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by Pietro Cova, Alessandro Notarpietro and Massimiliano Pisani

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# PROTECTIONISM AND THE EFFECTIVE LOWER BOUND IN THE EURO AREA

by Pietro Cova*, Alessandro Notarpietro* and Massimiliano Pisani*

## Abstract

This paper evaluates the macroeconomic impact on the euro area (EA) of the imposition of tariffs by simulating a multi-country New Keynesian model featuring the effective lower bound (ELB) on the EA monetary policy rate. The main results are as follows. First, the bilateral tariff dispute between the United States (US) and China (CH) has positive spillovers on the EA economy, because of favorable trade diversion effects. Second, simultaneous tariff increases between the US and CH and between the US and EA have negative effects on euro-area GDP and (ex-tariff) inflation. The effects are magnified if the ELB binds in the EA. Third, if the elasticity of substitution among tradables is low, the spillovers on euro-area GDP of US-CH trade tensions are negligible if the ELB is not binding, while they become negative if the ELB binds.

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* Bank of Italy, Directorate General for Economics, Statistics and Research.

# 1 Introduction[1]

Protectionist measures introduced by the United States (US henceforth) since 2018 have revived the academic and policy debate on the international macroeconomic effects of tariffs and the implied responses of central banks. Higher tariffs raised by the US and the implied retaliation by other countries weaken global aggregate demand. As a consequence, ex-tariff inflation (i.e., inflation not inclusive of tariffs) tends to decrease.

The response of the central bank is crucial for the transmission of the tariff increase to macroeconomic conditions. When higher tariffs weaken domestic economic activity, then the central bank should reduce the policy rate in order to sustain output and stabilize ex-tariff inflation. This reduction can be implemented as long as the effective lower bound (ELB) is not binding. However, if the ELB is binding then the central bank cannot effectively stabilize macroeconomic conditions in the aftermath of a tariff imposition.

This paper evaluates the macroeconomic impact on the euro area (EA) of tariff imposition on traded goods by developing and simulating a multi-country model of the global economy featuring the ELB in the EA. The model is New Keynesian, thus it features short-run nominal price (and wage) rigidities and a non-trivial stabilization role for the central bank. In each country the central bank sets the policy rate according to a Taylor rule in response to inflation and output fluctuations. The model is calibrated to the EA as a whole (i.e., the EA is not modelled as a monetary union), the US, China (CH), and rest of the world (RW). We include CH because recent US tariffs have been raised mainly against CH (tradable) goods. The model also includes a global crude oil market. *Ceteris paribus*, lower global aggregate demand associated with tariff imposition could induce a decrease in commodity prices, in particular for crude oil. The price of oil can in turn affect the purchasing power of households, because of the low elasticity of substitution between oil and non-oil products, in particular if households belongs to a net oil importer economy, as it is the case for the EA.

We run the following scenarios. In the first one, the US imposes an *ad-valorem* tariff on CH products and CH retaliates by imposing tariffs on imports of US tradables. The US tariff is raised by 15 percentage points (pp), the CH tariff by 9pp.[2] We then compare this scenario with one in which the US imposes tariffs not only on imports from CH, but also on imports from EA and both CH and EA retaliate in full by raising their tariffs on imports of US products. We assume

[1]We thank Fabio Busetti, Federico Cingano, and two anonymous referees for useful comments. The views expressed in this paper are those of the authors alone and should not be attributed to the Bank of Italy or the Eurosystem.

[2]These increases in the tariff rates correspond approximately to the increases originally scheduled by the US and CH to come into effect during 2019. More details on the evolution of tariff rates since 2018 and the calibration of the shocks to tariff rates can be found in Section 3.

that the US tariff on EA products is raised by 1.5pp, and that the EA retaliates in full.[3] The two scenarios are run under alternative assumptions on the ELB, depending on whether it is binding or not binding in the EA. Finally, we run a robustness analysis on key parameters, such as the intratemporal elasticity of substitution among (non-oil) tradable goods, the responsiveness of the international price of crude oil to changing demand, and non-oil tradable products nominal rigidities.[4] All scenarios are run under the assumption of perfect foresight. It is always assumed that the increases in the tariff rates last for four years and that tariff revenues are rebated to domestic households in a lump-sum way. Also, there is no uncertainty and no confidence effects associated with tariff imposition. Households and firms perfectly anticipate future shocks and policy measures. Thus, the whole path of tariffs surprises households and firms only in the initial period of the simulations.

Given the assumed tariff increase, the main results are as follows. First, the bilateral tariff dispute between US and CH has small positive spillovers on the EA economy, because of favorable trade diversion effects. Second, simultaneous tariff increases between US and CH and between US and EA have negative effects on EA GDP and (ex-tariff) inflation. The effects are magnified if the ELB binds in the EA. Third, if the elasticity of substitution among tradables is low, the spillovers on EA GDP of US-CH trade tensions are negligible if the ELB is not binding, while they become negative if the ELB binds.

The paper is related to the literature on the macroeconomic effects of protectionism and tariffs.

Eichengreen (2016) argues that tariffs may be beneficial when the economy is at the ELB, as the inflationary effect of increased import costs may help lift the economy out of the trap. However, Barattieri et al. (2018) use an estimated vector autoregression model to show that protectionism is both recessionary and inflationary and complement the analysis with a strucutral, small-open economy model. They conclude that the recessionary nature of a persistent trade policy shocks worsens the liquidity trap. Similarly, Bolt et al. (2019) analyze the effects of the

[3]The size of this tariff shock corresponds approximately to the average tariff rate increase that would occur under the assumption that the US administration were to bring the actual tariff rate on car imports from the EU (now at 2.5%) to the level applied by the EU on US cars (10%). See Section 3 for more details.

[4]The higher the degree of substitutability, the larger the trade diversion effect. If in each region it is easier for households and firms to substitute domestic or non-taxed goods for those that are subject to a tariff, then the effects of a domestic or foreign tariff on foreign goods should improve domestic production and favor price dynamics. Instead, in the case of low substitutability, the negative income effect of the higher tariff could prevail over the positive substitution effect, inducing a drop in demand for the non-taxed good as well and, thus, in production. The range of existing estimates of the elasticity is rather wide. Anderton et al. (2004) report values, for the EA, between 0.5 and 0.8. Taylor (1993) estimates the value for the US to be 0.39, Whalley (1985) reports a value of 1.5. These are macro estimates, that are in contrast to the estimates from lower levels of aggregation. Broda and Weinstein (2006) report mean estimates between 4 and 6. It is common in many applied macroeconomic models to choose values of the elasticity of substitution between 1 and 1.5. However (see Rabanal and Tuesta 2010 and Lubik and Schorfheide 2006) DSGE models estimated with Bayesian methods using macro data suggest that the elasticity of substitution is well below unity.

US-China trade dispute and show that, while both countries would lose from a tariff war, the EA may benefit from trade diversion in the short run, if it does not get involved in the conflict. Lindé and Pescatori (2019) quantify the macroeconomic costs of trade tariffs and find that they can be substantial, with permanently lower income and trade volumes. However, a fully symmetric retaliation to a unilaterally imposed border adjustment tax can prevent any sizable adverse real or nominal effects. Pisani and Caffarelli (2018) evaluate the macroeconomics effects of tariffs implied by the Brexit on the United Kingdom and the EA. Faruqee et al. (2008) analyze the effects of tariffs in a model of the global economy. Different from all these contributions, we assess the impact of US tariffs on both EA GDP and inflation, taking into account the response of the EA monetary policy rate, possibly constrained by the ELB.[5]

The paper is organized as follows. The next section reports the main equations of the model. Section 3 illustrates the simulated scenarios. Section 4 contains the main results. Finally, Section 5 concludes.

# 2 Model

We initially provide an overview of the model. Thereafter, we describe tariffs and their impact on aggregate demand and inflation, and monetary policy. Finally, we report the calibration of model. In a separate online Appendix we report the maximization problems solved by households and firms and the implied first order conditions.

## 2.1 Overview

We develop a four-country model of the world economy, calibrated to the EA, US, CH, and RW. We assume that internationally traded goods can be subject to the imposition of import tariffs.[6]

In each bloc the representative household maximizes an intertemporal utility function by choosing consumption and leisure.

Consumption and investment are final non-tradable goods produced by local firms under perfect competition. The consumption good is a basket of two bundles, fuel and non-fuel. The latter is composed by intermediate non-tradable and tradable goods. The intermediate tradable bundle is a basket of domestic and imported bundles. The investment basket includes non-fuel

[5]Metelli and Natoli (2017) investigate the effect of a Chinese slowdown on inflation in the EA and the US. They find that commodity, demand, and exchange rate shocks play a role and that there is room for central bank interventions at EA and global level.

[6]Countries have different sizes. World size is normalized to one. The size of each country is equal to the number of households and to the number of firms within each sector.

intermediate goods only. The fuel bundle is assumed to be composed by oil only.[7]

Intermediate non-tradable goods are produced by firms under monopolistic competition according to a constant elasticity of substitution (CES) technology in labor, capital, and fuel. A similar production function holds for the production of intermediate tradable goods. The latter are sold domestically and abroad. Following Corsetti et al. (2008), in each country there is a local distribution sector intensive in local non-tradables. Firms in the distribution sector act under perfect competition. They produce distribution services using intermediate non-tradables according to a Leontief technology. The distribution sector introduces a wedge between the wholesale and the retail price. It implies that the exchange rate pass-through to retail prices is lower than the pass-through at the border (wholesale price), consistent with empirical evidence.

Firms in the intermediate tradable and non-tradable sectors are price-setters. The market power implies that each firm optimally sets the nominal price of the produced good in the currency of the destination market charging a mark-up over marginal costs, taking into account local demand conditions, nominal price rigidities, the distribution sector, and tariffs.

The fuel bundle is a homogeneous good produced by domestic firms using crude oil as the only input of a linear production function. Firms producing fuel act under perfect competition. They buy crude oil in the world market, transform it at no cost into fuel and then sell fuel domestically to households and firms producing non-fuel intermediate goods. The price of crude oil is set in the world market. World oil demand is composed by region-specific oil demands. The latter depend on the relative price of oil and region-specific aggregate demand. The oil price is set in US dollars and is the same in every bloc once corrected for nominal exchange rate fluctuations. So the law of one price holds for the crude oil price (there is no international price discrimination). The global oil supply is assumed to be exogenous and, in the main simulations, constant at its baseline level.

As for financial markets, there is a riskless one-period bond denominated in local currency that is traded within each bloc other than the US. Moreover, a riskless bond denominated in US dollars is traded internationally. As such, an uncovered interest parity holds for each region other than the US, that links the differential between domestic and US policy rates to the expected nominal exchange rate depreciation of the domestic currency vis-à-vis the US dollar. Moreover, the model includes nominal and real frictions useful to fit the data. Specifically, habit in consumption, sticky prices and wages, price and wage indexation, adjustment costs on

[7]The general model structure is similar to the International Monetary Fund (IMF) Global Economy Model (GEM), the European Central Bank (ECB) New Area Wide Model (NAWM), and the Euro area and Global Economy model (EAGLE). On GEM, see Bayoumi et al. (2004), Laxton (2008), and Pesenti (2008); on NAWM see Warne et al. (2008); on EAGLE, Gomes et al. (2010).

investment in physical capital.

As for monetary policy, the central bank in each bloc sets the policy interest rate according to a standard Taylor-type rule, by reacting to changes in ex-tariff consumer price inflation and real activity. To capture inertia in the conduct of monetary policy, it is assumed that in each period the policy rate also reacts to its value in the previous period in a gradual way. Moreover, the ELB can constrain the EA monetary policy rate.

Finally, it is assumed that the budget of the public sector is always balanced and that tariff revenues, net of public consumption spending, are rebated to domestic households in a lump-sum way.

## 2.2 Firms

In what follows, we report the relevant equations for the transmission of the tariff shock in the EA. Similar equations hold for other countries. We initially describe the sectors producing final and intermediate goods and their interaction with the tariffs. Subsequently, we illustrate the monetary policy rule and the ELB.

### 2.2.1 Final goods

Firms in the final goods sector produce three different types of goods under perfect competition. One type is used for private consumption, one for investment, and one for public sector consumption.

The private consumption bundle is produced according to a CES function of non-fuel $C_{V,t}$ and fuel $FU_{C,t}$ bundles:

$$C_t = \left[ (1 - a_{FU_C})^{\frac{1}{\rho}} C_{V,t}^{\frac{\rho-1}{\rho}} + a_{FU_C}^{\frac{1}{\rho}} FU_{C,t}^{\frac{\rho-1}{\rho}} \right]^{\frac{\rho}{\rho-1}}, \tag{1}$$

where $a_{FU_C}$ $(0 < a_{FU_C} < 1)$ is the share of fuel in the bundle and $\rho > 0$ measures the elasticity of substitution between non-fuel consumption, $C_{V,t}$, and fuel, $FU_{C,t}$.

The private non-fuel consumption bundle, $C_{V,t}$, is produced according to a CES function of intermediate, tradable and non-tradable goods ($C_{TC,t}$ and $C_{N,t}$, respectively):

$$C_{V,t} = \left[ a_{TC}^{\frac{1}{\eta}} C_{TC,t}^{\frac{\eta-1}{\eta}} + (1 - a_{TC})^{\frac{1}{\eta}} C_{N,t}^{\frac{\eta-1}{\eta_V}} \right]^{\frac{\eta}{\eta-1}}, \tag{2}$$

where the parameter $a_{TC}$ $(0 < a_{TC} < 1)$ is the weight of tradable goods in the consumption bundle and $\eta > 0$ is the elasticity of substitution between tradable and non-tradable goods.

The basket of tradable goods $C_{T,t}$ is

$$C_{T,t} = \left[ a_{EA,C}^{\frac{1}{\eta_T}} C_{EA,t}^{\frac{\eta_T - 1}{\eta_T}} + a_{US,C}^{\frac{1}{\eta_T}} C_{US,t}^{\frac{\eta_T - 1}{\eta_T}} + a_{CH,C}^{\frac{1}{\eta_T}} C_{CH,t}^{\frac{\eta_T - 1}{\eta_T}} + (1 - a_{EA,C} - a_{US,C} - a_{CH,C})^{\frac{1}{\eta_T}} C_{RW,t}^{\frac{\eta_T - 1}{\eta_T}} \right]^{\frac{\eta_T}{\eta_T - 1}}, \tag{3}$$

where the parameters $a_{EA,C}, a_{US,C}, a_{CH,C}$ $(0 < a_{EA,C}, a_{US,C}, a_{CH,C} < 1,\ a_{EA,C} + a_{US,C} + a_{CH,C} < 1$ ) are respectively the weights of EA, US, and CH goods in the bundle ($C_{EA,t}$, $C_{US,t}$, and $C_{CH,t}$, respectively), while $\eta_T > 0$ is the elasticity of substitution among tradable goods.

The consumption good $C_{EA}$ is a composite basket of a continuum of differentiated intermediate goods, each supplied by a different EA firm $h$. It is produced according to the following function:

$$C_{EA,t} = \left[ \int_0^{n^{EA}} C_{EA,t}(h)^{\frac{\theta_T - 1}{\theta_T}} dh \right]^{\frac{\theta_T}{\theta_T - 1}}, \tag{4}$$

where $1 < \theta_T < \infty$ is the elasticity of substitution among EA brands. The parameter $n^{EA}$ is the size of the EA economy $(0 < n^{EA} < 1$, the size of the world is normalized to 1).[8] Similar bundles hold for other EA tradable (imported) and non-tradable goods.

The production of investment goods $I$ is isomorphic to that of consumption, Eq. (2). For the public consumption basket, we assume it is fully biased towards domestic non-tradable intermediate goods.

**Consumption deflators.** The implied overall consumption deflator is

$$P_{C,t} = \left[ (1 - a_{FU_C}) P_{V,t}^{1-\rho} + a_{FU_C} P_{FU,t}^{1-\rho} \right]^{\frac{1}{1-\rho}}, \tag{5}$$

where $P_{FU,t}$ is the fuel price deflator and $P_{V,t}$ the deflator of the non-fuel component, equal to

$$P_{V,t} = \left[ a_{TC} P_{TC,t}^{1-\eta} + (1 - a_{TC}) P_{N,t}^{1-\eta} \right]^{\frac{1}{1-\eta}}. \tag{6}$$

where $P_{N,t}$ is the price of the bundle of intermediate non-tradables.

[8]We assume that the size of each country is equal to the number of households and to the number of firms within each sector.

The deflator of the non-fuel tradable consumption basket, $P_{TC,t}$, is

$$P_{TC,t} = \left[ a_{EA,C} P_{EA,t}^{1-\eta_T} + a_{US,C} P_{US,t}^{1-\eta_T} + a_{CH,C} P_{CH,t}^{1-\eta_T} + \left(1 - a_{EA,C} - a_{US,C} - a_{CH,C}\right) P_{RW,t}^{1-\eta_T} \right]^{\frac{1}{1-\eta_T}}, \tag{7}$$

where $P_{EA,t}$, $P_{US,t}$, $P_{CH,t}$, and $P_{RW,t}$ are the EA consumption prices of EA, US, CH, and RW tradable goods, respectively.

The EA consumer price of the generic US good is

$$P_{US,t} = \bar{P}_{US,t} \left(1 + \tau_{EA,US,t}\right) + \eta^{distr} P_{N,t}, \tag{8}$$

where $\tau_{EA,US,t} > 0$ is the *ad valorem* tariff the EA applies on the generic imported US good and $\bar{P}_{US,t}$ is the border (ex-tariff) price of the imported euro-invoiced good. The term $\eta^{distr} > 0$ is a parameter and is due to the presence of distribution services intensive in local intermediate non-tradable goods. The distribution services introduce a wedge between the border (i.e., wholesale) price and the consumer (i.e., retail) price of the tradable good. Similar equations hold in other regions and for other tradable goods. Thus, higher tariffs would, *ceteris paribus*, increase imported inflation and, thus, overall (i.e., headline) consumer price inflation. In equilibrium the magnitude of the increase would depend upon many factors, in particular the price-setting decisions of firms operating in the intermediate tradable goods and the monetary policy response.

### 2.2.2 Production of intermediate goods

The production function for the generic EA intermediate tradable good $h$ is:[9]

$$Y_{H,t}(h) = \left[ \left(1 - a_{FU_H}\right)^{\frac{1}{\xi_Y}} V_{H,t}(h)^{\frac{\xi_Y - 1}{\xi_Y}} + a_{FU_H}^{\frac{1}{\xi_Y}} \left(FU_{H,t}(h)\right)^{\frac{\xi_Y - 1}{\xi_Y}} \right]^{\frac{\xi_Y}{\xi_Y - 1}}, \tag{9}$$

where the variable $FU_{H,t}(h)$ represents fuel, bought from the domestic fuel sector, the variable $V_{H,t}(h)$ is value added input, the parameter $a_{FU_H}$ $(0 < a_{FU_H} < 1)$ is the weight of fuel in the production, and the parameter $\xi_Y > 0$ measures the elasticity of substitution between value added and fuel.

The value added input of the generic EA intermediate tradable good $h$ is:

$$V_{H,t}(h) = \left[ \left(1 - a_{HL}\right)^{\frac{1}{\xi}} K_{H,t}(h)^{\frac{\xi - 1}{\xi}} + a_{HL}^{\frac{1}{\xi}} L_{H,t}(h)^{\frac{\xi - 1}{\xi}} \right]^{\frac{\xi}{\xi - 1}}, \tag{10}$$

[9] A similar equation holds for the generic firm in the intermediate non-tradable sector.

where the variable $K_{H,t}(h)$ is the end-of-period physical capital, rented from domestic households in a competitive market, and $L_{H,t}(h)$ is labor, supplied by domestic households. The parameter $\xi > 0$ measures the elasticity of substitution between capital and labor. The parameter $a_{HL}$ $(0 < a_{HL} < 1)$ is the weight of labor in the production.

The variable $L_H(h)$ is a composite of a continuum of differentiated labor inputs, each supplied by a different domestic household $j$ under monopolistic competition. In the case of the EA, the bundle is

$$L_{H,t}(h) = \left[ \int_0^{n^{EA}} L_{H,t}(h,j)^{\frac{\theta_L - 1}{\theta_L}} \, dj \right]^{\frac{\theta_L}{\theta_L - 1}}, \tag{11}$$

where $1 < \theta_L < \infty$ is the elasticity of substitution among labor varieties. The assumption of monopolistic supply allows us to have nominal wage rigidity in the model.

The generic firm in the intermediate tradable sector minimizes its production costs by optimally choosing the amount of inputs given the above technology constraints and the corresponding prices (the gross nominal rental rate of capital $R_t^K$, the nominal wage rate $W_t$, the price of fuel $P_{FU,t}$).

Moreover, the firm sets prices in each (domestic and foreign) destination market in local currency, taking into account local demand conditions and the presence of a local distribution sector. We introduce nominal price rigidities by assuming that the firm pays market-specific quadratic costs for adjusting ex-tariff nominal prices.[10]

Thus, when setting the ex-tariff optimal price, the firm takes into account that tariffs could affect relative prices and thus demand for the produced good. Specifically, and consistent with the definitions of the bundles and deflators reported above, the following consumption demand equation for the generic US brand $i$ holds in the EA:

$$C_{US,t}(i) = a_{US,TC} a_{TC} \left(1 - a_{FU_C}\right) \left( \frac{P_{US,t}(i)}{P_{US,t}} \right)^{-\theta_T} \left( \frac{P_{US,t}}{P_{TC,t}} \right)^{-\eta_T} \left( \frac{P_{TC,t}}{P_{V,t}} \right)^{-\eta} \left( \frac{P_{V,t}}{P_{C,t}} \right)^{-\rho} C_t, \tag{12}$$

where prices are inclusive of tariff (a similar equation holds for the investment demand). An increase in the tariff on the US good would raise its price inclusive of tariff, according to Eq. (8), inducing consumers to substitute other goods for the US ones.

[10] See Rotemberg (1982).

## 2.3 The central bank

In each bloc the central bank controls the monetary policy rate according to a standard Taylor rule, which implies that the policy rate reacts to the ex-tariff consumer price inflation, consistent with the fact that tariffs should mainly affect the level of consumer prices and have a transitory effect on the change in consumer prices. Moreover, the central bank reacts to real output growth.

In the case of the EA central bank, the gross monetary policy rate $R^{EA}$ is set according to the rule:

$$\left(\frac{R_t^{EA}}{\overline{R}^{EA}}\right) = max\left(\frac{1}{\overline{R}^{EA}}, \left(\frac{R_{t-1}^{EA}}{\overline{R}^{EA}}\right)^{\phi_R^{EA}} \left(\frac{\overline{\Pi}_{C,t}^{EA}}{\overline{\Pi}_C^{EA}}\right)^{\left(1-\phi_R^{EA}\right)\phi_\Pi^{EA}} \left(\frac{GDP_t^{EA}}{GDP_{t-1}^{EA}}\right)^{\left(1-\phi_R^{EA}\right)\phi_{gY}^{EA}}\right), \quad (13)$$

where $\overline{R}^{EA}$ is the steady-state gross monetary policy rate, $\overline{\Pi}_{C,t}^{EA} \equiv \overline{P}_{C,t}^{EA}/\overline{P}_{C,t-1}^{EA}$ is the ex-tariff gross headline inflation rate, $\overline{\Pi}_C^{EA}$ is the long-run steady-state inflation target, and $gdp_t^{EA}$ the EA output in real terms (i.e., evaluated at constant prices), the terms $\phi_R^{EA}$, $\phi_\Pi^{EA}$, and $\phi_{gY}^{EA}$ are parameters ($0 < \phi_R^{EA} < 1$). Thus, it is assumed that the central bank reduces the policy rate if the increase in tariff induces, in equilibrium, a decrease in the ex-tariff inflation rate. The decrease can be due to the lower domestic and global aggregate demand, induced by the tariff increase. Finally, the *max* operator in Eq. (13) allows us to have the ELB endogenously constraining the EA policy rate and, thus, affecting the propagation of changes in tariffs to the EA economy. The ELB for the EA gross monetary policy rate is set to one (i.e., zero for the net interest rate).[11]

## 2.4 Global crude oil market

It is assumed that there is a global crude oil market. The global oil supply $Y_{O,t}^S$ is exogenous and constant at its steady-state level. Oil supply is owned by the RW and, to a smaller extent, the US, and CH, that receive the related oil revenues. US, EA, and CH are net oil importers. The US dollar price of crude oil, $P_t^{O,USD}$, is determined in the world market. It is set in US dollars and is the same in every bloc once corrected for nominal exchange rate fluctuations. So the law of one price holds for the crude oil price, because of the assumption that the oil market is global (i.e., there is no cross-country market segmentation and investors can arbitrage out possible differences in oil price, so that in equilibrium the US dollar price is the same everywhere). Hence,

[11] We assume the ELB does not hold in the other three regions of the model.

for example, the implied euro-denominated crude oil price is:

$$P_t^O = S_t P_t^{O,USD},$$

where $S$ is the nominal exchange rate of the euro vis-à-vis the US dollar (euro units per US dollar). Firms in the EA fuel sector act under perfect competition. They import crude oil $O_t$ and transform it into liquid fuel $FU_t$ according to a simple linear technology ($FU_t = O_t$). Firms then make fuel available to domestic firms in the final consumption goods sector and to firms producing the EA (non-fuel) intermediate good. So firms sell fuel only domestically. Thus, the consumer price of fuel $P_t^{FU}$ is the same as the crude oil price $P_t^O$. The adopted framework is consistent with the empirical evidence on oil price pass-through to fuel prices for European countries, which is complete and quick.[12]

## 2.5 Calibration

The model is calibrated at quarterly frequency. Table 1 shows the great ratios for the four regions. Table 2 reports the trade matrix.[13]

The parameters are calibrated to match these quantities and in line with the existing literature. Tables 3 to 6 report the (quarterly) calibration.

Table 3 shows the preference and technology parameters. Preferences are the same across households of different regions.

The elasticity of substitution among tradable goods is 4. For the investment basket, the elasticity of substitution between domestic and imported goods is the same as that of the consumption basket. The degree of substitutability between tradables and non-tradables is set to 0.8. The parameter $\eta^{distr}$ of the distribution sector in Eq. (8) is set so that the distribution margin (i.e., the ratio between the cost of distribution service and the consumer price of tradable goods) is around 50%.

The intertemporal elasticity of substitution is set equal to 1.0, the habit parameter to 0.7, and the inverse of the Frisch elasticity to 1.5. We further assume a depreciation rate of physical capital of 0.025, consistently with an annual depreciation rate of 10%.

The weight of fuel in the production function of intermediate goods, $a_{FU_H}$ ($a_{FU_{H,N}}$), is set to 0.02. The elasticity of substitution between fuel and value added is set to 0.8, while that

[12]See Donoval et al. (2010).

[13]We rely on the United Nations' Commodity Trade Statistics (COMTRADE) data on each region's imports of consumer and capital goods, to derive the matrix delineating the pattern and composition of trade for all regions' exports and imports.

between capital and labor is set to 1. As such, oil and other inputs are hardly substitutable. For the consumption basket, we set the weight of fuel to 0.08, so that the share of fuel in the consumption basket is equal to 4.0 percent. The elasticity of substitution between non-fuel and fuel in the consumption basket is equal to 0.4.

The weight of domestic tradable goods in the consumption and investment tradable baskets is different across countries, to match multilateral import-to-GDP ratios. We then set the weights of bilateral imports to match the trade matrix, reported in Table 2.

Table 4 reports real and nominal rigidities. For real rigidities, parameters of the adjustment costs on investment changes are set to 4.5 in all countries. For nominal rigidities, we set the adjustment costs for wages to 600; for prices of domestic and imported tradable goods, to 60; for prices of non-tradables goods, to 1000.[14] The price and wage indexation parameters are set to 0.75.

Table 5 shows price and wage markup values. We identify the intermediate non-tradable and tradable sectors in the model with the services and manufacturing sectors in the data, respectively. In each region the markups in the non-tradable sector and in the labor market are assumed to be higher than that in the tradable sector.[15]

Table 6 reports the parameters of the monetary policy rules Eq. (13). For monetary policy, as dictated by Eq. (13), the policy rate reacts to the its lagged value (the corresponding parameter is set to 0.87), inflation (1.6) and output growth (0.1) when it does not hit the ELB. [16] The chosen calibration allows us to get a response of EA GDP and inflation to a domestic monetary policy shock in line with other models of the EA. The transmission of a global oil supply shock is also in line with the existing evidence for the EA, according to which the pass-through of an oil price shock to headline inflation is rather complete. [17] Moreover, the calibration allows us to match, for each country, the oil import (shares of overall imports), the share of domestic demand satisfied by domestic oil production, and the ratio between global oil consumption and worldwide GDP.

Given that the initial level of tariffs does not affect our results, for simplicity we set steady-state tariffs to zero in each region.

[14] The value 60 for import price adjustment costs is consistent with a relatively quick pass-through of the nominal exchange rate to import prices.

[15] Our values are in line with other existing similar studies, such as Bayoumi et al. (2004), Faruqee et al. (2007), and Everaert and Schule (2008).

[16] The response of the policy rate to output growth is rather small, in line with similar models for the EA, such as Gomes et al. (2010) and Warne et al. (2008).

[17] See Donoval et al. (2010).

# 3 Simulated scenarios

In the first scenario it is assumed that the US imposes a 15pp tariff increase on imports of CH products and that CH retaliates by imposing a 9pp tariff increase on US goods and services. These broadly correspond to the tariff rate increases originally scheduled by the US and China to come into effect by the end of 2019.[18]

The second scenario considers an escalation of the (global) trade tensions beyond the bilateral US-CH trade flows. A US-EA trade dispute is simulated on top of the US-CH one. Thus, while bilateral tariff rate increases between the US and CH are still as described above, it is now assumed that the US also increases tariff rates on all of its imports from the EA by 1.5pp and that the EA retaliates in full.This change in tariffs corresponds approximately to the average tariff rate increase that would occur under the assumption that the US administration were to bring the actual tariff rate on car imports from the EU (now at 2.5%) to the level applied by the EU on US cars (10%).[19]

The two scenarios are run under alternative assumptions on the ELB, depending on whether it is binding or not binding in the EA. Finally, we run a robustness analysis on key parameters, such as the intratemporal elasticity of substitution among (non-oil) tradable goods, the responsiveness of the international crude oil price to the tariff shocks, and on the degree of nominal rigidities in the non-oil tradable goods sector.

In all simulations the increases in the tariff rates last for four years. Tariff revenues are rebated in a lump-sum way to domestic households. We maintain the assumption that both the EA and CH, while affected by the higher tariffs on bilateral trade flows with the US, do not impose any tariffs on their respective bilateral exports and imports. The same holds for

[18] Prior to the trade dispute escalation US imports from China were subject to an average tariff rate of 3%, while China's tariff rate on imports from the US amounted on average to 8%. US tariffs were then increased in different waves throughout 2018, when they were raised to 10% on average on 200bn USD and to 25% on 50bn USD of imports from China (see Amiti et al. (2019b), Amiti et al. (2019a), Fajgelbaum et al. (2019), and Bown and Zhang (2019)). Total US imports from China amounted in 2018 to 540bn USD. From the second half of 2019 the US administration further raised tariffs, by levying the 25% tariff rate uniformly also on the 200bn USD of imports from China that were subject to the 10% rate. Starting on September 1 2019 the US administration has further imposed an average tariff of 15% on part of the imports that were not yet subject to any tariff. China has so far always retaliated, levying a 22pp average tariff rate on most imports from the US. See also Bown and Kolb (2019). At the current juncture further tariff rate increases by the US administration scheduled for October 15 and December 15 2019 have been suspended. As trade negotiations with China are still ongoing, it is as yet unclear whether these suspensions are to be considered only temporary or whether they are the beginning of a broader trade detente between the two countries.

[19] The US administration is considering the imposition of higher tariffs on auto imports from the European Union (EU). Inside the EA, these higher tariffs would hit exports in particular from Germany. In 2018 EU exports of auto vehicles to the US amounted to about 22% of total EU exports of manufacturing goods to the US. Assuming that the US administration increased the tariff rate on car imports (now at 2.5%) to the level applied by the EU to US cars (10%), the average tariff on overall EU exports to the US would then rise by approximately 1.5pp (see also Cappariello and Mancini (2019)). This is the shock underlying our simulations. See also Bown and Kolb (2019).

the RW bloc which is neither directly affected by higher US, EA or CH tariffs nor is it raising any tariffs on its three trading partners. Finally, all scenarios are run under the assumption of perfect foresight.[20] There is no uncertainty and households and firms perfectly anticipate future shocks and policy measures. Thus, the whole path of tariffs surprises households and firms only in the initial period of the simulations. In the ELB-based simulations, it is assumed that the EA monetary policy rate is stuck at the ELB, while the exit period is endogenously determined.

# 4 Results

We initially report results of the US and CH imposing tariffs on each other's tradables. We then consider the case of simultaneous US-CH and US-EA tariff disputes. Thereafter, we investigate the role of the ELB. Finally, in the section on robustness, we analyze the role of the elasticity of substitution among (non-oil) tradables and the role of changes in global oil prices.

## 4.1 US-CH trade restrictions

Fig. 1 reports the responses of the main US and CH variables.[21] The imposition of higher bilateral tariffs persistently pushes down US and CH gross multilateral exports and imports. CH exports decrease more than CH imports because the US is a large destination market for CH products. Moreover, the increase in US tariffs is larger than that of the CH tariffs.

Lower US aggregate demand drives down ex-tariff consumer price inflation, while the price level inclusive of tariffs (headline consumer price level) increases because of the tariff itself. US GDP declines over time in a smooth way. At the beginning of the fifth year, when the tariffs are suddenly reduced to their baseline levels, US GDP starts to return towards its baseline level. The smooth decrease in US GDP mainly reflects lower US consumption and investment, which are negatively affected by the increase in US tariffs on CH imports, whose weight in the US consumption and investment bundles is non-negligible (in line with data, US imports of CH products are in steady state set to 3.0% of US GDP). Lower ex-tariff inflation and economic activity induce the US central bank to reduce the policy rate, consistent with the Taylor rule, Eq. (13).

CH GDP decreases as well. The large drop is accounted for by lower CH exports and domestic investment. The US tariff widely affects the CH economy, because the US is a relevant destination

[20] We solve the model in Dynare using a Newton-Raphson type algorithm. This allows us to account for nonlinearities related to the presence of the ELB.

[21] In all charts, reported GDP and its components are evaluated at constant prices, i.e. using the steady-state corresponding deflators.

market for CH exports and the CH economy is open to international trade.

The CH central bank reduces the policy rate, because the bilateral trade dispute has a negative effect on the ex-tariff inflation rate and economic activity. Overall, the CH policy rate decrease is slightly larger than that of the US rate. Thus, the US dollar exchange rate vis-à-vis the CH currency appreciates on impact. At the same time, the lower US and CH policy rates imply that both the US dollar and CH currency depreciate vis-à-vis the RW and EA currencies on impact.[22]

Lower economic activity in US and CH induces a decrease in global oil demand, because of the lower demand of fuel for production and consumption purposes. Given the assumption of constant global oil supply (at its baseline level), the international price of crude oil, invoiced in US dollars, decreases. The implied decrease is rather persistent but it is not very large (-1%), consistent with the relatively small size of the global shock. Thus, it does not greatly contribute at keeping inflation low in the considered countries, through the lower inflation rate of the fuel component of the consumption basket and the lower production costs of non-oil products. Instead, weak inflation dynamics is mainly associated with the reduction in the non-fuel component of inflation (not reported to save on space).

Finally, spillovers to the RW GDP are rather small, as suggested by the contained GDP response, whose sign is positive because of the favorable trade diversion effect.

As reported in Fig. 2, spillovers to the EA are small as well. The EA economy is not greatly affected by the US-CH trade tariff increase. EA economic activity slightly improves (GDP increases by about 0.1%), because the trade tariff increase between US and CH generates a trade diversion effect in favor of EA exports, that increase towards both countries. The monetary policy rate and the other main macroeconomic variables essentially stay at their baseline values. The policy rate increases only mildly. The nominal exchange appreciates vis-à-vis the US and CH currencies, because the US and CH central banks reduce the respective monetary policy rates. The appreciation partly reduces the competitiveness of EA products and, thus, the favourable trade-diversion effect of the US-CH trade tensions.

Overall, we find that the effects of US-CH trade tensions on the EA economy are rather small.

## 4.2 US-CH and US-EA simultaneous trade restrictions

Our next scenario considers an escalation of the trade dispute beyond the bilateral US-CH trade flows. A US-EA trade tariff increase is simulated on top of the US-CH one. Thus, while bilateral

[22]In the model, each bilateral nominal exchange rate is a forward-looking variable and its current value reflects the stream of current and expected future monetary policy rates differential, according to a forward-looking uncovered interest parity condition.

tariff rates between the US and CH are still increased as in the scenario described in the previous section, it is now assumed that the US also raises tariffs on all of its imports from the EA by 1.5pp and that the EA retaliates in full. At the same time we maintain the assumption that both the EA and CH, while affected by the higher tariffs on bilateral trade flows with the US, do not impose any tariffs on their respective bilateral exports and imports. The same holds for the RW bloc which is neither affected directly by higher US, EA, and CH tariffs nor is it raising any tariffs on its three trading partners.

Fig. 3 reports the responses of the US, CH, and RW variables. They do not greatly change relative to the scenario of US-CH trade dispute (see Fig. 1). US GDP decreases slightly more than in that scenario, because EA tariffs induce an additional drop in US exports and because US households and firms further reduce aggregate demand, given that now both CH and EA products are more expensive.

Fig. 4 shows the responses of the EA variables. EA consumption, investment, and GDP are negatively affected by the tariffs. Instead, in the case of CH-US (bilateral) trade tariff increase, the spillovers to EA GDP were small and somewhat expansionary, because of the favourable trade diversion effects (Fig. 2). In the current simulation US demand shifts away from EA exports, causing them to decrease. Similarly, EA imports of US tradables decrease, because of the higher EA tariffs. The imposition of tariffs negatively affects EA investment, because lower exports have a negative effect on production and, thus, on capital accumulation. EA ex-tariff inflation slightly decreases, inducing the central bank to mildly reduce the policy rate to stabilize macroeconomic conditions. This implies that the decreases in EA GDP and ex-tariff inflation are rather small.

### 4.3 US-CH and US-EA trade restrictions: the role of the ELB

We newly consider the previous scenario, representing simultaneous trade disputes between US and CH and between US and EA, under the assumption that the reduction in the EA monetary policy rate is not implementable because of the endogenous ELB.

Fig. 5 displays the results. The EA policy rate is endogenously stuck at the ELB in the first four years, i.e., when higher tariffs are implemented. Thereafter, the policy rate gradually increases. In this case, the recessionary effects of the tariff increase on the EA economy are widely amplified. EA aggregate demand decreases more, because of the lower consumption and investment induced by the higher real interest rate (not shown to save on space). The latter increases because the nominal policy rate is stuck at the ELB while expected inflation decreases. Moreover, on impact the nominal exchange rate vis-à-vis the US dollar appreciates to a larger extent under the ELB-assumption, inducing (i) lower imported inflation and (ii) a deterioration in the price-competitiveness of EA exports and, thus, contributing to further decrease EA exports.[23] EA GDP and annualized ex-tariff inflation decrease by around 0.25% and 0.1pp, respectively (trough levels).

Overall, we find that the deflationary effects of trade tariffs are enhanced if the ELB constrains the central bank response.

## 4.4 Robustness

We newly run the two scenarios (trade disputes between US and CH, simultaneous trade disputes between US and CH and between US and EA) under alternative assumptions on the value of the elasticity of substitution among (non-oil) tradables. In one case, we set the value of the elasticity to a higher value than in the benchmark calibration, 6.0 instead of 4.0. In the other, to a lower value, 1.2. Moreover, we newly run the scenario of "simultaneous trade disputes between US and CH and between US and EA" under alternative assumptions on the response of crude oil price in US dollars, i.e., it decreases or it is kept constant at its baseline level.

### 4.4.1 The elasticity of substitution

Fig. 6 reports the responses of the EA variables in the case of US-CH trade tensions. Spillovers to the EA are positive and relatively large under the assumption of high elasticity. In this case, it is easier for US and CH households to rebalance their aggregate demand towards the EA products, that are not subject to the tariff increase and, thus, are cheaper (than CH and US products, respectively). Following higher exports, both EA GDP and inflation increase more under the high elasticity assumption. The EA central bank raises the policy rate to stabilize inflation and economic activity.

Under the no-ELB assumption for the EA, and different from the case of high elasticity, the spillovers to the EA are roughly nil in the case of low elasticity (assumed to be equal to 1.2). EA GDP slightly decreases in the medium run, following the lower EA exports. For CH and US households it is now more difficult to substitute EA products for the corresponding goods and services subject to tariffs. Thus, the negative effect of higher tariffs on US and CH aggregate demand dominates the positive (to the EA exports) trade diversion effect. The lower aggregate

[23] The additional appreciation is consistent with the uncovered interest rate parity condition – that links the difference between EA and US policy rates to the expected depreciation of the euro – and the larger decrease, compared to the EA, in the US policy rate, which is not constrained by the ELB when reacting to weak pre-tariff inflation and production dynamics due to the trade tensions.

demand reduces EA inflation. Consistent with the weak inflation, the EA central bank lowers the policy rate.

When, in addition to low elasticity of substitution, the ELB is binding, the sign of the spillovers on EA GDP is negative. The EA central bank cannot reduce the policy rate in response to lower inflation and economic activity. As a result, the real interest rate increases and the EA faces a persistent drop in EA GDP (around -0.1%) and inflation.

Fig. 7 shows the EA variables in the scenario representing simultaneous trade disputes between US and CH and between US and EA.

If the ELB is assumed to never bind and the elasticity is high (equal to 6), EA exports increase instead of decreasing as in in the case of low elasticity, while EA imports decrease more. The reason is that under high elasticity US households find it easier to substitute EA products for CH tradables, which are subject to a higher tariff. Similarly, CH households substitute EA for US products. In addition, EA households have a larger incentive to reduce imports of US products and shift aggregate demand toward domestic goods. EA GDP decreases to a lower extent if the elasticity is high.

For a given (high or low) elasticity, if the ELB binds, EA exports drop to a larger extent relative to the no-ELB case, because of the stronger appreciation of the euro exchange rate vis-à-vis the US dollar and the other currencies. Moreover, the ELB implies, for a given elasticity, a larger drop in EA imports, consistent with the larger decrease in EA aggregate demand. There is a pronounced and persistent decrease in EA GDP when the ELB binds and the elasticity of substitution is low, because of the larger drop in EA exports and the larger drop in EA aggregate demand. The latter is due to the combination of higher real interest rate (the ELB binds) and the greater difficulty of households and firms to substitute domestic for imported goods (the elasticity is low).

Overall, we do find the elasticity of substitution among tradables can matter for the sign and size of the tariff effects. In particular, the effects on EA GDP are negative and larger if the elasticity of substitution is low and the ELB binds.

#### 4.4.2 Constant oil price

Finally, Figure 8 reports the responses of the main EA variables in the case of simultaneous trade disputes between US and CH and between US and EA under alternative assumptions on crude oil prices. Specifically, it is assumed that the crude oil price, invoiced in US dollars, is constant at its baseline level instead of dropping, because the global oil supply decreases to match the decrease in global oil demand.

If the ELB is assumed not to bind in the EA, the drop in GDP is smaller when the global oil price decreases after the imposition of higher tariffs on non-oil tradables. Since the EA is a (net) oil importer, households' purchasing power benefits from the decrease in fuel price associated with lower oil prices.

Similarly, if the ELB is binding, EA GDP decreases to a smaller extent when the oil price is not constant (but instead drops following the decline in global aggregate demand). Given the relatively mild decline in global oil prices and the calibration of the consumption basket, the favourable income effect of lower oil prices partly compensates the negative intertemporal substitution effect associated with higher real interest rates. The reason is that the EA is an importer of oil, whose elasticity of substitution with other goods is relatively low. Thus, the reduction in its price positively affects the purchasing power of households and firms (positive income effect).

# 5 Conclusions

We have evaluated the macroeconomic impact on the EA economy of US tariffs on traded goods by developing and simulating a multi-country model of the global economy featuring the ELB in the EA. According to our results, the bilateral tariff dispute between US and CH has small positive spillovers on the EA economy, because of favorable trade diversion effects. Simultaneous tariff increases between US and CH and between US and EA have negative effects on EA GDP and (ex-tariff) inflation. The effects are somewhat magnified if the ELB binds in the EA. Finally, if the elasticity of substitution among tradables is low, the spillovers on EA GDP of US-CH trade tensions are negligible if the ELB is not binding, while they become negative if the ELB binds.

Our contribution can be extended along several dimensions. First, the EA economy can be modeled as a monetary union. The deflationary effect would depend on the relevance of international (both intra- and extra-EA) trade of EA member countries. Second, we can assess the effectiveness of non-standard monetary policy measures, such as long-term sovereign bond purchases by the central bank, in overcoming the ELB constraint and, thus, limiting the deflationary effects of tariffs. Third, changes in the monetary policy strategies can be considered, like assuming that the central bank targets the price level or time-average inflation instead of following an inflation targeting. Fourth, the role of employment and wage dynamics for the propagation of the shock can be assessed by introducing in the model a labor market featuring search-and-matching frictions.[24] We leave these issues for future research.

[24] See Jacquinot et al. (2018).

# References

**Amiti, Mary, Stephen J. Redding, and David Weinstein**, "New China Tariffs Increase Costs to U.S. Households," Federal Reserve Bank of New York Liberty Street Economics (blog), Federal Reserve Bank of New York May 2019.

**_ , _ , and _** , "The Impact of the 2018 Trade War on U.S. Prices and Welfare," NBER Working Papers 25672, National Bureau of Economic Research, Inc March 2019.

**Anderton, Robert, Filippo di Mauro, and Fabio Moneta**, "Understanding the impact of the external dimension on the euro area: trade, capital flows and other international macroeconomic linkages," Occasional Paper Series 12, European Central Bank April 2004.

**Barattieri, Alessandro, Matteo Cacciatore, and Fabio Ghironi**, "Protectionism and the Business Cycle," NBER Working Papers 24353, National Bureau of Economic Research, Inc February 2018.

**Bayoumi, Tamim, Hamid Faruqee, Douglas Laxton, Philippe D Karam, Alessandro Rebucci, Jaewoo Lee, Benjamin L Hunt, and Ivan Tchakarov**, "GEM; A New International Macroeconomic Model," IMF Occasional Papers 239, International Monetary Fund November 2004.

**Bolt, Wilko, Kostas Mavromatis, and Sweder van Wijnbergen**, "The Global Macroeconomics of a Trade War. The EAGLE model on the US-China trade conflict," DNB Working Papers 623, Netherlands Central Bank, Research Department February 2019.

**Bown, Chad P. and Eva (Yiwen) Zhang**, "Trump's 2019 Protection Could Push China Back to Smoot-Hawley Tariff Levels," Trade and Investment Policy Watch, Peterson Institute for International Economics May 2019.

**_ and Melina Kolb**, "Trumps Trade War Timeline: An Up-to-Date Guide," Peterson Institute for International Economics, Peterson Institute for International Economics 2019.

**Broda, Christian and David E. Weinstein**, "Globalization and the Gains From Variety," *The Quarterly Journal of Economics*, 2006, *121* (2), 541–585.

**Cappariello, Rita and Michele Mancini**, "US trade policy in numbers: how exposed is the EU?," Questioni di Economia e Finanza (Occasional Papers) 528, Bank of Italy, Economic Research and International Relations Area November 2019.

**Corsetti, Giancarlo, Luca Dedola, and Sylvain Leduc**, "High exchange-rate volatility and low pass-through," *Journal of Monetary Economics*, September 2008, *55* (6), 1113–1128.

**Donoval, Milan, Erwan Gautier, Galo Nuo, Anton Nakov, Noelia Jimnez, Mara de los Llanos Matea, ngel Estrada, Pinelopi Zioutou, Zacharias Bragoudakis, Laura Weymes, and Derr O'Brien**, "Energy markets and the euro area macroeconomy," Occasional Paper Series 113, European Central Bank June 2010.

**Eichengreen, Barry**, "What's the Problem with Protectionism?," *Project Syndicate*, July 13 2016.

**Fajgelbaum, Pablo D., Pinelopi K. Goldberg, Patrick J. Kennedy, and Amit K. Khandelwal**, "The Return to Protectionism," NBER Working Papers 25638, National Bureau of Economic Research, Inc March 2019.

**Faruqee, Hamid, Douglas Laxton, Dirk Muir, and Paolo Pesenti**, "Would protectionism defuse global imbalances and spur economic activity? A scenario analysis," *Journal of Economic Dynamics and Control*, August 2008, *32* (8), 2651–2689.

**Gomes, Sandra, Pascal Jacquinot, and Massimiliano Pisani**, "The EAGLE. A model for policy analysis of macroeconomic interdependence in the euro area," Temi di discussione (Economic working papers) 770, Bank of Italy, Economic Research and International Relations Area July 2010.

**Jacquinot, Pascal, Matija Lozej, and Massimiliano Pisani**, "Labor Tax Reforms, Cross-Country Coordination, and the Monetary Policy Stance in the Euro Area: A Structural Model-Based Approach," *International Journal of Central Banking*, June 2018, *14* (3), 65–140.

**Laxton, Douglas**, "Getting to Know the Global Economy Model and Its Philosophy," *IMF Staff Papers*, June 2008, *55* (2), 213–242.

**Lindé, Jesper and Andrea Pescatori**, "The macroeconomic effects of trade tariffs: Revisiting the Lerner symmetry result," *Journal of International Money and Finance*, 2019, *95* (C), 52–69.

**Lubik, Thomas and Frank Schorfheide**, "A Bayesian Look at the New Open Economy Macroeconomics," in "NBER Macroeconomics Annual 2005, Volume 20" NBER Chapters, National Bureau of Economic Research, Inc, 2006, pp. 313–382.

**Metelli, Luca and Filippo Natoli**, "The effect of a Chinese slowdown on inflation in the euro area and the United States," *Economic Modelling*, 2017, *62* (C), 16–22.

**Pesenti, Paolo**, "The Global Economy Model: Theoretical Framework," *IMF Staff Papers*, June 2008, *55* (2), 243–284.

**Pisani, Massimiliano and Filippo Vergara Caffarelli**, "What will Brexit mean for the British and euro-area economies? A model-based assessment of trade regimes," Temi di discussione (Economic working papers) 1163, Bank of Italy, Economic Research and International Relations Area January 2018.

**Rabanal, Pau and Vicente Tuesta**, "Euro-dollar real exchange rate dynamics in an estimated two-country model: An assessment," *Journal of Economic Dynamics and Control*, April 2010, *34* (4), 780–797.

**Rotemberg, Julio J.**, "Monopolistic Price Adjustment and Aggregate Output," *Review of Economic Studies*, October 1982, *49* (4), 517–31.

**Taylor, John B.**, *Macroeconomic Policy in a World Economy: From Economic Design to Practical Operation* Books, New York, NY: Norton., 1993.

**Warne, Anders, Gnter Coenen, and Kai Christoffel**, "The new area-wide model of the euro area: a micro-founded open-economy model for forecasting and policy analysis," Working Paper Series 944, European Central Bank October 2008.

**Whalley, John**, *Trade Liberalization Among Major World Trading Areas* Books, Cambridge, MA: MIT Press., 1985.

Table 1: Great ratios (% of GDP)

| | EA | US | CH | RW |
|---|---|---|---|---|
| Private consumption | 58.5 | 57.8 | 58.0 | 57.4 |
| Investment | 20.0 | 20.7 | 20.5 | 21.1 |
| Public consumption | 21.5 | 21.5 | 21.5 | 21.5 |
| Imports | 24.8 | 14.7 | 18.2 | 21.6 |
| Consumption goods | 18.0 | 9.6 | 10.9 | 19.6 |
| Investment goods | 4.7 | 4.8 | 5.7 | 3.0 |
| Oil (net imports) | 2.1 | 0.3 | 1.6 | −1.0 |
| Share of world GDP | 20.6 | 24.1 | 16.1 | 39.2 |

Note: EA=euro area; US=United States; CH=China; RW=Rest of the world.

Table 2: International linkages (% of GDP, non-oil tradables)

| | EA | US | CH | RW |
|---|---|---|---|---|
| Imported consumption goods from | | | | |
| EA | ... | 1.6 | 1.0 | 9.0 |
| US | 1.0 | ... | 0.9 | 7.1 |
| CH | 2.0 | 2.0 | ... | 3.5 |
| RW | 15.0 | 6.0 | 9 | ... |
| Imported investment goods from | | | | |
| EA | ... | 0.8 | 0.3 | 2.0 |
| US | 0.7 | ... | 0.4 | 0.5 |
| CH | 1.0 | 1.0 | ... | 0.5 |
| RW | 3.0 | 3.0 | 5.0 | ... |

Note: EA=euro area; US=United States; CH=China; RW=Rest of the world.

Table 3: Households and firms behavior

| | EA | US | CH | RW |
|---|---|---|---|---|
| **Households** | | | | |
| Subjective discount factor $\beta$ | 0.9996 | 0.9996 | 0.9996 | 0.9996 |
| Intertemporal elasticity of substitution $1/\sigma$ | 1.00 | 1.00 | 1.00 | 1.00 |
| Habit persistence $\zeta$ | 0.70 | 0.70 | 0.70 | 0.70 |
| Inverse of the labor Frisch elasticity $\tau$ | 1.50 | 1.50 | 1.50 | 1.50 |
| Depreciation rate of capital $\delta$ | 0.025 | 0.025 | 0.025 | 0.025 |
| Distribution margin $\eta^{distr}$ | 50% | 50% | 50% | 50% |
| **Final consumption goods** | | | | |
| Substitution btw fuel and (non-fuel) goods $\rho$ | 0.40 | 0.40 | 0.40 | 0.40 |
| Substitution btw domestic and imp. goods $\eta_T$ | 4.0 | 4.0 | 4.0 | 4.0 |
| Substitution btw tradables and nontrad. $\eta$ | 0.80 | 0.80 | 0.80 | 0.80 |
| Bias toward fuel $a_{FU_c}$ | 0.08 | 0.08 | 0.08 | 0.08 |
| Bias toward tradable goods $a_{TC}$ | 0.60 | 0.60 | 0.60 | 0.60 |
| Bias toward domestic tradable goods $a_{EA_c}$ | 0.50 | 0.65 | 0.50 | 0.70 |
| **Final investment goods** | | | | |
| Substitution btw domestic and imp. goods $\eta_{TI}$ | 4.0 | 4.0 | 4.0 | 4.0 |
| Substitution btw tradables and nontrad. $\eta_I$ | 0.80 | 0.80 | 0.80 | 0.80 |
| Bias toward tradable goods $a_{TI}$ | 0.70 | 0.70 | 0.70 | 0.70 |
| Bias toward domestic goods $a_{EA_I}$ | 0.65 | 0.50 | 0.50 | 0.20 |
| **Intermediate tradable goods** | | | | |
| Substitution btw value added and fuel $\xi_Y$ | 0.80 | 0.80 | 0.80 | 0.80 |
| Substitution btw labor and capital $\xi$ | 1.00 | 1.00 | 1.00 | 1.00 |
| Bias toward fuel $a_{FU_H}$ | 0.02 | 0.02 | 0.02 | 0.02 |
| Bias toward capital $(1 - a_{HL})$ | 0.40 | 0.40 | 0.40 | 0.40 |
| **Intermediate non-tradable goods** | | | | |
| Substitution btw value added and fuel $\xi_{Y,N}$ | 0.80 | 0.80 | 0.80 | 0.80 |
| Substitution btw labor and capital $\xi_N$ | 1.00 | 1.00 | 1.00 | 1.00 |
| Bias toward fuel $a_{FU_{H,N}}$ | 0.02 | 0.02 | 0.02 | 0.02 |
| Bias toward capital $(1 - a_{HL,N})$ | 0.36 | 0.36 | 0.36 | 0.36 |

Note: EA=euro area; US=United States; CH=China; RW=Rest of the world. In each region the corresponding parameter is set equal to the reported value.

Table 4: Real and nominal rigidities

| | |
|---|---|
| **Real rigidities** | |
| Investment adjustment $\phi_I$ | 4.50 |
| **Nominal adjustment costs** | |
| *Households* | |
| Wage stickiness $\kappa_W$ | 600 |
| *Tradable goods* | |
| Price stickiness (domestically produced goods) $\kappa_H$ | 60 |
| Price stickiness (imported goods) $\kappa_G$ | 60 |
| *Non-tradable goods* | |
| Price stickiness $\kappa_N$ | 1000 |
| **Indexation** | |
| Prices $a_P$ | 0.75 |
| Wages $a_W$ | 0.75 |

Note: in each region the corresponding parameter is set equal to the reported value.

Table 5: Gross price and wage markups

| | |
|---|---|
| Tradables price markup $\theta_T$ | 1.20 |
| Non-tradables price markup $\theta_N$ | 1.33 |
| Wage markup $\theta_W$ | 1.30 |

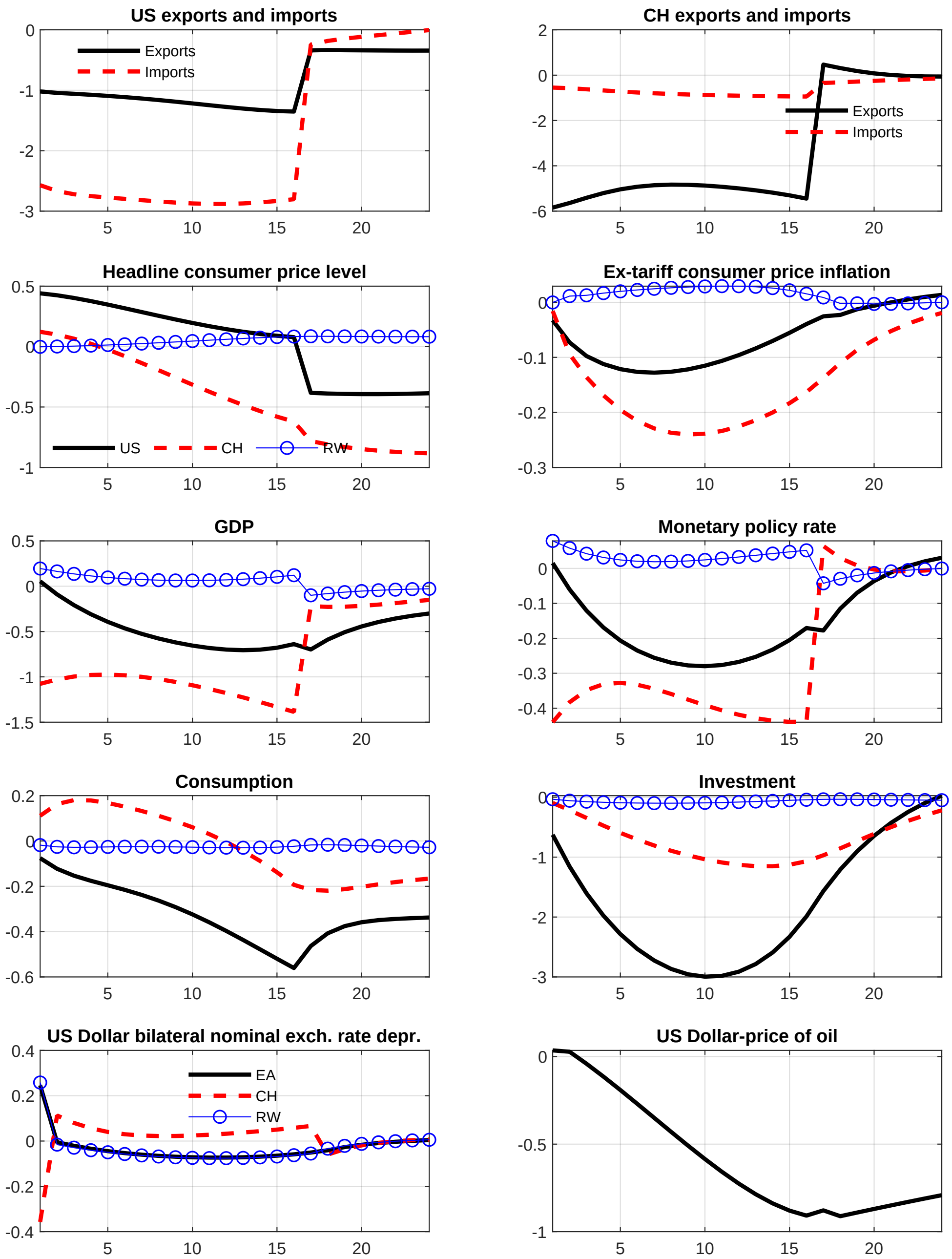
Note: in each region the corresponding parameter is set equal to the reported value.

Table 6: Monetary policy rule

| | |
|---|---|
| Interest rate inertia $\phi_R$ | 0.87 |
| Interest rate response to inflation gap $\phi_\Pi$ | 1.60 |
| Interest rate response to output growth $\phi_{gY}$ | 0.10 |

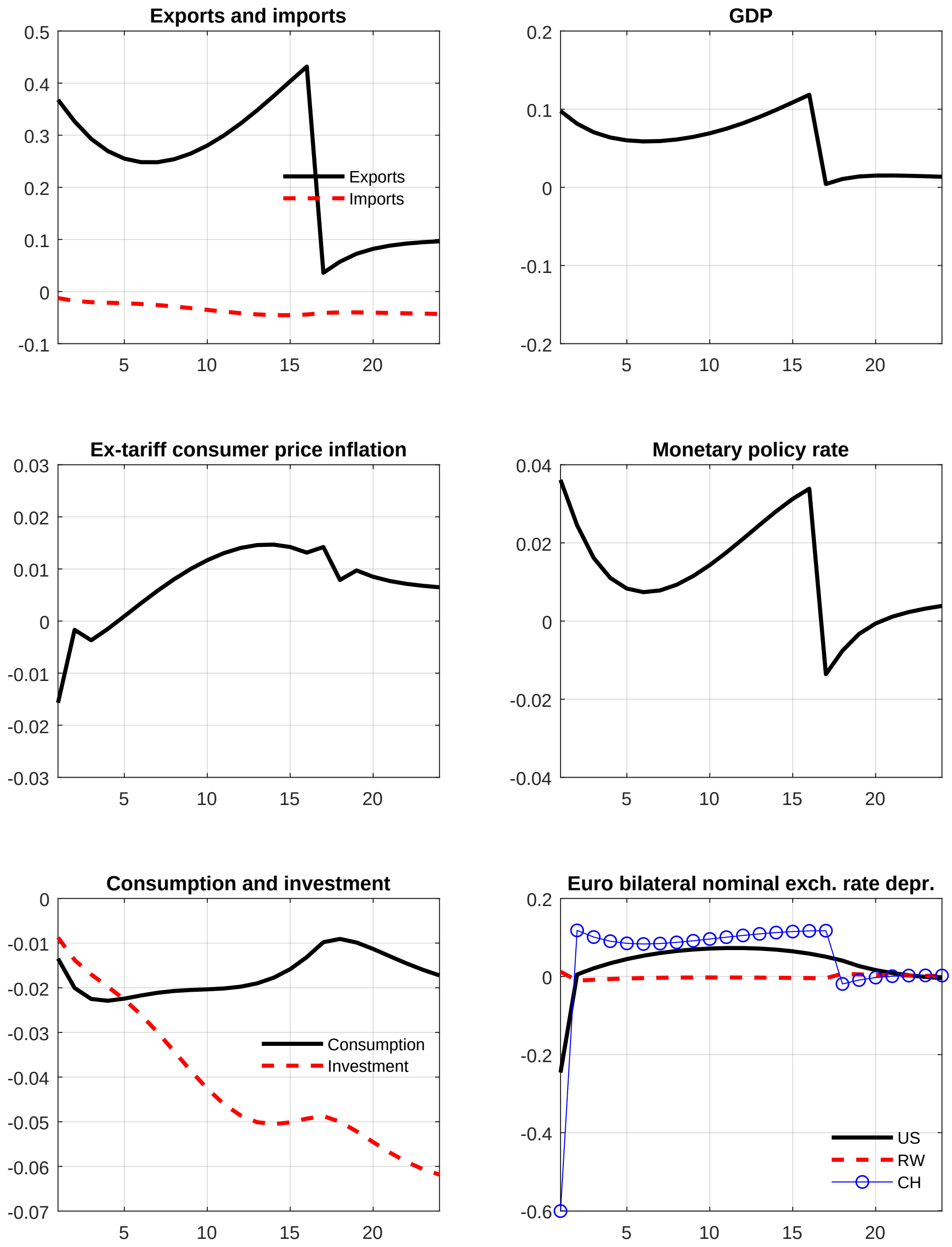
Note: in each region the corresponding parameter is set equal to the reported value.

Figure 1: Increase in US and CH tariffs: US, CH, and RW variables



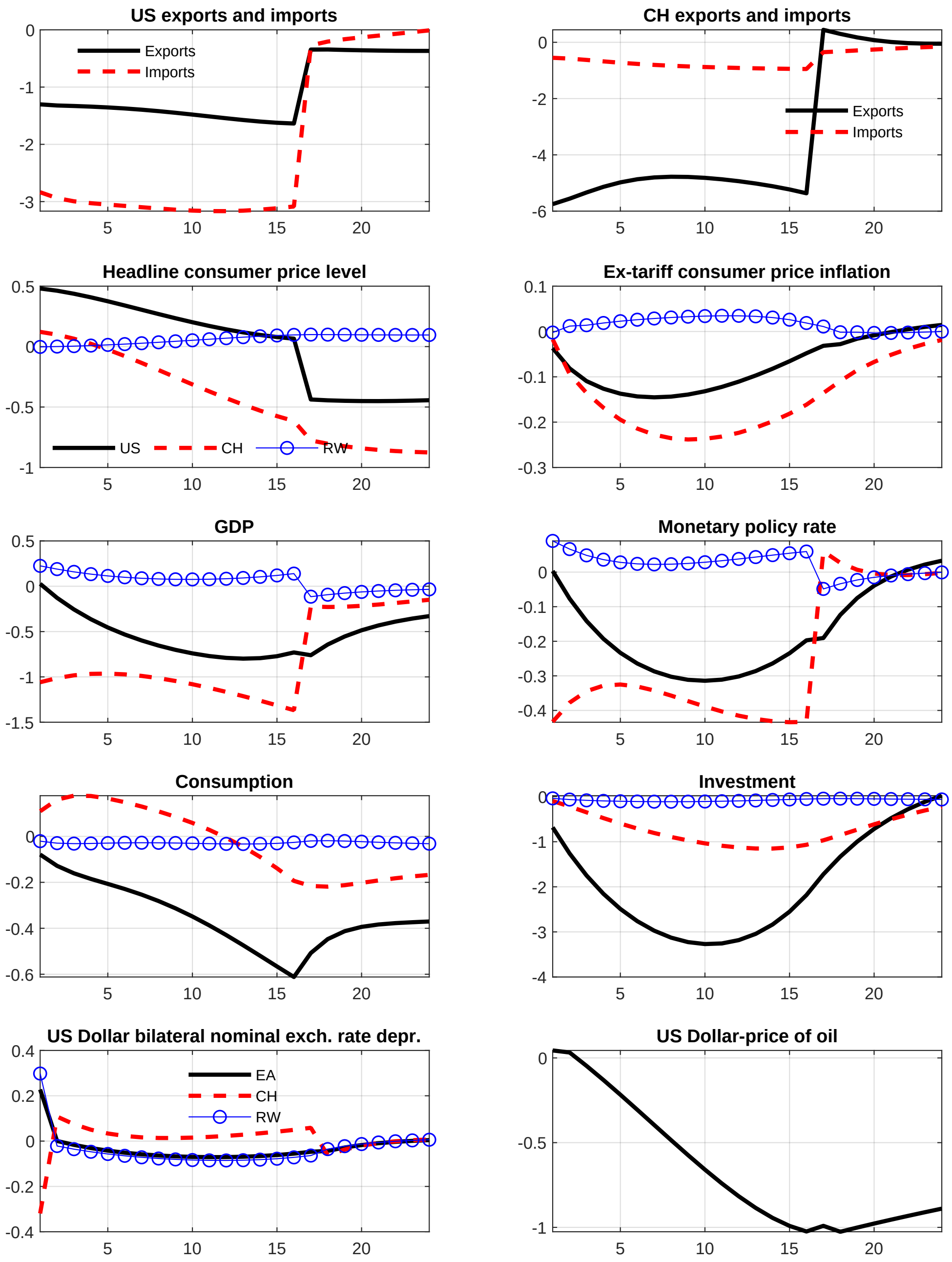

Notes: quarters on the horizontal axis; on the vertical axis, % deviations from the baseline; monetary policy rate and inflation rate: annualized pp deviations; US dollar depreciation rate (+=depr.): pp deviations.

Figure 2: Increase in US and CH tariffs: EA variables



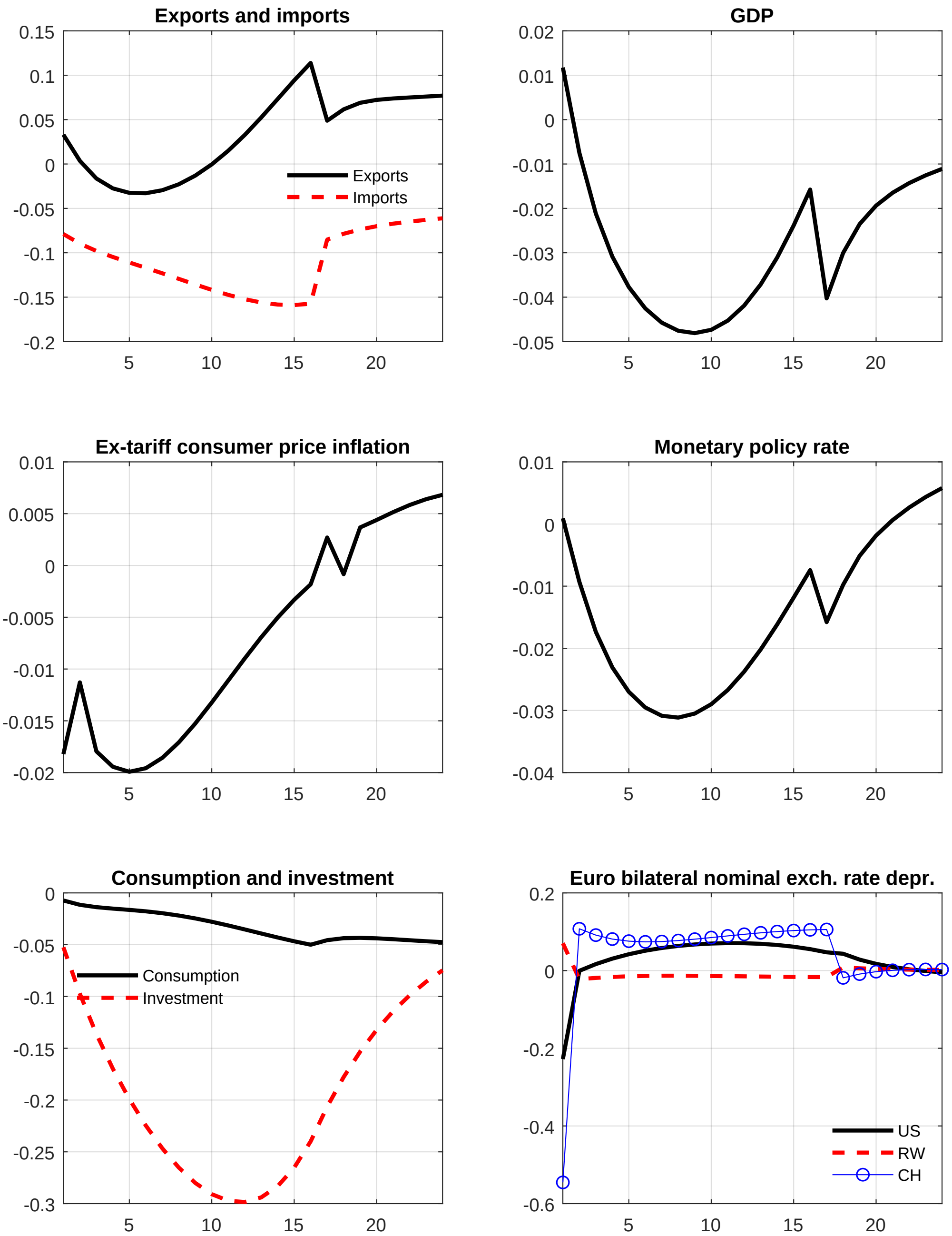

Notes: quarters on the horizontal axis; on the vertical axis, % deviations from the baseline; monetary policy rate and inflation rate: annualized pp deviations; euro depreciation rate (+=depr.): pp deviations.

Figure 3: Increase in US, CH, and EA tariffs: US, CH, and RW variables



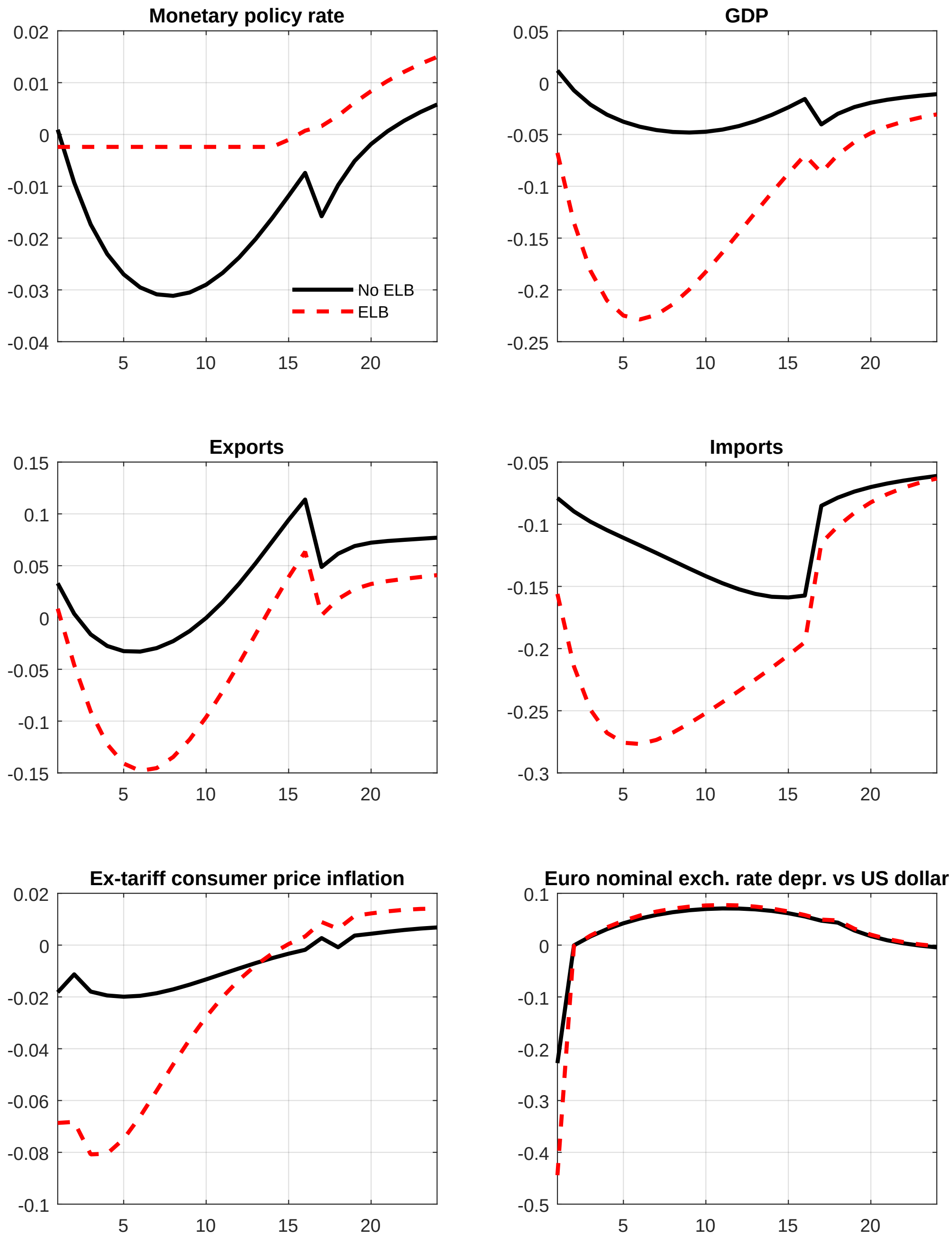

Notes: quarters on the horizontal axis; on the vertical axis, % deviations from the baseline; monetary policy rate and inflation rate: annualized pp deviations; US dollar depreciation rate (+=depr.): pp deviations.

Figure 4: Increase in US, CH, and EA tariffs: EA variables



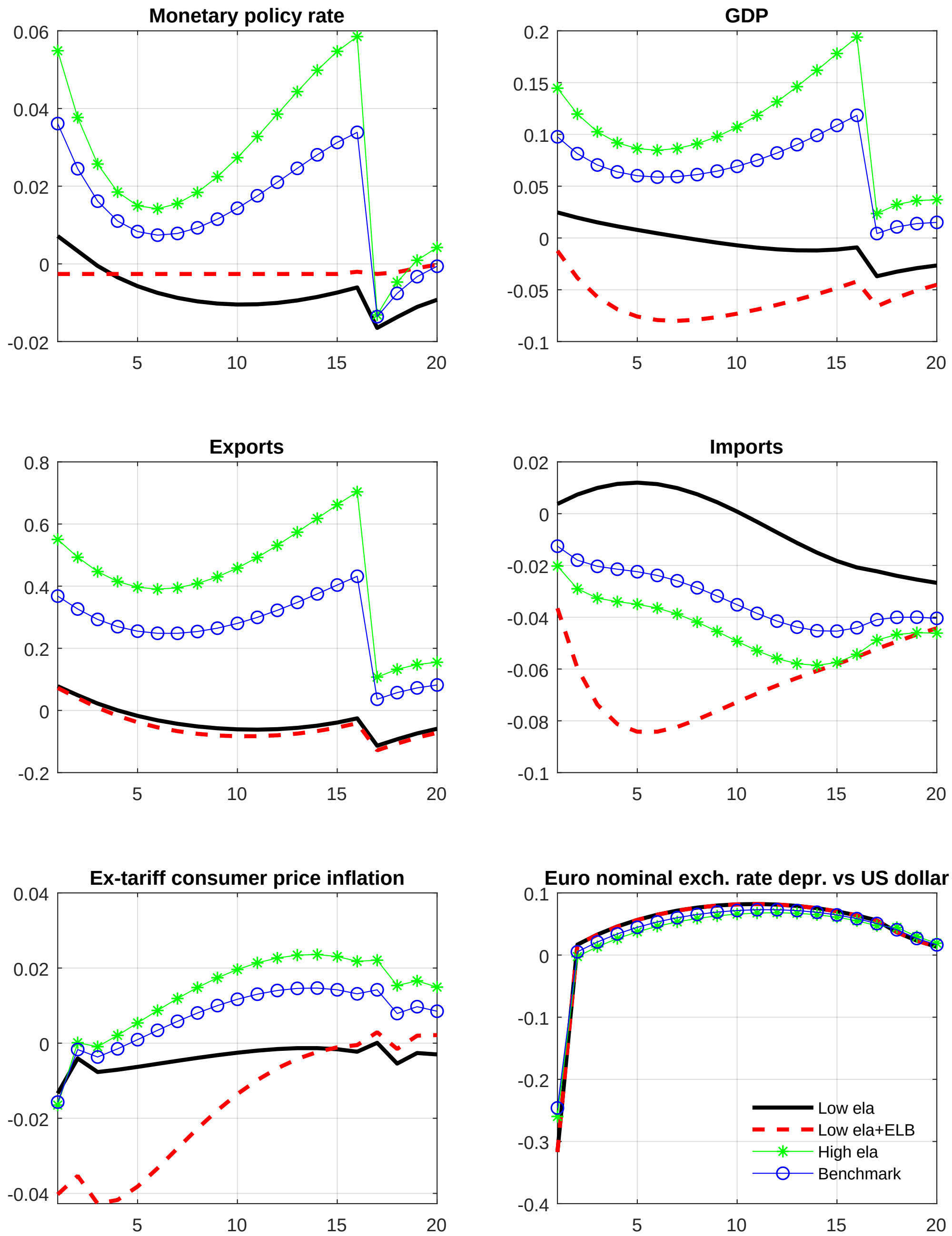

Notes: quarters on the horizontal axis; on the vertical axis, % deviations from the baseline; monetary policy rate and inflation rate: annualized pp deviations; euro depreciation rate (+=depr.): pp deviations.

Figure 5: US, CH, and EA tariff increase and EA ELB: EA variables



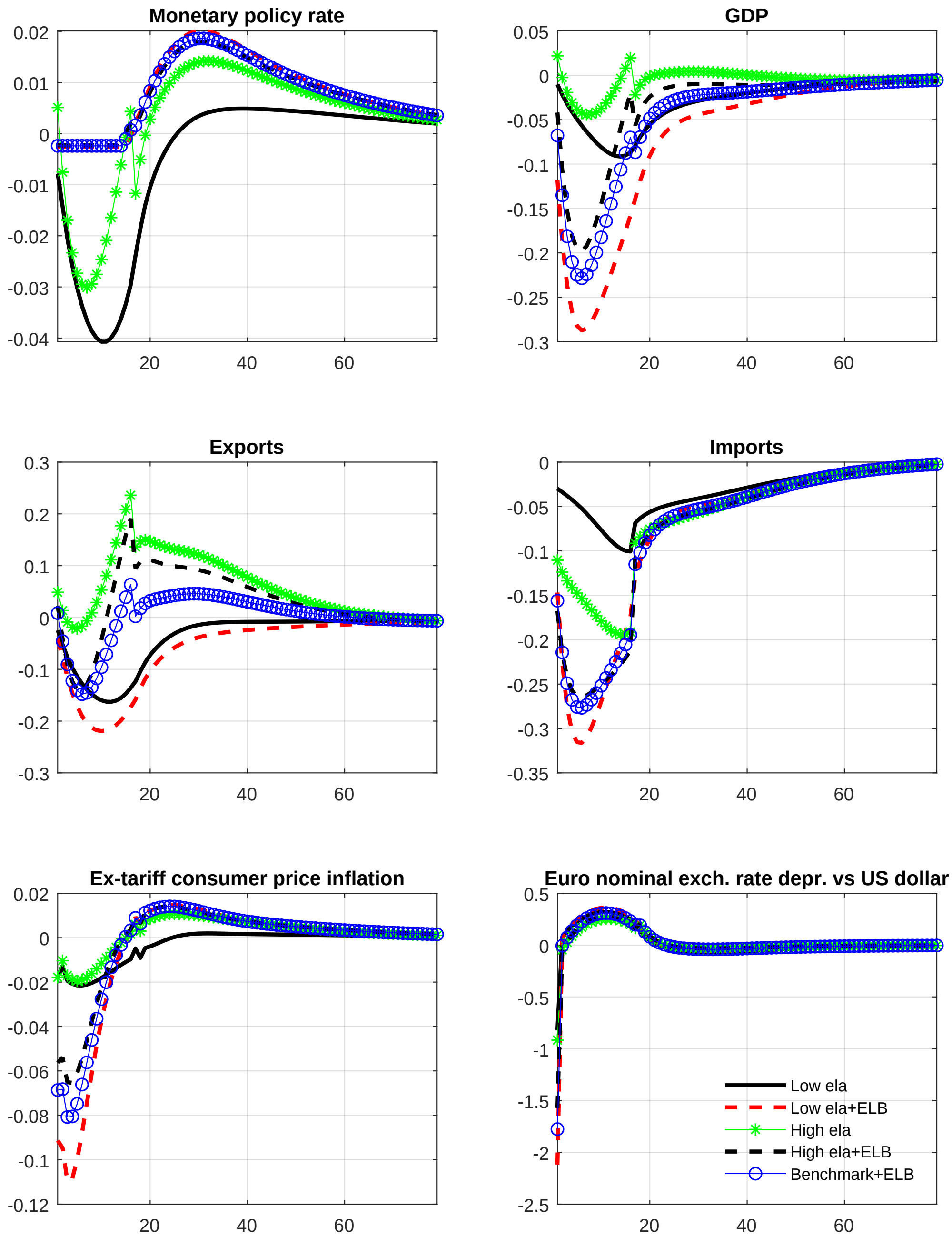

Notes: quarters on the horizontal axis; on the vertical axis, % deviations from the baseline; monetary policy rate and inflation rate: annualized pp deviations; euro depreciation rate (+=depr.): pp deviations.

Figure 6: US and CH tariff increase, elasticity of substitution, and EA ELB: EA variables



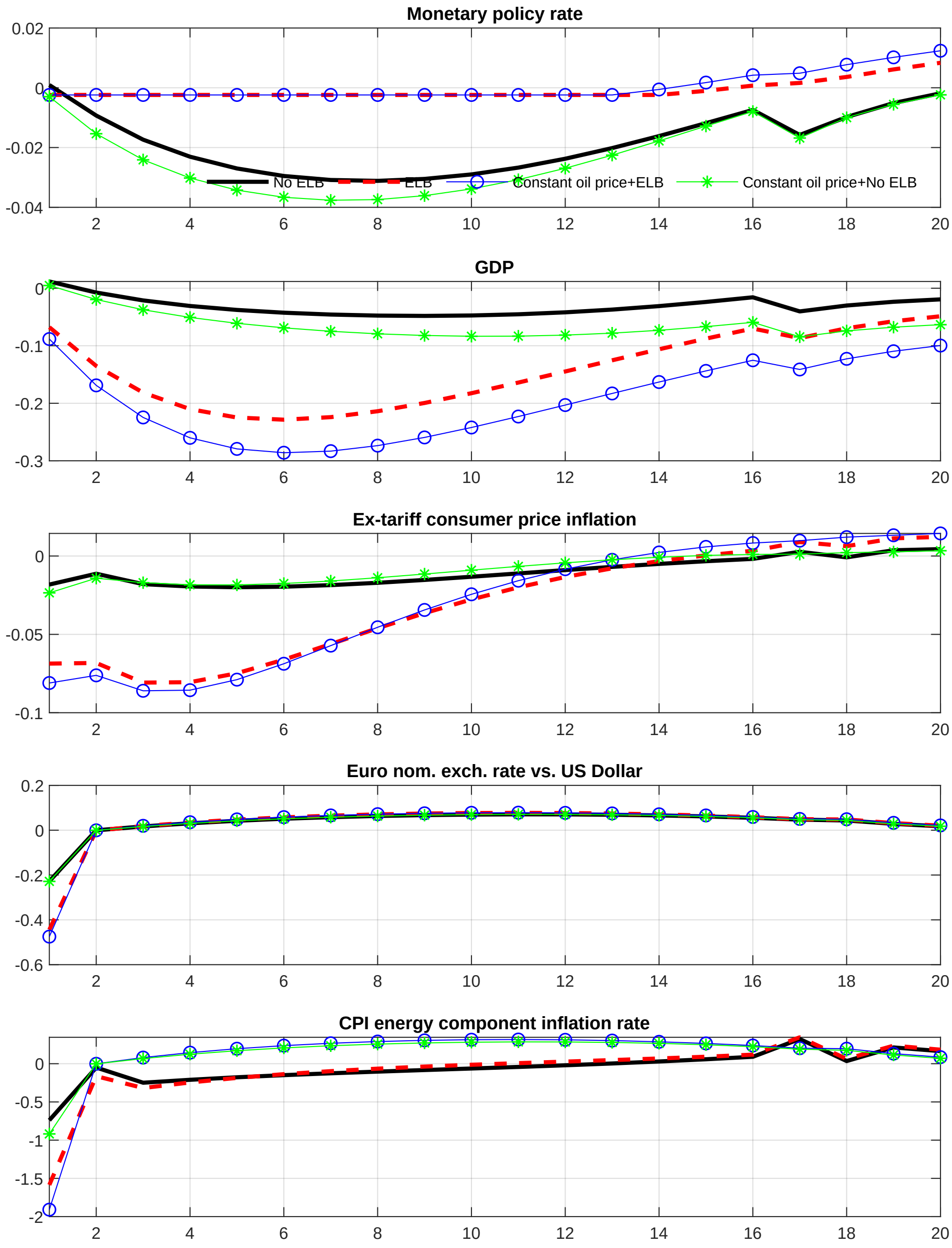

Notes: quarters on the horizontal axis; on the vertical axis, % deviations from the baseline; monetary policy rate and inflation rate: annualized pp; euro depreciation rate (+=depr.): pp deviations.

Figure 7: US, CH, and EA tariff increase, elasticity of substitution, and EA ELB: EA variables




Notes: quarters on the horizontal axis; on the vertical axis, % deviations from the baseline; monetary policy rate and inflation rate: annualized pp deviations; euro depreciation rate (+=depr.): pp deviations.

Figure 8: US, CH, and EA tariff increase, constant oil price, and EA ELB: EA variables

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*2018*

ACCETTURO A., V. DI GIACINTO, G. MICUCCI and M. PAGNINI, *Geography, productivity and trade: does selection explain why some locations are more productive than others?,* Journal of Regional Science, v. 58, 5, pp. 949-979, **WP 910 (April 2013).**

ADAMOPOULOU A. and E. KAYA, *Young adults living with their parents and the influence of peers,* Oxford Bulletin of Economics and Statistics,v. 80, pp. 689-713, **WP 1038 (November 2015).**

ANDINI M., E. CIANI, G. DE BLASIO, A. D'IGNAZIO and V. SILVESTRINI, *Targeting with machine learning: an application to a tax rebate program in Italy,* Journal of Economic Behavior & Organization, v. 156, pp. 86-102, **WP 1158 (December 2017).**

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BOFONDI M., L. CARPINELLI and E. SETTE, *Credit supply during a sovereign debt crisis,* Journal of the European Economic Association, v.16, 3, pp. 696-729, **WP 909 (April 2013).**

BOKAN N., A. GERALI, S. GOMES, P. JACQUINOT and M. PISANI, *EAGLE-FLI: a macroeconomic model of banking and financial interdependence in the euro area,* Economic Modelling, v. 69, C, pp. 249-280, **WP 1064 (April 2016).**

BRILLI Y. and M. TONELLO, *Does increasing compulsory education reduce or displace adolescent crime? New evidence from administrative and victimization data,* CESifo Economic Studies, v. 64, 1, pp. 15–4, **WP 1008 (April 2015).**

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DE BLASIO G, S. DE MITRI, S. D'IGNAZIO, P. FINALDI RUSSO and L. STOPPANI, *Public guarantees to SME borrowing. A RDD evaluation,* Journal of Banking & Finance, v. 96, pp. 73-86, **WP 1111 (April 2017).**

GERALI A., A. LOCARNO, A. NOTARPIETRO and M. PISANI, *The sovereign crisis and Italy's potential output,* Journal of Policy Modeling, v. 40, 2, pp. 418-433, **WP 1010 (June 2015).**

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*2019*

ALBANESE G., M. CIOFFI and P. TOMMASINO, *Legislators' behaviour and electoral rules: evidence from an Italian reform,* European Journal of Political Economy, v. 59, pp. 423-444, **WP 1135 (September 2017).**

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CIAPANNA E. and M. TABOGA, *Bayesian analysis of coefficient instability in dynamic regressions,* Econometrics, MDPI, Open Access Journal, v. 7, 3, pp.1-32, **WP 836 (November 2011).**

COLETTA M., R. DE BONIS and S. PIERMATTEI, *Household debt in OECD countries: the role of supply-side and demand-side factors,* Social Indicators Research, v. 143, 3, pp. 1185–1217, **WP 989 (November 2014).**

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FOA G., L. GAMBACORTA, L. GUISO and P. E. MISTRULLI, *The supply side of household finance,* Review of Financial Studies, v.32, 10, pp. 3762-3798, **WP 1044 (November 2015).**

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RIGGI M., *Capital destruction, jobless recoveries, and the discipline device role of unemployment,* Macroeconomic Dynamics, v. 23, 2, pp. 590-624, **WP 871 (July 2012).**

*2020*

BRIPI F., D. LOSCHIAVO and D. REVELLI, *Services trade and credit frictions: evidence with matched bank – firm data,* The World Economy, v. 43, 5, pp. 1216-1252, **WP 1110 (April 2017).**

COIBION O., Y. GORODNICHENKO and T. ROPELE, *Inflation expectations and firms' decisions: new causal evidence,* Quarterly Journal of Economics, v. 135, 1, pp. 165-219, **WP 1219 (April 2019).**

CORSELLO F. and V. NISPI LANDI, *Labor market and financial shocks: a time-varying analysis,* Journal of Money, Credit and Banking, v. 52, 4, pp. 777-801, **WP 1179 (June 2018).**

D'IGNAZIO A. and C. MENON, *The causal effect of credit Guarantees for SMEs: evidence from Italy,* The Scandinavian Journal of Economics, v. 122, 1, pp. 191-218, **WP 900 (February 2013).**

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BOTTERO M., F. MEZZANOTTI and S. LENZU, *Sovereign debt exposure and the Bank Lending Channel: impact on credit supply and the real economy,* Journal of International Economics, **WP 1032 (October 2015).**

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PANCRAZI R. and M. PIETRUNTI, *Natural expectations and home equity extraction,* Journal of Housing Economics, **WP 984 (November 2014).**

PEREDA FERNANDEZ S., *Copula-based random effects models for clustered data,* Journal of Business & Economic Statistics, **WP 1092 (January 2017).**

RAINONE E., *The network nature of otc interest rates,* Journal of Financial Markets, **WP 1022 (July 2015).**

SANTIONI, R., F. SCHIANTARELLI and P. STRAHAN, *Internal capital markets in times of crisis: the benefit of group affiliation*, Review of Finance, **WP 1146 (October 2017).**

SCHIANTARELLI F., M. STACCHINI and P. STRAHAN, *Bank Quality, judicial efficiency and loan repayment delays in Italy,* Journal of Finance, **WP 1072 (July 2016).**