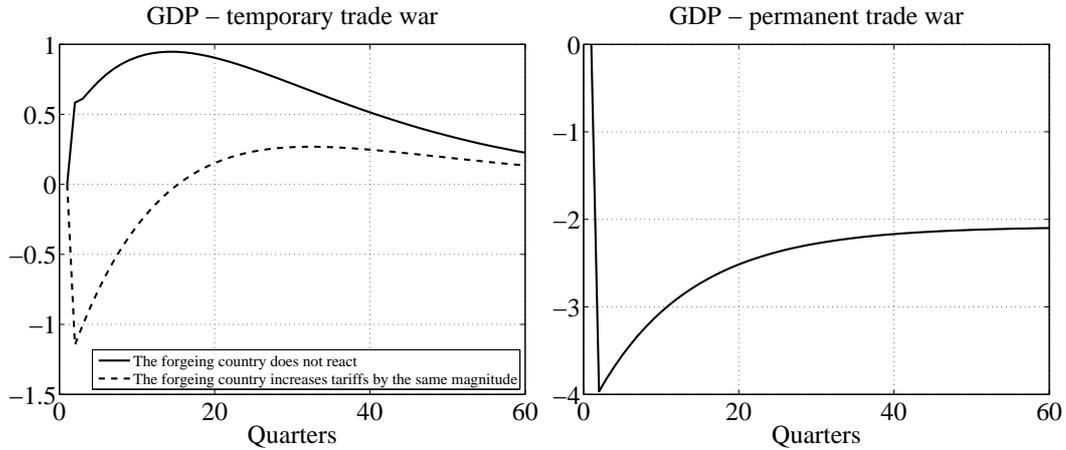


Figure 9: Trade wars

Not surprisingly, the effects become more beneficial with a decrease in steady state tariffs. The result that increases in tariffs are not a good instrument to stimulate output remains robust, except for very low steady state tariffs. It has to be noted that for steady state values of tariffs lower than the Nash-equilibrium the present value of consumption has to increase by assumption. A steady state that deviates from the Nash-equilibrium implies that each country has an incentive to permanently increase tariffs because this increases the present value of consumption. It might be argued that this problem (which is essentially a prisoner's dilemma) can be overcome by bilateral free trade agreements. However, if this is the case an increase in tariffs might be very dangerous, even if it is meant to be temporary and looks attractive in the short-run.

Two problems may arise. i) The trading partner has an increased incentive to retaliate. This is illustrated by the right-hand panel of figure 8. While the temporary increase in tariffs of the home country always hurts the foreign country, the pain grows with the decrease in steady state tariffs. This will diminish the good-will in the foreign country even further and make retaliation more likely. A potential outcome is illustrated in the left-hand panel of figure 9 where we assume that both countries managed to abolish tariffs in steady state but temporarily increase tariffs as a business-cycle instrument. Not very surprisingly, this makes things worse for both countries (output in the foreign country would be the same because now the policy is symmetric).

ii) There might even be a worse outcome. The protectionism of the home country might lead into a severe trade war, implying the free trade agreement to break down permanently. Then the two economies would converge back to the Nash-equilibrium and both countries would have permanently lower output. This is illustrated in the right-hand panel of figure 9 which shows the effect of a

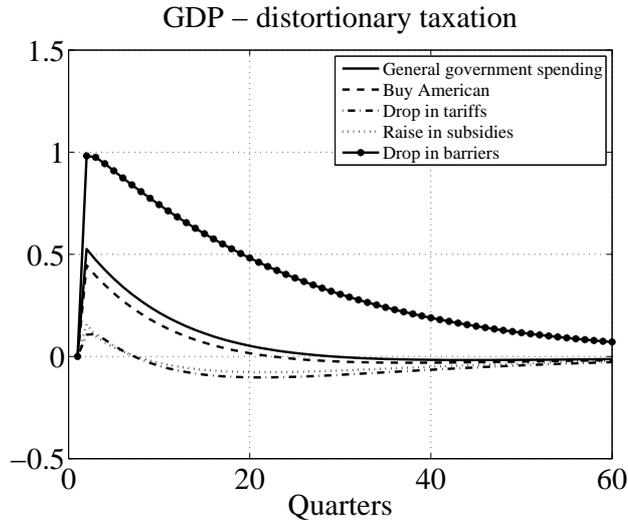


Figure 10: Starting from recession (deviation from path without stimulus)

permanent increase in tariffs from zero to the Nash-equilibrium value (42%).

5.3 Starting from Recession

As is common in the business cycle literature, we have demonstrated the effects of government stimulus by assuming that policy changes when the economy is in the steady state and illustrating the corresponding effects. Again this is done to isolate the effects of the policy but it is not realistic, since in practice business cycle policy is used during a recession. Because there might be some non-linearities we therefore deterministically simulate the same set of policies as above for the scenario where at the same time the economy is hit by a recession. As is common in the literature, we assume that the recession is caused by an exogenous decrease in aggregate productivity. The results are illustrated in figure 10. It can be seen that the right-hand panel of figure 7 is almost identical to figure 10, so that non-linearities do not play an important role.

6 Conclusion

We have used the dynamic new-trade theory model of Ghironi and Melitz (2005) and extended it by tariffs, export subsidies, general government spending and Buy-American to answer the question whether there is a short-run case for protectionism. The answer to this question is a clear “No.” Trade policy should not be used as a business-cycle instrument, especially not if it restricts trade. Although

protectionist measures can have a positive impact on domestic production, they also tend to worsen the terms-of-trade thus harming the export industry. The latter negative effect dominates, implying that measures that restrict trade actually decrease output instead of increasing it. This is a strong argument against using protectionism as an instrument in times of economic crisis. It refutes Krugman's argument that there is a short-run case for protectionism.

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