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Why should the world care? Analysis, mechanisms and spillovers of the destination based border adjusted tax

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Abstract

Members of the US House of Representatives have proposed a major overhaul of the US corporate tax system, the so-called "destination-based border-adjusted cash-flow tax" (DBCFT). The literature on the economic implications and spillovers of such a DBCFT is scarce. This paper aims to provide a comprehensive analysis of the mechanics of such a tax, its macroeconomic implications as well as its global spillovers using a fully structural global multi-country model. Our results suggest that the short term macroeconomic impact of the reform would depend primarily on how permanent agents perceive the policy to be. Robustness scenarios show that the magnitude of the short term impact will also depend on the extent to which exporters are reimbursed by their domestic costs; what categories of goods are excluded from the reform; how the government uses the revenues generated by the border adjusted tax; and the pricing system used by exporters. Moreover, global spillovers will depend on how easy it is to replace imported goods by domestic production; whether US trading partners retaliate, and how financial markets in emerging economies react. If there is disequilibrium in relative prices in the short term, global economic activity spillovers could be strongly negative and world trade could decline substantially.

JEL codes: C68, E47, F41, F44, F62, O41
Keywords: Fiscal policy, International business cycle, Spillovers model based analysis.

Non-technical summary

Republican members of the US House of Representatives have proposed a corporate tax reform, the so-called "destination-based border-adjusted cash-flow tax" (DBCFT). This tax would represent a major overhaul of the US corporate tax system and would potentially have important economic implications in the US and globally if implemented. Against this background, this paper analyses the mechanics of the new tax proposal, its macroeconomic implications as well as its global spillovers using a global multi-country model. The model embodies fully structural demand for imports, which is an input in domestic firms' production functions, and tracks bilateral trade in intermediate and final goods. This structure enables us to track a key feature of this new tax that changes the relative cost of imports related to domestic production. The structure in the model is also complex enough to capture the impacts of lower taxation on new investments and the effect of higher employment and nominal wages on personal income taxation. Finally, the decisions on savings and investment are fully micro-founded, which enable us to properly track how this new tax would affect the external balance macroeconomic fundamentals. Finally, we have a stylized way to capture the change in the capital taxation that might not fully reflect the nuances of the complex US tax system. Our results suggest that the short term macroeconomic impacts of the reform would depend primarily on how permanent agents perceive the policy to be. This perception determines if the desired net foreign asset position would change in the short term, and therefore directs the pressures on the US dollar to appreciate in order to offset the impact of the border adjustment. When agents perceive the policy to be more permanent, most of the short term boost to US GDP comes from lower taxation on capital. Instead, when agents see the policy to be temporary, the short term economic impact is amplified because the border adjustment in this case affects the agents' investment and saving decisions and leads to a temporary disequilibrium in domestic-foreign relative prices, which triggers a temporary positive terms of trade shock that leads to an external sector boost on top of the economic stimulus from the lower taxation on capital. In this case, the US economy rebalances away from domestic demand and imports towards exports.

The macroeconomic implications also depend on a number of other factors that are explored in the paper. These include: (1) whether US trading partners retaliate, which will have implications on the external sector dynamics in any scenario studied; (2) the extent to which export firms are reimbursed by tax liabilities related to their domestic costs, which will determine the possible neutrality of this tax in relation to investment and saving decisions and on the size of the initial terms of trade shock if the policy is perceived as temporary; (3) the extent to which some categories of goods may be excluded from the DBCFT tax base, which will have the same implications as item (2); (4) how the government uses the revenues generated by the border adjustment, which will determine by how much domestic consumers will be compensated by possible higher costs on import goods and (5) the pricing system used by exporters, which won't have longer term effects but might have implications on the short term adjustment period if exporters cannot immediately pass through higher taxation costs to consumers.

The robustness scenarios show that the short-term rise in US GDP and inflation would be substantially reduced in particular if exporters do not receive a rebate for the tax liability related to their domestic inputs. In addition, all the scenarios show that the US fiscal deficit would deteriorate over time, thus increasing the need for fiscal consolidation in the medium-term that could offset some of the positive short-term GDP impacts of this corporate tax reform.

The global spillovers of the DBCFT also depend on agents' subjective probability of policy reversal. Under a policy perceived as more permanent spillovers are limited. However, the spillovers to global GDP and world trade are sizeable and negative if the policy change is perceived as temporary and assuming no retaliation by other countries. Moreover, there is a rebalancing in global trade deficits, with surplus regions experiencing deterioration and the US experiencing an improvement in its trade balance. As for global trade, even in the policy perceived to last 4 years scenario without retaliation, world trade declines substantially and global economic activity spillovers are substantially negative. Countries with large exposure to US trade are hit the hardest World trade would decline significantly more strongly if a coordinated retaliation against the US border adjusted tax materialises. Aside from retaliation, global spillovers will also depend on how easy it is to replace imported goods by domestic production, and on the extent to which the US dollar appreciation may cause stress in EME financial markets.

1 Introduction

In 2016, US House Republicans released their "blueprint" for a reform of the US tax system entitled 'A better Way: Our Vision for a Confident America'. This plan covers changes to several aspects of the US tax system. One aspect is the new proposed way to tax corporations. This so-called "destination-based border-adjusted cash-flow tax" (DBCFT) would potentially represent a major overhaul of the US corporate tax system. The main features of the proposal are (i) a significant reduction in the corporate income tax rate from currently 35% to a cash flow tax rate of 20% and (ii) border adjustment, which we show is economically equivalent to an export subsidy and an import tariff.[2]

There is little real world experience with cash-flow taxes, with only origin-based cash-flow taxes having been implemented in practice, see European Commission (2015). In addition, despite being intensely debated in policy circles, the literature on the macroeconomic implications of a border-adjusted cash-flow tax is rather scarce.

From a theoretical standpoint, the literature has focused on the debate surrounding the potential reaction of the US dollar and the impact on tax revenues. As regards the exchange rate, proponents of the DBCFT, including the ideological originators, Auerbach and Holtz-Eakin (2016), argue that the US dollar will adjust sharply to offset economic effects on US inflation and the trade balance. According to them, due to an immediate exchange rate reaction, the border-adjusted tax would not distort trade. In line with this view, Feldstein (2017) argues that the border-adjusted tax would essentially have no impact on US inflation, since higher import prices would be immediately offset by a rise in the US dollar. To preserve the original trade balance (despite the border adjustment), with a 20% cash flow tax rate, the value of the dollar would have to rise by 25%. However, as argued by Hufbauer and Zhiayao (2017), this reflects an assumption that US national saving and investment and, by implication, the trade deficit would remain unchanged.[3] Viard (2017) points out that the impact on trade depends on whether the design of the DBCFT reform includes a full refund to exporters. If the latter was not given, the tariff on imports and subsidy rate on exports would not be equal, thus leading to trade distortions. In a widely quoted earlier paper, Feldstein and Krugman (1990) discuss the impact of border adjustment in the context of a Value Added Tax (VAT). They show that the absence of distortionary effects from a VAT depends on the rebate of VAT on exports. They also argue that in the absence of an export rebate, a VAT would act like an export tax-which in general equilibrium is equivalent to an import tariff. Moreover, they argue that a VAT without border adjustment could also be neutral with respect to trade, if the currency of the country introducing the VAT adjusts to a large extent to offset the trade distortions.

Turning to the impact on US fiscal revenues, Feldstein (2017), focusing only on the border-adjustment element of the tax reform, argues that border-adjustment would lead to a substantial rise in tax revenues, which - since the value of US imports exceeds that of US exports - would not be borne by US consumers or firms. Static microsimulations based on a panel of US corporations by McClelland and Patel (2017) confirm this. The authors analyse the impact on the size and cyclicality of the

[2] Our paper focuses on the macroeconomic implications of a unilateral adoption of the DBCFT in the United States. The effects would be very different under universal adoption.

[3] Private-sector economists are also sceptical that the US dollar will adjust fully. A number of private-sector economists have done some quantitative assessments of the impact of the DBCFT. Overall, these suggest that the border-adjusted tax is expected to have an impact on US CPI inflation of an order of magnitude of between 0.5-1.5pp, while increasing the US dollar by around 10-15%.

tax base of replacing the current corporate tax system with a DBCFT by comparing the two steady-states. Their main findings are that the tax base under the DBCFT would be larger and less cyclical on aggregate compared with the current corporate income tax base. However, this assumes no behavioural changes to the tax reform. Instead, as discussed by Cline (2017), behavioural changes in the economy coupled with an incomplete exchange rate offset would eventually erode the trade deficit and, thereby, the expected revenue from the cash flow tax.

Critics of the tax point to its distributional effects and possible trade retaliation by other countries aside from potential fiscal revenue losses. Devereux and de la Feria (2014) discuss the legal and practical issues arising with the universal implementation of such a tax, while Auerbach et al (2017) evaluate a universal versus unilateral adoption of the DBCFT based on five criteria (economic efficiency, robustness to tax avoidance and evasion, ease of administration, fairness and stability). Summers (2017) strongly criticises the proposed reform, summarising four major flaws: (i) the change would exacerbate inequality, with more than half the benefits going to the top 1% of Americans; (ii) the tax would redistribute income, increase uncertainty and put some sectors at disadvantage; (iii) the change would harm the global economy, could be seen as a protectionist act that violates WTO rules and may cause protectionist responses by other countries; in addition it could lead to a strong rise in the US dollar that hurts dollar debtors (while benefiting countries with large dollar reserves such as China); (iv) the reform could erode the revenue base, thus requiring other tax increases or spending reductions. On distributional effects, evidence provided Gaertner et al (2017) suggests that financial markets believe the increased tax costs to import-intensive firms will not be fully offset by the exchange rate. The paper finds evidence of significant changes in equity values of publicly traded firms, with import-intensive firms, such as retailers, experiencing significant negative abnormal returns on days of high search interest in the DBCFT according to Google Trends.

This paper aims to fill the gap in the literature by conducting a model-based macroeconomic analysis of DBCFT, modelling its key features in its design and the possible implications for the US economy and the global spillovers. We explore in depth the mechanisms of the DBCFT reform, deriving in a simple example how different designs of this tax can affect or not firm's trade decisions and exchange rates. Moreover, using a variation of an established global multi-country structural model, we show how price frictions and assumptions about agents' expectations can determine the impact of the tax on the short term dynamics of the US economy and spur large spillovers to the global economy. While several scenarios are simulated, in particular we find whether agents consider the new regime to be transitory or permanent will be important to determine how the USD exchange rate would respond. We show that the macroeconomic implications and global spillovers depend on a number of additional factors including (1) to what extent exporters would be reimbursed by their domestic costs; (2) what categories of goods could be excluded from the reform; (3) how the government wants to use the revenues generated by the border adjustment tax; (4) how easy it is to replace imported goods by domestic production; (5) whether US trading partners retaliate, and (6) how financial markets in emerging economies react.

The paper is structured as follows. The next section outlines the details of the proposed corporate tax reform, as well as its motivation. Section 3 discusses mechanics in technical terms by outlining how firm's decisions and government revenues are affected by the introduction of the tax. It also derives the conditions under which the proposal would be trade-neutral. In Section 4, model-based simulations results of the tax reform on the US macro-economy are shown, while Section 5 describes the

resulting spillovers to the world economy. This is followed by a number of sensitivity checks to key assumptions in Section 6 and to different parameters in Section 7 before concluding.

2 Proposed reform of the US corporate tax system

Republican members of the House of Representatives have proposed a major overhaul of the US corporate tax system which seeks to move towards a "destination-based border-adjusted cash flow tax" (DBCFT). The main features of the proposal would be (i) a significant reduction in the corporate income tax rate from currently 35% to a cash flow tax rate of 20% and (ii) border adjustment, which is economically equivalent to an export subsidy and an import tariff.

Figure 1: Headline corporate tax rates in OECD countries *(percent)*

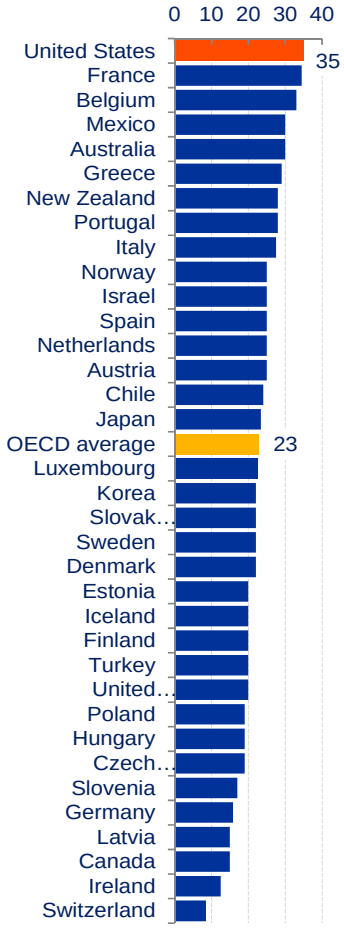


Figure 2: Corporate tax revenue OECD countries *(percentage of GDP)*

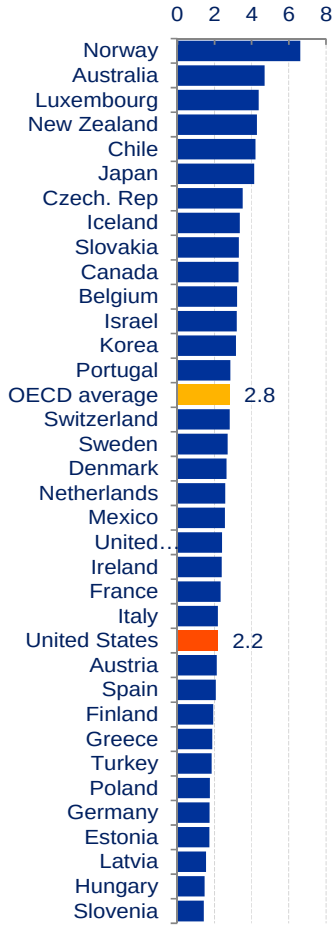
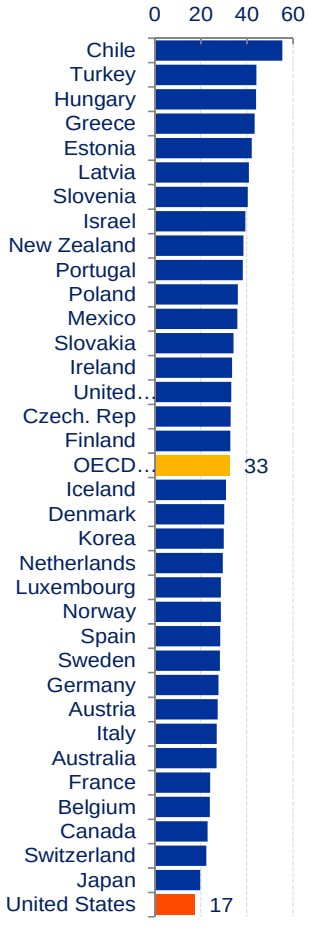


Figure 3: Indirect tax revenue in OECD countries *(indirect tax revenue as percentage of total tax revenue)*



Source: OECD.
Notes: Latest observation: 2014. Headline corporate tax refers to the basic central government statutory flat or top marginal rate. Indirect tax revenue refers to taxes on goods and services.

A key motivation behind the introduction of the border-adjusted cash flow tax is that the current US tax system has significant shortcomings and is seen by many Americans as putting US companies at a

competitive disadvantage. As shown in Figure 1, the US has the highest corporate tax rate among OECD countries (at 35%), but at the same time, revenue collections from corporate income taxes as a percentage of GDP are slightly below the OECD average (Figure 2). This suggests that as corporations exploit loopholes, the system is inefficient in terms of tax collection. Efficient taxation is usually based on two principles: first, to impose the lowest tax rate consistent with raising the required revenue and second, to impose the tax as broadly and evenly as possible across all goods and services to avoid distortions (see Cecchetti and Schoenholtz, 2017). In the current US corporate tax system, which is origin-based (implying that US corporations are taxed on their world-wide profits), there are strong incentives for corporate inversions, whereby companies move overseas to reduce their tax burden (see McIntyre et al., 2015). Figure 3 shows that the US system also does not fulfil the second principle of efficient taxation: most tax revenue is collected via direct taxes, as opposed to indirect taxes as in most other OECD countries, likely causing a greater distortion. The US does not have a nationwide sales tax and indirect revenue collections via state-specific sales taxes are small compared with the OECD average.

To reform the corporate tax system, Republicans in the House of Congress have made a comprehensive proposal for a destination-based border-adjusted cash flow tax (DBCFT), based on an academic paper by Auerbach and Holtz-Eakin (2016), with the following four main features:

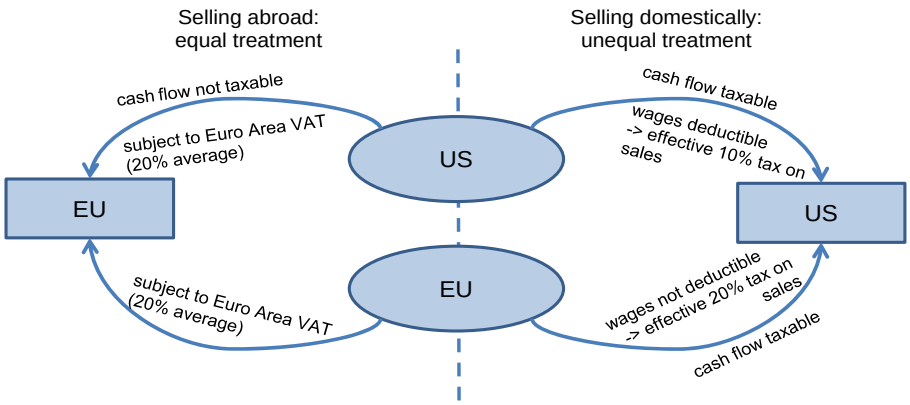
1. **Border-adjustment**: Firms can deduct receipts from exports but can no longer deduct imports from taxable income. This is economically equivalent to a tariff on imports and a subsidy on exports.
2. **Tax incentives for new investment:** Investment outlays can be written off immediately (rather than according to a set depreciation schedule), while interest payments are no longer tax deductible.
3. **A reduction in the corporate tax rate from 35% to a proposed 20%.**
4. **Shift from an origin-based system** (where corporations are taxed on their worldwide profits) **to destination-based system** (where corporations are taxed only on profits incurred within the US). This has implication for the incentives to repatriate profits back to the US.

Currently, US corporate taxes are levied at the location where the company is established, with the tax base being revenue less capital and labour expenses. Exporters pay corporate income tax, while imports are exempt for companies not established in the US – i.e. there is no border adjustment. On the other hand, VAT is levied at the destination (where the sale takes place) and the tax is based on the sales price. In addition, it is border-adjusted, implying that exports are exempt from VAT, while imports are subject to VAT and treated in the same way as domestically produced goods. As such, the proposed DBCFT would have elements of both VAT and corporate taxes. It would be levied where the sale takes place (as with the VAT). By contrast, the tax base would refer to revenues less a deduction of capital and labour expenses (similar to the corporate tax), although this would refer only to domestic costs. As such, the border adjustment part of the DBCFT would act like the combination of an export subsidy and an import tariff. Effectively, this would mean that the tax would be applied to the "cash flow" of domestically-produced goods. Moreover, exports of goods would be exempted from cash flow taxes.

To illustrate how the border adjustment works, Figure 4 shows a simple example. Assuming that wage costs and domestic investment expenditure amount to 50% of sales price and the tax rate is 20%. For a domestic sale of 100 USD, the cash flow tax (after accounting for wages and investment expenditure) would amount to 10 USD; the effective tax rate would be 10%. For the domestic sale of imported

goods for USD 100, by contrast, the tax would amount to 20 USD with an effective tax rate of 20%. Ceteris paribus, such a tax would imply higher sales prices (or lower profits) for foreign goods and, effectively, act like a tariff. Only in the case when the US dollar appreciates substantially, the economic effects caused by the unequal tax treatment brought in by the border adjustment would be compensated. The second change would provide tax incentives for new investment. This change will affect the financing structure of corporations via eliminating previous incentives to hold debt over equity, thus reducing firm leverage. In addition, adopting a destination-based tax system would reduce US corporations' incentives to move their tax residences overseas (i.e. "corporate inversions") and to declare domestic corporate income as foreign-source income. Effectively, this border-adjusted cash-flow tax would raise revenue by broadening the tax base. Taxing spending on imports instead of taxing profits from exports would raise federal revenues and thereby finance part of the planned cuts in corporate tax rates[4,5].

Figure 4: Illustration of the effect of border adjustment on foreign sales (where treatment is equal) and domestic sales of goods and services (where treatment is unequal)



Notes: The illustration is done for imports of final consumer goods as it is the simplest case. It is assumed that for the US company, wage costs and domestic investment represent 50% of its sales. Numbers are illustrative.

3 Derivations and equivalences of the proposed corporate tax reform

In order to lay out the main features of this proposal, we will briefly discuss the firms' decision problems and how they are affected by the introduction of this new tax. This section starts from the structure from the IMF's Global Integrated Monetary and Fiscal (GIMF) Model (Kumhof et al., 2010) and subsequently adds the DBCFT to the firms' optimisation problem.

3.1 Domestic firms:

Starting with the current system, let's assume that there is a continuum of domestic firms indexed by $i \in [0, 1]$ in two separate sectors indexed by $Z \in \{N, T\}$, where N represents non-tradable and T tradable. All these firms buy labour and capital inputs to produce their output. While firms in the non-

[4] The blueprint is unclear on whether tax rebates will be considered or whether a zero bound on tax payments will be imposed.
[5] In general, border-adjustment is allowed under WTO rules only for consumption taxes, but not for direct taxes. Hence, Republicans stress that the cash-flow tax resembles more a consumption rather than a corporate tax. Hufbauer and Zhiyao (2017) discuss a number of adjustments that could be made to the DBCFT that may make the tax WTO compatible, for example including wages in the tax base, but allowing for a portion of the tax revenue to be used as credit for Social Security or Medicare taxes; or allowing a deduction for the wage component of imported goods.

tradable sector sell the entirety of their goods to domestic distributors, firms operating in the tradable sector can either sell their goods to domestic distributors or to foreign markets. These firms are perfectly competitive in their input markets and monopolistically competitive in the market for their output. In order to capture a realistic dynamic to equilibrium, these firms are subject to nominal rigidities when setting prices.

The demand for domestic producers' D_t^z varieties is given by:

$$D_t^z = \left(\int_0^1 D_t^z(i)^{\frac{\sigma_z - 1}{\sigma_z}} di \right)^{\frac{\sigma_z}{\sigma_z - 1}} \quad (1)$$

and demand for exporters' D_t^X varieties is given by:

$$D_t^X(1,j) = \left(\int_0^1 D_t^X(1,j,i)^{\frac{\sigma_x - 1}{\sigma_x}} di \right)^{\frac{\sigma_x}{\sigma_x - 1}}, \quad (2)$$

where $D_t^z(i)$ are variety in sector Z, and $D_t^X(1,j,i)$ are variety i and total demands for exports from country 1 to country J and σ_z and σ_x measure the elasticity of substitution between varieties of domestic producers and exporters, respectively.

Cost minimization by domestic distributors and foreign countries generates demands for domestic and export varieties:

$$D_t^z(i) = \left(\frac{P_t^z(i)}{P_t{}^z} \right)^{\sigma_z} D_t^z \quad (3)$$

$$D_t^X(1,j,i) = \left(\frac{P_t^X(1,j,i)}{P_t{}^X(1,j)} \right)^{\sigma_x} D_t^X(1,j), \quad (4)$$

Where the price indices are defined as:

$$P_t^z = \left(\int_0^1 P_t^z(i)^{\frac{1}{1-\sigma_z}} di \right)^{\frac{1}{1-\sigma_z}} \quad (5)$$

$$P_t^X(1,j) = \left(\int_0^1 P_t^X(1,j,i)^{\frac{1}{1-\sigma_x}} di \right)^{\frac{1}{1-\sigma_x}}; \quad (6)$$

Where P_t^z is the deflator for sector Z ∈ {N, T}, and $P_t^X(j)$ is the export deflator from country 1 to country J. Moreover, total exports of country 1, $X_t(1)$, can be calculated when we sum $D_t^X(1,j)$ over all J countries in the world.

$$X_t(1) = \sum_{j=2}^{J} D_t^X(1,j) \tag{7}$$

Technology is given by a CES production function in utilized capital $K_t^z(i)$, labour $L_t^z(i)$, and intermediate goods imports $M_t^{mz}(j,i)$ demanded by variety i from country j. Other important parameters in the production function are the elasticities of substitution $\eta_t^z(i)$ between capital and labour and $\eta_t^{mz}(i)$ between domestic and imported intermediate goods.

$$\begin{aligned} Y_t^z(i) &= F\left(K_t^z(i), L_t^z(i)\right) \\ &= \kappa \left\{ \left[(1-\alpha)^{\frac{1}{\eta_t^z(i)}} K_t^z(i)^{\frac{\eta_t^z(i)-1}{\eta_t^z(i)}} \right.\right. \\ &\quad \left. + (\alpha)^{\frac{1}{\eta_t^z(i)}} \left(T_t A_t^Z L_t^z(i)\right)^{\frac{\eta_t^z(i)-1}{\eta_t^z(i)}} \right]^{\frac{\eta_t^{mz}(i)-1}{\eta_t^{mz}(i)}} \\ &\quad \left. + (1-\alpha_m)^{\frac{1}{\eta_t^{mz}(i)}} M_t^{mz}(j,i)^{\frac{\eta_t^{mz}(i)-1}{\eta_t^{mz}(i)}} \right\}^{\frac{\eta_t^{mz}(i)-1}{\eta_t^{mz}(i)}}, \end{aligned} \tag{8}$$

Where labour augmenting productivity is $T_t A_t^Z$.

Firms are subject to two types of adjustment costs. First, firms face a quadratic inflation costs $G_t^z(i)$ when setting prices:

$$G_t^z(i) = \frac{\phi}{2}\left(\frac{\frac{P_t^z(i)}{P_{t-1}^z(i)}}{\frac{P_{t-1}^z(i)}{P_{t-2}^z(i)}} - 1 \right)^2. \tag{9}$$

The second adjustment cost $G_{L,t}^z(i)$ is related to labour hiring. Firms have a real cost to quickly adjust to new labour values:

$$G_{L,t}^z(i) = \frac{\phi_L}{2}\left(\frac{L_t^z(i)}{L_{t-1}^z(i)} - 1 \right)^2. \tag{10}$$

It is assumed that each firm pays out each period's after tax nominal net cash flow as dividends $Div_t^z(i)$. Thus, in the current US corporate taxation system, the firms' problems can be characterized by maximizing $Div_t^z(i)$:

$$Div_t^z(i) = \left(P_t^z(i)\, Y_t^z(i) - W_t L_t^z(i) - r_{k,t}^z K_t^z(i) - P_t^{mz}(i) M_t^z(i) - P_t^z(i) G_t^z(i) - V_t G_{L,t}^z(i) - \frac{I_t^z(i)}{2} \right)(1-\tau_k) \tag{11}$$

Where $P_t^z(i)\,Y_t^z(i)$ is nominal revenue, $W_t L_t^z(i)$ is the wage bill, $r_{k,t}^z K_t^z(i)$ is the spending in capital services with the real cost of capital denoted by $r_{k,t}^z$, and $P_t^{mz}(i)M_t^z(i)$ is the spending in imported intermediate goods in domestic currency. Other components of the profit include the adjustment costs $\left(P_t^z(i)G_t^z(i) + V_t G_{L,t}^z(i)\right)$; and 50% of investment spending $\frac{I_t^z(i)}{2}$. Furthermore $\Pi_t^{old(z)}$ is defined as gross profit under the current system.

$$\Pi_t^{old(z)} = \left(P_t^z(i)\,Y_t^z(i) - W_t L_t^z(i) - r_{k,t}^z K_t^z(i) - P_t^{mz}(i)M_t^z(i) - P_t^z(i)G_t^z(i) - V_t G_{L,t}^z(i) - \frac{I_t^z(i)}{2}\right)$$

Note that the current US corporate taxation system allows the deduction of 50% of the investment spending and the cost with borrowed capital from the corporate tax base. That is, current government revenue from taxing corporate income is given by:

$$CIT\ revenues = \tau_k^{old}\left(P_t Y_t - W_t L_t - r_{k,t} K_t - e_t P_t^M M_t - P_t G_t - V_t G_{L,t} - \frac{I_t}{2}\right), \qquad (12)$$

Where e_t is the nominal effective exchange rate and P_t^M is the price of imported goods in foreign currency.[6]

3.2 Import agents:

In the next section, we show that the question of domestic cost pricing or pricing to market are not important to assess the implications of the corporate tax reform if the reform is perceived as permanent, but turn out to be important in determining short term dynamics if the policy is perceived as non-permanent. In the version of GIMF used in most of the simulations in this paper, it is assumed that import firms use a pricing to market approach.

The way that this is modelled is through the introduction of import agents that buy intermediate goods (or final goods) from manufacturers in their owners' country and sell these goods to distributors (intermediate goods) or consumption/investment goods producers (final goods) in the destination country. They are assumed to be perfectly competitive in their input market and monopolistically competitive in their output market. The nominal rigidities in their price setting are important to determine the short dynamic response to change in tariffs. We first analyse the demands for their output and then describe their optimization problem.

The demand for each country j of each import agent i is given by:

$$D_t^M(j,i) = \left(\frac{P_t^M(1,j,i)}{P_t{}^M(1,j)}\right)^{-\sigma_{jM}} D_t^M(j), \qquad (13)$$

Nominal rigidities in this sector take the similar quadratic form given in equation (9):

$$G_t^M(j,i) = \frac{\phi_{Pm}}{2} D_t^M(j)\left(\frac{\frac{P_t^M(1,j,i)}{P_{t-1}^M(1,j,i)}}{\frac{P_t{}^M(1,j)}{P_{t-1}^M(1,j)}} - 1\right)^2. \qquad (14)$$

[6] Adjustment costs might include some elements that are not tax deductible, as some of these factors might affect the profitability of firms by increasing inefficiency without changes in the (tax-deductible) factor input. We disregard these elements, as we believe them to be of a second order of magnitude and it would be hard to identify them in aggregate firms' data.

We denote the price of inputs of variety i, imported from country j at the border of country 1 by $P_t^{M,cif}(1,j,i)$, the cif (cost, insurance, freight) import price. The import tariff on country j, τ_{jm}, is applied on top of this import price. Thus, the objective function of import agents is to maximize the expected present discounted value of nominal revenue $P_t^M(1,j,i)D_t^M(j,i)$ minus nominal costs of inputs $(1+\tau_{jm})P_t^{M,cif}(1,j,i)D_t^M(j,i)$ minus nominal inflation adjustment costs $P_t G_t^M(j,i)$. The optimal price for the import agents satisfies the following first order condition:

$$\left(\mu_{jM}\frac{(1+\tau_{jm})P_t^{M,cif}(1,j,i)}{P_t^M(1,j,i)}-1\right) = \phi_{Pm}(\mu_{jM}-1)\left(\frac{\pi_t^M(1,j,i)}{\pi_{t-1}^M(1,j,i)}\right)\left(\frac{\pi_t^M(1,j,i)}{\pi_{t-1}^M(1,j,i)}-1\right) - E_t\xi_t\phi_{Pm}(\mu_{jM}-1)\frac{P_{t+1}^M(1,j,i)D_{t+1}^M(j,i)}{P_t^M(1,j,i)D_t^M(j,i)}\left(\frac{\pi_t^M(1,j,i)}{\pi_{t-1}^M(1,j,i)}\right)\left(\frac{\pi_t^M(1,j,i)}{\pi_{t-1}^M(1,j,i)}-1\right), \quad (15)$$

where $\mu_{jM}=\frac{\sigma_{jM}}{\sigma_{jM}-1}$ and ξ_t is the discount factor. Note that the parameter ϕ_{Pm} measures the degree of nominal rigidity for the import agents. The domestic cost pricing assumption is achieved as a particular case of this equation when we set $\phi_{Pm}=0$. In this case, there is a complete pass-through of the import tariff τ_{jm} on the optimal price set by the import agents.

$$\left(\mu_{jM}\frac{(1+\tau_{jm})P_t^{M,cif}(1,j,i)}{P_t^M(1,j,i)}-1\right)=0, \quad (16)$$

Finally, it is important to highlight the importance of the assumed elasticity of substitution parameter σ_{jM} in this price setting. This parameter measures how easy it is to replace the variety i from different countries j. Notice that in an extreme scenario where it is extremely easy to replace the countries providing variety i, that is, when $\sigma_{jM\to\infty}$, then we achieve the exact optimal condition (16) that we obtain when we assume domestic cost pricing. That is, if the elasticity of substitution is large enough, the assumption of pricing to market or domestic cost pricing achieve very similar solutions in response to shocks and there is an almost complete pass-through of the import tariff τ_{jm} on the optimal price set by the import agents.

3.3 New corporate taxation proposal

The proposed corporate tax reform can be decomposed into four independent elements. This decomposition is important because it allows us to simulate each element at a time and measure independent impacts. The four elements of the reform are:

1) Trade border adjustments;

2) Tax incentives for new investment;

3) Reduction in the tax rate;

4) Change to a destination base tax levy;

We discuss each element in more detail below and derive possible static impacts on government revenues. In this section we derive how the element 1, 2 and 3 can be independently calculated and simulated. We do not have any equation related to the element 4, as this part of the change in the system is just related to the extra revenue from companies that were not paying income tax before. However, we will go in detail on how we calculated the potential static effects.

3.3.1 Trade border adjustments:

The trade border adjusted part only relates to companies involved in international trade. The effects on other firms are discussed later. The border adjustment generates the following static revenues to the government compared to the current system:[7]

$$\begin{aligned}\Delta government\ revenues &= \tau_k^{new} e_t P_t^m M_t - \left(\tau_k^{old}\left(\Pi_t^{old(X)}\right)\right) \\ &\quad - \alpha\left(\tau_k^{new}\left(W_t L_t^X + P_t^X G_t^X + V_t G_{L,t}^X + I_t^x\right)\right) \\ &= \tau_k^{new} e_t P_t^m M_t - \left(\tau_k^{old}\left(e_t P_t^X X_t - W_t L_t^X - r_{k,t}^X K_t^X - e_t P_t^M M_t{}^x - P_t^X G_t^X - V_t G_{L,t}^X - \frac{I_t^X}{2}\right)\right) \\ &\quad - \alpha\left(\tau_k^{new}\left(W_t L_t^X + P_t^X G_t^X + V_t G_{L,t}^X + I_t^x\right)\right)\end{aligned} \tag{17}$$

Where $\tau_k^{new} e_t P_t^m M_t$ is the aggregated revenue collected from import goods levied at the new rate, which using 2015 import numbers would generate about $550 billion dollars per year[8]. The second term, $\left(\tau_k^{old}\left(\Pi_t^{old(X)}\right)\right)$, is the loss in revenue because export companies will no longer pay corporate taxes, which using 2015 profit numbers we estimated at $60 billion per year. We estimated this number from total exports assuming that export companies have a mark-up of about 8% over the total export value,[9] which is in the range found in the literature that use plant-level production data for estimation. The third term is the tax refund exporters would get from the tax levied in their domestic inputs, which using 2015 data is estimated at $370 billion per year. The export companies' domestic cost was calculated as total cost minus their import costs. Their import cost should be around 15% of this value given that the US import content of exports is 15% (OECD 2016). Finally, we allow for partial reimbursement, where α is the fraction of reimbursed tax related to domestic costs. In our simulation where policy is perceived to last 4 years, we calculate the static impact on government revenues from the border adjustment element assuming that export companies get full refund for taxes paid on domestic costs (α=1).[10]

Overall, the revenue gains from border-adjustment are around $120 billion per year in the static estimation.[11] Looking at the relative magnitudes above, we already see the importance of the refund assumption, given that the bulk of the subsidy to the export companies comes from the refund of taxes

[7] To simplify the presentation, we split the tax revenues collected from firms from their domestic sales to their export operations.
[8] Source is the Bureau of Economic Analysis.
[9] This is a mark-up value consistent to the calibration of the model we using, but it could be understating total profits. In the seminal paper in this area, Hall (1988) found a mark-up of 3%, and Loecker and Warzynski (2012), using Slovenian companies' data, estimated it to be in a range of 17% to 28%. However, this value choice shouldn't affect the total export subsidy, just the revenue loss composition between refunds and profits.
[10] We relax this assumption in the robustness section.
[11] This estimate is broadly consistent with the static ten-year estimates of USD1069 billion in Pomerleau (2016) and USD1180 in Nunns et al (2016).

paid on domestic costs. This is the key revenue-generating element of the tax reform, which given the current US large trade deficit can increase revenues offsetting the losses from the other elements of the tax reform.[12]

Adding and subtracting $\tau_k^{old} \mathrm{P_t^m} M_t$ and rearranging the expression, we can rewrite the equation above as:

$$\begin{aligned} &\Delta government\ revenues \\ &= \Delta\tau\, P_t^m M_t + \tau_k^{old} \left(\mathrm{W_t L_t^X} + \mathrm{r_{k,t} K_t^x} + \mathrm{P_t^x G_t^x} + e_t P_t^{M} M_t{}^{x} + \mathrm{V_t G_{L,t}^x} + \frac{\mathrm{I_t^x}}{2} \right) \\ &- \alpha\tau_k^{new} \left(\mathrm{W_t L_t^X} + \mathrm{P_t^x G_t^x} + \mathrm{V_t G_{L,t}^x} + \mathrm{I_t^x} \right) - \left(\tau_k^{old} e_t (P_t^X X_t - P_t^m M_t) \right) \end{aligned} \tag{18}$$

Note that the last expression $P_t^X X_t - P_t^m M_t$, is equivalent to the nominal trade balance. A particular case of this expression is when exporters get the full refund for the tax paid on domestic costs (α=1) and the tax rate does not change ($\Delta\tau$ =0) and the deductions are the same as in the old system. In this case, the change in revenues is equivalent to a tax on the trade balance:

$$\Delta government\ revenues = -\tau_k e_t (P_t^X X_t - P_t^m M_t) \tag{19}$$

Thus, if we were just considering this case, government revenues would be around $100 billion from the 2015 trade deficit of around $500 billion. However as shown later, the reform would imply a reduction in the trade balance and therefore the revenues. Another interesting particular case is when exporters receive less than full refunds for the tax paid on domestic costs. In this case, revenues collections are higher than the tax on the trade balance even if the rate does not change ($\Delta\tau$ =0). In our initial simulation, we assume that export companies get full refunds.

3.3.2 New investment incentives

In the second strand of the proposal, firms would be allowed to deduct the full expense of domestic investment while disallowing deduction of interest expenses. We now discuss more formally the implications.

In the current system, we assume that firms can deduct 50% of investment expenses and total interest payment costs when calculating their profits,[13] that is:

$$\text{Current system taxes} \Rightarrow \tau_k^{old} * \Pi_t^{\mathrm{old(z)}}(\mathrm{i}) \tag{20}$$

[12] The theoretical paper by Auerbach and Holtz-Eakin (2016) on which the DBCFT is based assumes that exporters get fully refunded for their domestic costs. Thus, even though the blueprint for the tax reform is silent on this issue, our baseline simulations follow the assumption on full refunds.

[13] The cost of purchased assets in the United States is normally written off over a certain number of years (fixed by law according to the nature of the item) by taking an annual depreciation allowance. In addition, several rules allow the deduction of some of the cost of the acquired assets already in the year of purchase. Code Sec. 179 allows the deduction as an expense in the year of purchase (subject to a dollar limit and investment ceiling). Moreover, the bonus first-year depreciation allows a 50% bonus depreciation allowance for qualified property placed in service in 2015 through 2017, with the amount diminishing to 40% in 2018 and 30% in 2019. Bonus depreciation is currently scheduled to expire after 2019. In our paper, we take the simplifying assumption that firms can deduct 50% of investment expenses in the first year.

$$= \tau_k^{old} * \left(P_t^z(i)\, Y_t^z(i) - W_t L_t^z(i) - r_{k,t}^z K_t^z(i) - P_t^{mz}(i) M_t^z(i) - P_t^z(i) G_t^z(i) - V_t G_{L,t}^z(i) - \frac{I_t^z(i)}{2} \right)$$

where $\Pi_t^z(i)$ is the gross profit as defined in equation (11). The new system allows the full expense of investment $I_t^z(i)$, while removing the deduction of interest payments $r_{k,t} K_t^z$:

$$\text{New system taxes} \Rightarrow \tau_k^{new} \Pi_t^{new(z)}(i) = \tau_k^{new} \left(P_t^z(i)\, Y_t^z(i) - W_t L_t^z(i) - P_t^{mz}(i) M_t^z(i) - P_t^z(i) G_t^z(i) - V_t G_{L,t}^z(i) - I_t^z(i) \right) \quad (21)$$

After some manipulation, the aggregate changes in revenues, when we isolate the part of the changes only related to this change in deduction and not due to border adjustment or a change in the tax rate, can be written as:

$$\Delta government\ revenues = \tau_k^{new} \left(r_{k,t} \tilde{K}_t - \frac{\tilde{I}_t}{2} \right) \quad (22)$$

Where the first term is the impact of the change in the tax rate, element 3 of the reform, and the second term represents the short run losses in revenue from the changes in deductible items from the corporate tax base, which is the element 2 of the reform. Note that $\tilde{K}_t$ and $\tilde{I}$ measure total capital and investment minus the capital and investment from export firms, respectively. We do this because we already incorporated this element in the border adjustment part.

The revenue loss related to this change in the definition of items allowed to be deducted from corporate income taxation will go down over time as interest payments are expected to go up, reflecting a normalization of interest rates, and the depreciation of the new capital stock becomes larger. Because of the historical period of low interest rates experienced in the world economy, the ratio between firms expense on interest payments over gross private investment was 22% in 2015[14][15]. As projections indicate that interest rates will normalize in the medium term, this ratio could go back to its pre-crisis level of 38%. Overall, if we assume that investment increases at its average over the past 3 years, our calculations indicate that the revenues foregone from the corporate tax would be $110 billion in the first year but only $70 billion in the third year, as higher interest rates would have implied lower revenues in the current system but would not impact the new system.

3.3.3 Reduction in tax rate

This is just a simple change in the headline rate paid on corporate income. The US House Republican proposal was to reduce this rate from 35% to 20%.

Formally, isolating the change in the headline rate from the other changes, this would change the government revenues by:

$$\Delta government\ revenues = \Delta \tau \Pi_t^{old} \quad (23)$$

Assuming that the revenue collection efficiency remains the same, a linear calculation would imply that the revenue loss related to the tax rate reduction would be around $200 billion per year. Of course,

[14] Source: Haver.

[15] Firms deducted from the corporate tax base approximately $1569 billion in domestic capital expense and $693 billion in interest expense in 2015.

the dynamic effect on the deficit will depend on the fiscal multiplier. In our model, the two years cumulative corporate tax multiplier is 0.57, which seems broadly in line with the literature. Gechert and Rannenberg (2014), using a meta-regression analysis, estimated tax multipliers to be 0.6 for the US. Reichling and Whalen (2015) found corporate tax multipliers to be in the range of 0-0.4.

3.3.4 Tax inversion

The final element of the proposal changes the system from an origin to a destination base for tax purposes. This change should generate revenues as firms will no longer be able to shift their profits to tax havens for tax avoidance. Estimates of lost revenue to the US Treasury due to tax inversions range between $90 to 110 billion per year (see McIntyre et al (2015) and Clausing (2016)). Of course, this revenue loss would be naturally lower with a reduced corporate tax rate of 20%. In a linear fashion, the implied revenue loss from tax inversions would be around $60 billion per year, of which we estimate that half could be recovered from the change to a destination based system. This conservative assumption is based on firms' capacity of creating new forms of tax evasion even in the new system.

Static Summary

Overall, assuming that exporters get fully refunded (α=1), the impact on government revenues can be fully decomposed by the elements in equations (18) and (22) and (23), which are combined below, summed to the recovered revenues from the elimination of tax inversions.

$$\begin{aligned}\Delta\text{government revenues} &= \Delta\tau\Pi_t^{\text{old}} + \tau_k^{new}\left(r_{k,t}K_t - 0.5I_t\right) + \Delta\tau\, P_t^m M_t \\ &+ \Delta\tau\left(W_t L_t^X + r_{k,t}K_t^x + P_t^x G_t^x + V_t G_{L,t}^x + \frac{I_t^x}{2}\right) - \left(\tau_{old}(P_t^X X_t - P_t^m M_t)\right)\end{aligned} \tag{24}$$

Table 1 summarizes the impact on government revenues of each of the above four major elements introduced by the DBCFT. Given uncertainty about these estimates, the numbers are rounded. The estimated static annual revenue impact of the tax reform amounts to 0.9 % of US GDP. Moreover, the bulk part of the fiscal stimulus comes from the reduction in the headline rate.

Table 1: Estimated impact of the DBCFT on government revenues per annum

	Current Regime	Proposed DBCFT	Revenue difference ($billion per annum)
1. Border adjustment:	Deduct import cost	Imports not deductible from income tax base	550
	Tax exporters profits	No tax on export companies profits	-60
		Tax refund to exporters	-370
			=120
2. Investment incentives:	Deduction of 50% of capital expenses Deduction of interest payments	Full deduction of capital expenses	-110
3. Reduction corporate tax:	35% headline rate	20% headline rate	-200
4. Tax inversion:	Taxes levied on worldwide profits of companies established in the US	Taxes levied only on profits accrued from sales in US	30
Total impact on revenues			-160 (0.9% of GDP)

Source: BEA and author's calculations.
Note: Numbers are rounded given uncertainty around these estimates.

3.4 Assumptions under which the DBCFT is trade neutral

A significant US dollar appreciation, after the introduction of the tax, could make firms indifferent to the border adjustment and mean this measure could in theory be revenue neutral. Indeed, Auerbach and Holtz-Eakin (2016) claim that the border adjustment part of the DBCFT does not distort trade decisions because the exchange rate would appreciate substantially to completely offset the impact of the imposition of the tariff on imports and subsidy on exports. In order for the trade balance to be unchanged, the US dollar would have to appreciate (in the example above) by an order of 25% to bring the dollar prices of imported products and foreign price of exports back to the values that would prevail without the border tax adjustment. However, as shown below, unless the costs of exporters are fully rebated, there is no single exchange rate that will remove trade distortions. Instead, the "break-even" extent of exchange rate appreciation (that would neutralise the impact on profits) would vary across export firms, because it would depend on each firm's mark-up. Additional factors may also imply a more muted exchange rate appreciation. First, economic agents may not see the policy change as permanent given concerns about a WTO-led response and, thus, the risk of policy reversal. Moreover, countries could intervene in currency markets to offset some of the exchange rate effects, while the elasticity of demand and supply of US exports and imports would determine the extent to which margins would be adjusted, thus at least initially absorbing some of the appreciation. This section of the paper investigates more precisely under which conditions there exists a single exchange rate that would remove all trade distortions created only by the border adjustment part of the tax.

The "break-even" exchange rate would adjust revenues for exporters and costs for importers so that profits of both exporters and importers are unchanged after the tax system changes. Following equation (11), the after-tax profit for a producer of variety i that imports inputs under the current system is given by[16]:

$$\mathrm{Div}_t^m(i) = \left(P_t^z(i)\, Y_t^z(i) - W_t L_t^z(i) - r_{k,t}^z K_t^z(i) - \sum_{j=2}^{J} e_t^j p_{mt}^j\, M_t^z(j,i) - P_t^z(i) G_t^z(i) - V_t G_{L,t}^z(i) - \frac{I_t^z(i)}{2} \right) (1-\tau_k) \tag{25}$$

Where e_t^j is the bilateral exchange rate with country j before the change in the system and p_{mt}^j is the price in country j's currency of the imported good $M_t^z(j,i)$. Under the proposed DBCFT system, import costs will no longer be deductible from tax obligations. Thus, the after tax profit for an importer in the new system will be:

$$\mathrm{Div}_{t+1}^m(i) = \left(P_{t+1}^z(i)\, Y_{t+1}^z(i) - W_{t+1} L_{t+1}^z(i) - r_{k,t+1}^z K_{t+1}^z(i) - P_{t+1}^z(i) G_{t+1}^z(i) - V_{t+1} G_{L,t+1}^z(i) - \frac{I_t^z(i)}{2} \right) (1-\tau_k) - \sum_{j=2}^{J} e_{t+1}^j p_{mt+1}^j\, M_{t+1}^z(j,i), \tag{26}$$

[16] Since this section is not trying to quantity the results of the corporate tax reform and is only exploring the theoretical concept of the "break-even" exchange rate, we disregard the change in the tax rates and investment incentives to simplify calculations.

From this expression, we can also see that the border adjustment tax in the DBCFT system is equivalent to an imposition of tariffs on imports in the current system. Specifically, (25) will be equivalent to (26) if we define the tariff to be $t_m = \frac{\tau_k}{1-\tau_k}$.

Turning to the investigation of the existence of a "break-even" exchange rate, we know that, by definition, this exchange rate needs to adjust in t+1 so as to satisfy the following condition:

$$\mathrm{Div}_t^m(\mathrm{i}) = \mathrm{Div}_{t+1}^m(i) \qquad (27)$$

Abstracting from changes in the price level because of inflation, it is easy to demonstrate that one solution for this equation is that each bilateral exchange rate appreciates by the amount of the new tax, that is, $\frac{e_{t+1}^j}{e_t^j} = (1-\tau)$, for all j≠2.

In terms of firms that export their production[17], the after tax profit under the current system is given by:

$$\mathrm{Div}_t^x(\mathrm{i}) = \left(\sum_{j=2}^J e_t^j p_{xt}^j Y_t^X(j,i) - W_t L_t^X(i) - r_{k,t} K_t^X(i) - P_t^X(i) G_t^X(i) - V_t G_{L,t}^X(i) - \frac{I_t^X(i)}{2}\right)(1-\tau_k), \quad (28)$$

Where similar to the importer case, e_t^j is the bilateral exchange rate with country j before the change in the system. Under the DBCFT system, export revenues will no longer be deductible from tax obligations and tax rebates on domestic costs are a possibility. Thus, the after tax profit for an exporter in the new system will be:

$$Div_{t+1}^X(\mathrm{i}) = \left(\sum_{j=2}^J e_{t+1}^j p_{xt+1}^j Y_t^X(j,i) - (1-\alpha\tau_k)\left(W_{t+1} L_{t+1}^X(i) - r_{k,t+1} K_{t+1}^X(i) - P_{t+1}^X(i) G_{t+1}^X(i) - V_{t+1} G_{L,t+1}^X(i) - \frac{I_{t+1}^X(i)}{2}\right)\right), \quad (29)$$

In the particular case where exporters get fully refunded by their domestic costs, (α=1), the condition of the break-even exchange rate implies:

$$\mathrm{Div}_t^x(\mathrm{i}) = \mathrm{Div}_{t+1}^x(i).$$

Similar to before, it is easy to demonstrate that one solution to this condition would be when every bilateral exchange rates appreciates by the extension of the tax, that is, $\frac{\mathrm{e}_{t+1}^{\mathrm{j}}}{\mathrm{e}_t^{\mathrm{j}}} = (1-\tau)$ for all j≠2.

The equation (28) and (29) can also be used to show the equivalence of the border adjustment tax in the DBCFT system with a subsidy to export price under the current regime. In the simplest case where exporters get fully refunded by their costs, (α=1), this full equivalence would be obtained if exporters received a subsidy to export price equals to $s_x = \frac{\tau_k}{1-\tau_k}$. This is exactly equivalent to the tariff imposed on importers. To summarize, if exporters get fully refunded, then the border adjustment tax in the DBCFT system is equivalent to imposing the same rate of subsidy to exports and tariffs to imports in the current system. Under these conditions, if the bilateral exchange rates also appreciate at the same rate as the tax, all the relative prices remain unchanged.

These results resemble Feldstein and Krugman (1990) for the case of the value added tax with border adjustment. That is, there exists a single exchange rate that makes exporters and importers indifferent after the introduction of the tariff. In other words, under the case where exporters get fully refunded by their domestic costs, there exists a level of exchange rate that could completely offset the trade distortions of this tax.

[17] With little loss of generality, we are abstracting from the fact that some export companies also import part of their production. The argument would still hold if we did not assume this simplification, but the notation would be unnecessarily more complicated.

Turning to the other extreme would be to assume that exporters do not receive any rebate for their costs, (α =0), then: $\text{Div}_t^X(i) = \text{Div}_{t+1}^X(i) \Rightarrow$

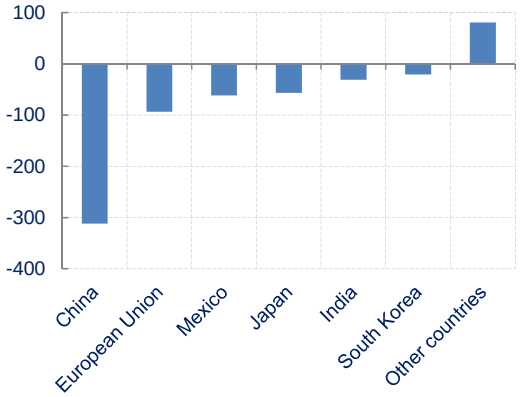
$$\Delta e = (1-\tau_k) + \frac{\left(W_t L_t^X(i) + r_{k,t} K_t^X(i) + P_t^X(i) G_t^X(i) + V_t G_{L,t}^X(i) + \frac{I_t^X(i)}{2}\right)}{\sum_{j=2}^{J} e_{t+1}^{j} p_{xt+1}^{j} Y_t^X(j,i)} \tau_k$$

$$= (1-\tau_k) + \frac{\tau_k}{(1+markup(i))} \tag{30}$$

The last expression shows that if the costs are not fully rebated, then there is not a single exchange rate appreciation that will remove trade distortions caused by the change in relative prices. Moreover, the break even exchange rate appreciation would vary per export firm of variety i, because it would depend on each firm's mark-up. In particular, export firms with higher mark-up would be hurt less if there was no rebate on taxation of domestic costs.

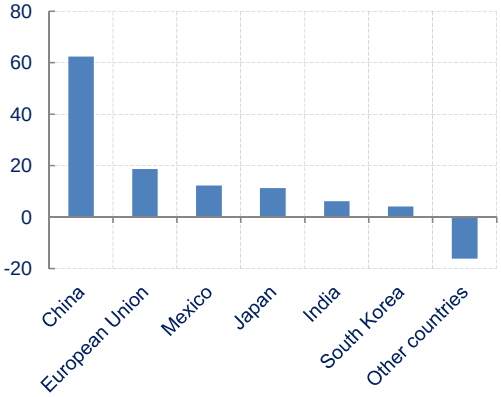
Before we turn to the dynamic simulations, it is also interesting to discuss the consequences of the border adjustment tax in the DBCFT system when there is no distortion to trade, that is, when exporters are fully refunded by taxation on domestic costs and the exchange rate appreciates to fully offset the trade distortions caused by the change in relative prices. In this case, the trade balance would not be affected by the introduction of the border adjustment tax. Even in this case, there will be direct consequences for the rest of the world, in the sense that the US would be collecting revenue from abroad according to the equation (18). This happens because the US currently holds a $500 billion USD trade deficit with the world, which means that this tax would collect about $100 billion USD per annum[18].

Figure 5: Bilateral trade deficits with the US by main country or region
(2015, USD billions)



Source: US Census Bureau.

Figure 6: Implied contributions towards fiscal revenue from the new DBCFT
(USD billions)



Source: Authors' estimation.

Looking at the latest trade deficit numbers (see Figure 5), China, with a trade deficit of over $300 billion, would be the country that initially would transfer the most resources to the US with the introduc-

[18] Note that this calculation assumes that rates don't change, while the calculation in Table 1 also reflects the proposed change in the corporate income tax rate.

tion of this tax. Specifically, 60% of the increase in tax revenues from this tax would come from China (see Figure 6), about 20% from the European Union and 12% from Mexico. South and Central America, regions in which the US has a surplus of $73 billion, would receive about $15 billion from the US. Of course, as the trade balance changes over time, these transfers between countries would also change, but these measures estimate well the initial impact. That is, even in the extreme case where we have no trade distortions, there would be a large transfer of resources among countries, with the greatest losses being incurred by the countries with the largest trade deficit with the US.

4 Simulations on the macroeconomic impacts of the DBCFT

We simulate the economic impact of the corporate tax reform package using a multi-country general equilibrium model. The trade related component of this new tax makes it necessary to employ a model that encompasses the global economy with a detailed fiscal block to establish the economic impacts on the US economy as well as bilateral spillovers to the rest of the world. For that reason, the IMF's Global Integrated Monetary and Fiscal Model (GIMF) is used to simulate the scenarios (see Kumhof, M. et al., 2010 and Anderson et al., 2013)[19]. We use a version calibrated to 6 regions (US, EU, China, Mexico, Japan and rest of the world).

Given the equivalences found in the previous section, the border-adjustment element is implemented via a tariff on imports and a subsidy on exports. The import tariff level depends on whether or not all goods are included in the tax base. In parallel, the rate of subsidy on exports depends on the extent to which export companies are reimbursed by the tax liabilities levied on their domestic costs. In order to properly capture the transfer in resources among countries generated by trade imbalances in the short run, the calibration of the model should feature existing trade imbalances at least in the first periods of the simulation, or that net foreign asset positions in the steady state be different than zero and consistent with existing trade imbalances. This is a peculiar situation where the no policy scenario in which the simulation is run matters a lot, because this is an introduction of a new tax, which is applied to bilateral trade deficits. The other parts are implemented in the model via a lower cost of capital.

The key underlying assumptions are that (i) the government uses the extra revenue to reduce the government deficit; (ii) there is no trade retaliation against the US by other countries; (iii) export firms apply pricing-to-market; (iv) exporters get fully refunded for their domestic costs; and (v) no additional increase in emerging market sovereign risk premia (that could arise due to the strong dollar appreciation and terms-of-trade shocks) is assumed. Furthermore, we assume the reform is implemented in 2018. Some of the assumptions are relaxed in Section 6.

In this first section of simulation results, we show how the agents' subjective probability of policy reversal plays a critical role to determine what the short term impact of the reform will be. Xiangming Li (2004) found that exchange rate movements were smaller in episodes of trade liberalisation when policy reversals were more likely. In order to test the importance of the expectation channel, we considered two scenarios: 1) agents expect the DBCFT to be a more permanent shift in the way corporate taxation is done and assume that its initial design is kept for 20 years; 2) given the possibility of a

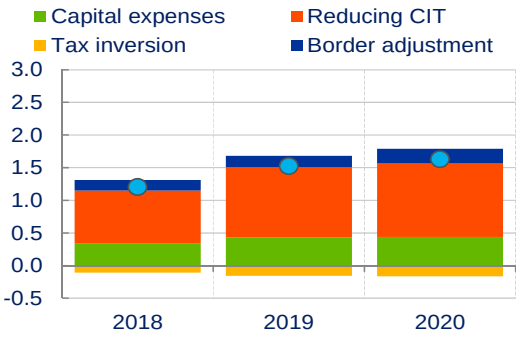
[19] The version used in this paper is an adaptation of GIMF version 6, in which the trade flows were adjusted in the first 10 years to reflect the trade imbalances observed in the data. The version and calibration of the model are available upon request.

WTO challenge or a change of administration, agents could instead expect that the policy would be quickly reverted and would only remain in place for four years[20].

In the case that the expectation is for a more permanent policy change, the shock to the terms of trade, caused by the introduction of the border adjustment element of the DBCFT, would be expected to be more permanent and the exchange rate will eventually need to appreciate to maintain savings and investment decisions unchanged in the US. Through the uncovered interest parity condition, this expectation for a US dollar appreciation quickly translates into exchange rate changes which jump by over 22% in the first year. This strong appreciation quickly offsets the external price distortions produced by the border adjustment. Thus, the trade balance hardly moves, the impact of the border adjustment on US GDP is small and the spillovers to other countries are minimal. The positive impact on US GDP mostly stems from the fiscal stimulus via lower corporate tax rates (Figure 7). Private investment, reacting to the lower overall taxation on capital, contributes decisively to the increased US activity. The small negative impact from the elimination of tax inversions comes from the lower private investment in reaction to higher capital taxation from the companies that were previously lowering their corporate taxes through tax planning. The impact on inflation is initially muted, mostly offset by a jump in the exchange rate. Most of the remaining inflationary pressures come from the fact that the economy is overheating as a result of the fiscal stimulus (Figure 8). As economic activity picks up, there is more demand for labour, and real domestic wages rise (by 0.5% in the first year), leading to an additional push for higher domestic prices[21]. Overall, inflation increases by about 0.25pp in the first year (see Figures 8 and 11).

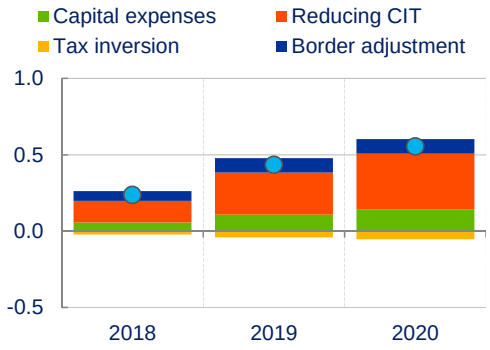
Decomposition of the effect of the DBCFT tax reform if policy is perceived as permanent

Figure 7: US GDP *(% change)*



Source: Simulation results and author calculations.

Figure 8: US inflation *(ppts deviation)*



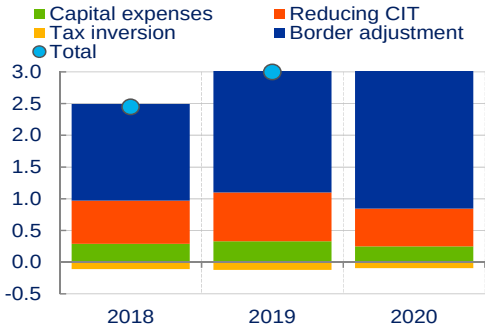
Source: Simulation results and author calculations.

[20] The model is run with perfect foresight where agents are rational. We consider the response to the US economy in the first three years only. In the four year scenario, the results would be different after three years, if policy turned out to last longer despite agents expectation of it being reversed after 4 years. For this reason we highlight the perceived aspect of the two policies.

[21] It is possible that wage pressures are underestimated in our simulations if the reform is implemented in the current context, as the model does not incorporate extra wage pressures from a labour market operating close to full employment.

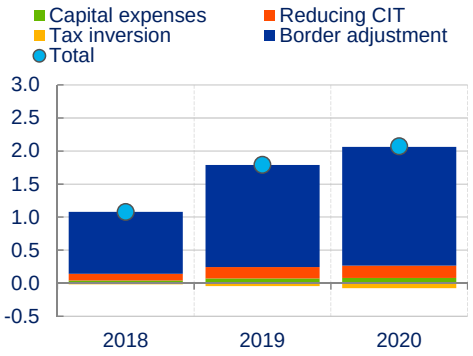
Decomposition if policy is perceived as temporary

Figure 9: US GDP *(% change)*



Source: Simulation results and author calculations.

Figure 10: US inflation *(ppts deviation)*



Source: Simulation results and author calculations.

In the case when agents perceive this new policy as temporary and assess a policy reversal as likely, the tax reform leads to a decline in consumption, and a rebalancing of the economy towards external demand. In this case, the border adjustment element leads to a substantial improvement in US competitiveness and deterioration in US import demand that raises US GDP growth by about 2.5% in the first year (see Figure 9). At the same time, inflation rises, as importers pass on to domestic prices part of the additional cost from higher taxation. As a result of higher inflation, monetary policy reacts strongly and the policy rate rises by almost 350 bps relative to baseline after three years (Figure 11).[22] A large part of the increase in domestic production comes at the cost of a large subsidy to US exporters. In turn, higher inflation and limited substitutability of previously imported products causes real consumption to fall by almost 1.5% after the introduction of the tax. Overall, export corporations with high local production content would benefit the most whereas US households consume less despite having to work harder. The model suggests liquidity constrained household would be hit harder.

The exchange rate appreciation in this case only partially offsets the trade distortions introduced by the DBCFT and the change in traded prices reduces the US trade deficit. In our scenario, the nominal effective exchange rate appreciates by around 11% in the first year.[23] This reflects an increase in import prices of about 15% in the first year and a decrease in export prices of 17.5%.[24] Such a dramatic change in traded good prices prompts a substantial improvement in US trade balance, which improves by almost 3% of GDP after 4 years, effectively closing the US trade balance.

Converse to the case where policy is perceived as permanent, the border adjustment is the largest driver of GDP growth in the scenario where the policy is perceived to be temporary. About 60% of the increase in GDP is explained by the border adjustment, with the reduction in the corporate tax rate explaining most of the residual increase in GDP (Figure 9). As the exchange rate does not fully appreciate to offset the additional taxes on imports, the rest of the world contributes heavily to the subsidy

[22] The qualitative results will not change much if we assume a monetary policy rule that responds 50% more strongly to inflation and 30% more strongly to growth deviations. With this more aggressive monetary policy rule, the USD would appreciate by nearly 13% in the first year instead of 11% in the baseline scenario. The peak of inflation would be 1.6% in the third year, compared to 2.1% in the baseline. The peak in US GDP is about the same in magnitude at 2.7% compared to 3% in the baseline scenario, but the path is different, with the GDP increasing more slowly with this rule, as expected. GDP would increase by 1.6% in the first year compared to 2.4% in the baseline scenario.

[23] See Section 6 for an analysis of the sensitivity of the results to different assumptions.

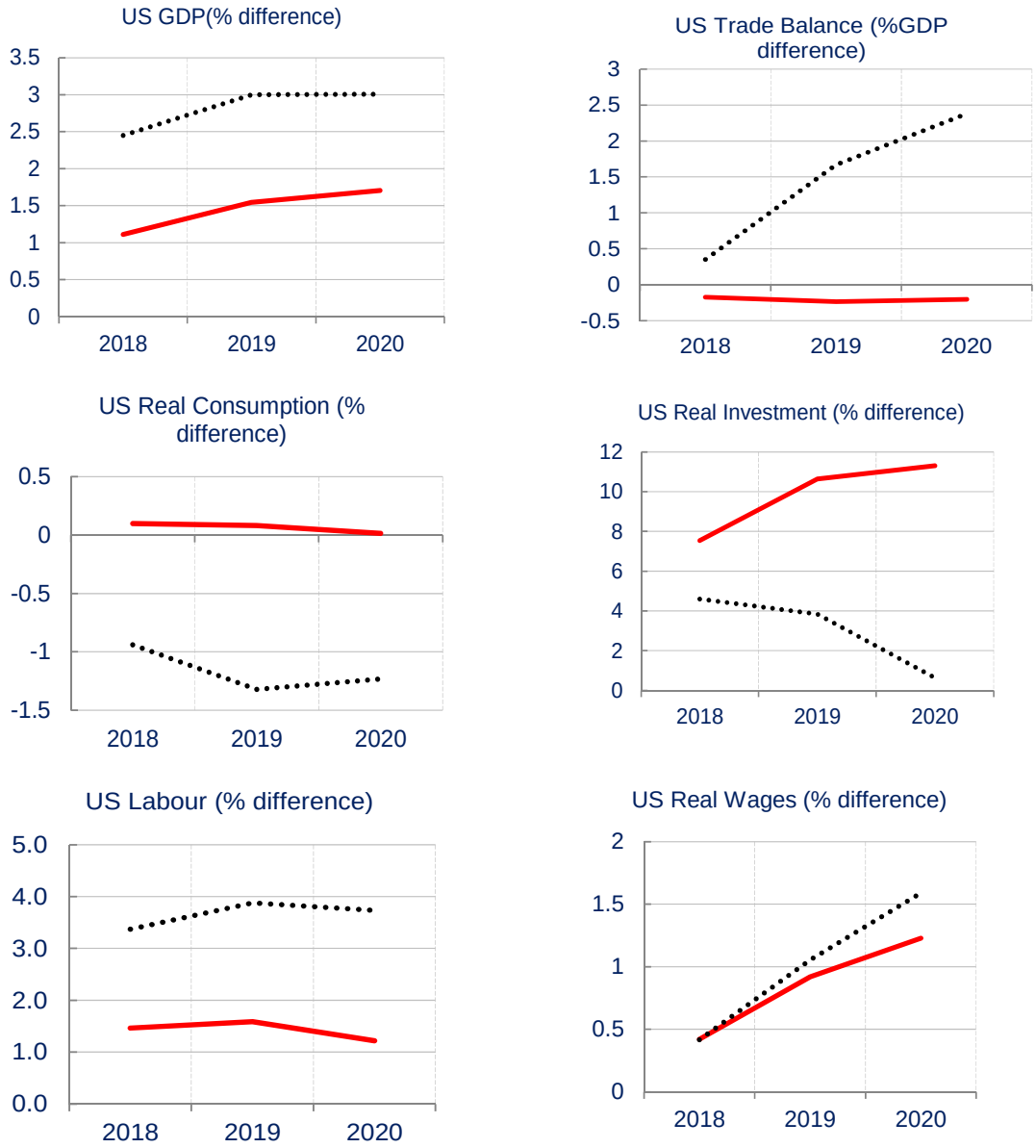
[24] Import prices overshoot because of the initial cost of replacing imported goods by domestic production. After three years, import prices are above pre-scenario levels by 7.5%.

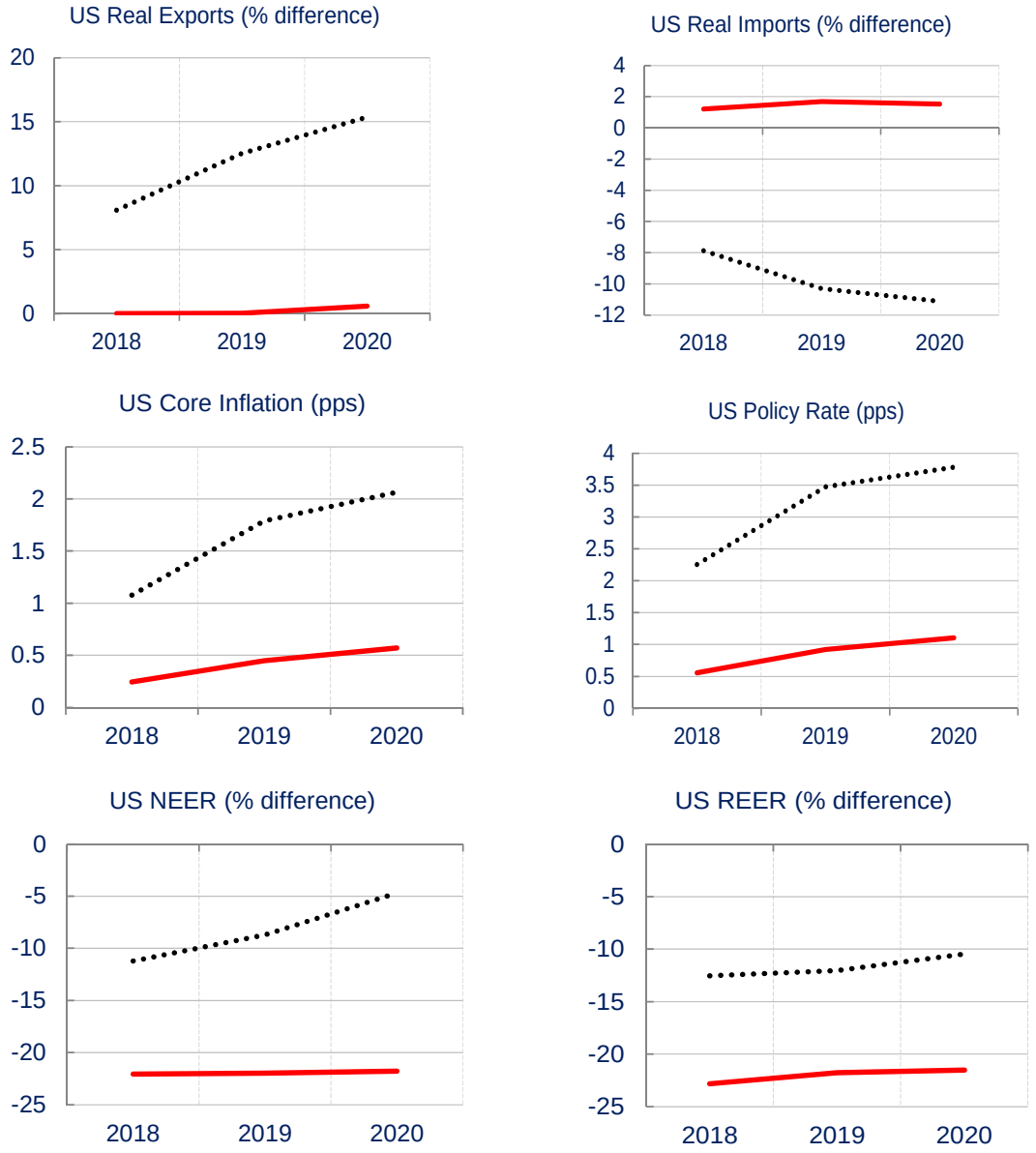
of US exporters in the new system. This foreign financing contribution allows a strong output response to a fiscal stimulus package of 0.9% of GDP.

Figure 11: US Macroeconomic impact from DBCFT reform

Perceived as permanent (20 years)

Perceived as temporary (4 years)





Source: Simulation results and author calculations.

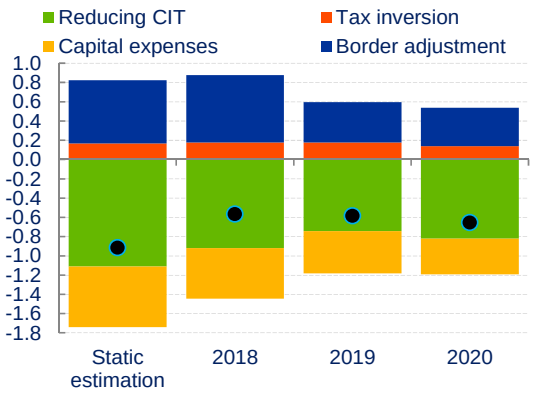
The dynamic government deficit has pronounced differences between the two scenarios. When the policy is perceived as permanent, the initial deficit is lower than the one calculated in the static fiscal stimulus. Lower capital taxation promotes economic growth and reduces the initial deficit, as a percentage of GDP, from the initial fiscal stimulus. As the trade balance does not change much over time, the revenues generated by the border adjustment help to offset the loss in revenues from the lower taxation. Conversely, when agents see the policy as temporary, the border adjustment element induces an improvement in the trade balance. As the trade deficit shrinks, the revenues generated by the border adjustment element disappear and the government balance further deteriorates to about 1.3% of GDP (see Figure 12). This is an important caveat of the initial positive GDP impact of this reform, because this fiscal stimulus might not be able to be sustained for long, and some other fiscal adjustment would eventually be necessary in the medium-term.

This section has shown that while it is theoretically possible that a strong appreciation would occur and offset most of the distortions from the border adjustment in the DBCFT system, it is possible that agents would not immediately assume that the new system will be sustained without challenge. Moreover, this tax contains a self-fulfilling lack of credibility mechanism: if agents believe that this tax would be seen as a protectionist measure and the WTO would eventually rule against the US, then the trade effects would be larger and it is likely that other countries could indeed see this tax as a protectionist measure.

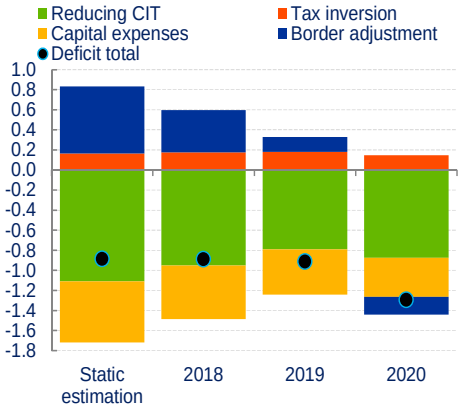
Figure 12: Impact of the DBCFT proposal on US government balance

(% of GDP)

Policy perceived as permanent



Policy is perceived as temporary



Source: Simulation results and author calculations.

5 Spillovers to the world economy and possible retaliation

In this section we will focus on the case where agents believe the DBCFT to be a temporary policy change, since the economic spillovers are relatively larger in this case. In this scenario without trade retaliations, spillovers are negative to the rest of the world as a result of the border adjustment feature. There are two opposite effects at play that affect US foreign demand. On the one hand, lower corporate tax liabilities stimulate the demand for imports. On the other hand, the new tax on US imports means goods and services produced abroad are less competitive in the US. Overall, the negative impact from the border adjustment feature more than offsets the positive impact of the fiscal stimulus.

The rest of the world rebalances towards domestic demand, amid a reduction in global trade. The inverse rebalancing occurs in the rest of the world, with more consumption and investment and lower external demand. Consumers in other countries are partially subsidised by US taxpayers. They are able to consume more US products - with fewer resources after the introduction of the border adjustment feature — while working less. Overall, world trade declines substantially (see Figure 14).

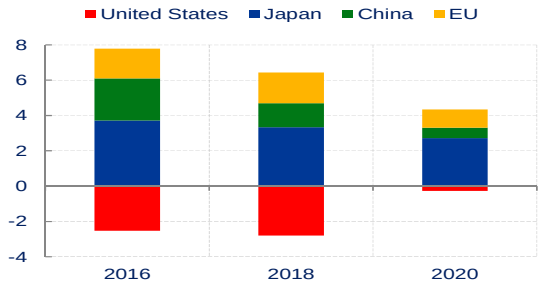
It also implies a significant global narrowing of trade deficits and surpluses in the world economy. Assuming no retaliation by other countries, there is a rebalancing in trade deficits, with surplus regions experiencing a deterioration and the US experiencing an improvement in its trade balance, which in turn would imply a closing of the US trade deficit by 2020 (Figure 13).

There is a notable amount of variability in the GDP impact across countries depending on the strength of trade links with the US. The introduction of this tax would drive Mexico's GDP down by 1% in the first year, reflecting the fact that 80% of its exports are directed to the US. While not affected by the

same degree, the Chinese economy sees lower GDP by 0.7%, and the Japanese and EU economies by nearly 0.5%. Monetary (and fiscal policies) react and lessen the negative impacts from lower US external demand. To the extent that other countries have limited room for policy reaction, the negative spillovers could be substantially larger.[25]

Figure 13: Global imbalances

(Current account balances in percent of countries' GDP)

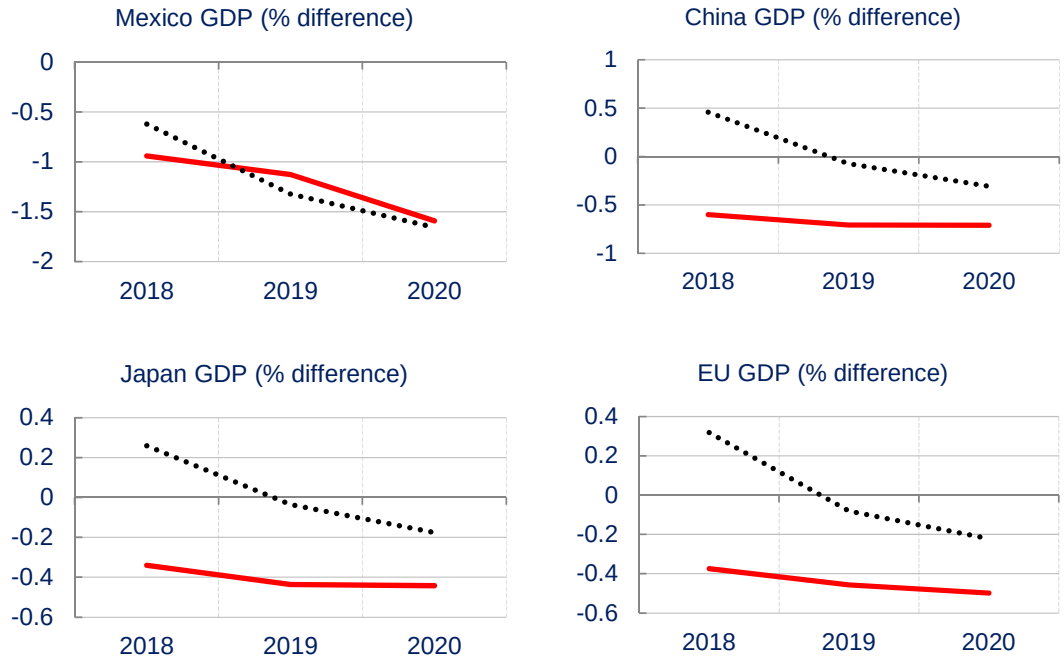


Note: IMF WEO data for 2016 and projections for 2018. The changes between 2020 and 2018 stem only from the simulated results of the DBCFT.

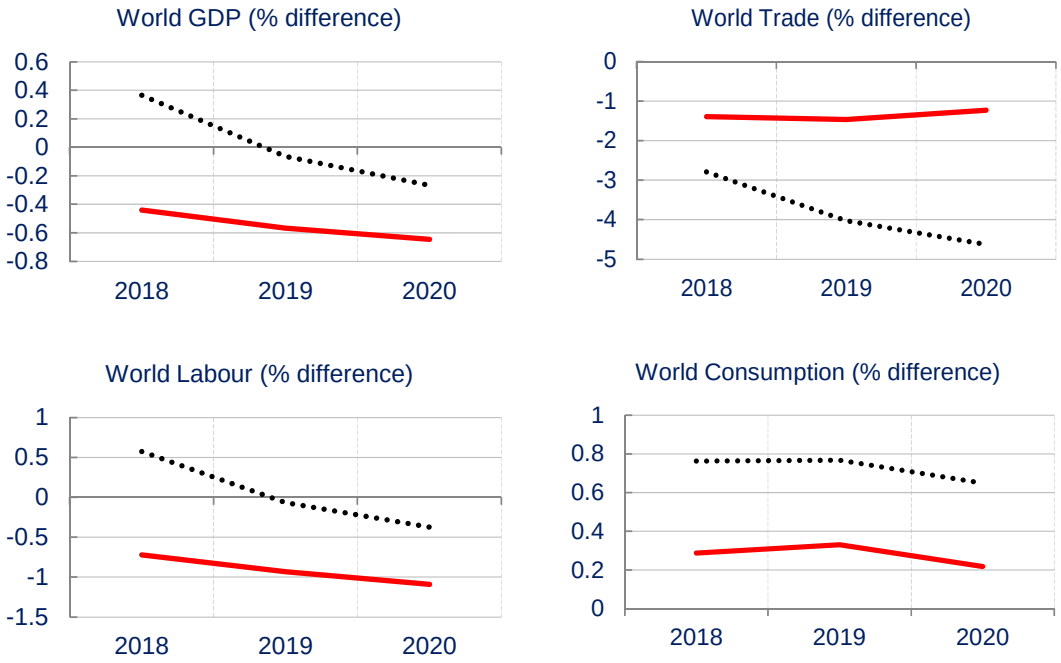
Figure 14: Spillovers to other economies from DBCFT

Without retaliation, perceived as temporary

With retaliation, perceived as temporary



[25] For example, China's GDP could fall as much as cumulatively 4.7% if monetary and fiscal policies do not react to the negative spillovers from the US economy.



Source: Simulation results and author calculations. Note: World variables exclude the United States.

In the event of a coordinated retaliation to the US border adjustment the spillovers would be materially different. A possible scenario is one where countries would try to retaliate against the US economy by imposing an import tariff on US goods and services.[26] Assuming that all countries impose a 20% tariff on all US goods[27], the spillovers turn positive for countries less dependent on US demand. The major channel explaining this change is the substitution away from US goods, which leads to an increase in bilateral trade among other countries. World trade, meanwhile, is hit even harder, declining by 2.9% in the first year (see Figure 14).

6 Sensitivity of the DBCFT to key assumptions

As with any simulation there are some important caveats regarding the assumptions. In this section we undertake sensitivity analysis across different assumptions on US policy as well implications of alternative spillover assumptions. We start by relaxing three of the most important assumptions on US policy: (i) that the US government uses the extra revenue to reduce its government deficit; (ii) that exporters get fully refunded by the tax liability related to their domestic costs; and (iii) export firms apply pricing-to-market.

The impact on activity could be larger if the government spends the proceeds of the border adjustment revenues. While we assume that all proceeds from the border adjustment tax are used to reduce the government's deficit, the impact on activity would be amplified if the government uses the proceeds

[26] In practice, there are two facts that could hinder rapid retaliation: first, on the basis of past WTO challenges, it may take years for countermeasure decisions to be issued; second, retaliation would be an optimal strategy for other countries only if it represented a concerted action among WTO members, which is more difficult to organise, see Deutsche Bank (2017).

[27] The retaliation assumed is simplistic and is not complete, as it only addresses the problems related to double non-taxation of US exports, but it does not address the problem of double taxation of US imports. A more complete retaliation policy could include the reimbursement of domestic companies for paid US border taxes, or the exemption of exports to the US from CIT tax base.

on defence spending for example. In this case, GDP would be about 0.3% higher by 2020 than under the original scenario where policy is perceived to last 4 years and the extra revenue is used to reduce the deficit (see Table 2).

Table 2: Sensitivity - US variables and world trade

Deviation from no policy scenario	Policy for 20 years			Policy for 4 years			Policy for 4 years +Spending revenue		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
GDP (%)	1.1	1.5	1.7	2.4	3.0	3.0	2.9	3.3	3.3
Inflation (%)	0.7	1.1	1.2	1.1	1.8	2.1	1.1	1.9	2.2
NEER (%) (+ appreciation)	20.3	19.3	17.6	11.2	8.7	4.7	11.4	8.8	4.7
World trade (%)	-1.8	-1.7	-0.9	-1.4	-1.5	-1.2	-1.3	-1.4	-1.1

Source: Simulation results and author calculations. Note: World trade includes the United States;

If US exporters do not get reimbursed then trade distortions are larger and the positive impacts on activity are lower. While products, services and intangibles produced in the US and exported abroad would no longer be subject to corporate income tax, the Republican blueprint is silent about the case of negative tax liabilities which would arise when a firm incurred domestic wage and capital expenditure costs and exported its production.[28] As Section 3 formally demonstrates, if exporters do not get fully reimbursed, then the DBCFT would just be a typical protectionist policy and would distort trade decisions and effectively increase trade costs. As Table 3 shows, on aggregate, export firms become less competitive as the exchange rate appreciation would more than offset the reduction in tax liabilities. The overall effect is a reduction in exports that dampens the positive economic impacts of the expansionary fiscal policy. As export firms are less competitive without the refunds, the exchange rate needs to appreciate by less to balance households' desired net foreign asset positions.

Another important variation of the initial scenarios is when some goods are excluded from the DBCFT's tax base. A scenario like this could emerge from negotiations in Congress, in which large retail importers might be able to lobby Congress and obtain tax exemptions. In the scenario represented in the last three columns of Table 3, this would be equivalent to a lower cost of taxation on import goods, which could come in several forms. In order to keep it simple, we assume that half of the cost of imported goods can be deducted from the DBCFT's tax base. As expected, this scenario engenders a larger boost to US GDP and lower to inflation, as the cost of production is not as hard hit by increase in import costs. Investment booms and expands by 6% in the first year, compared to 4.6% in the original scenario where policy is perceived to last 4 years. The exchange rate does not need to appreciate as much to balance the US households' desired net foreign asset positions in this scenario and world trade is not as distressed. However, it is important to highlight that the increase in the US fiscal deficit in this scenario, by 2% of GDP after the first year, is twice worse than in the original scenario where policy is perceived to last 4 years. Thus, strong fiscal consolidation should be expected in the medium-term if the reform passes exempting a large portion of the imported goods and export companies get fully refunded for taxes paid on domestic inputs.

[28] The original idea by Auerbach and Holtz-Eakin (2016) included a full refund of tax liabilities on any domestic costs, which means that DBCFT would work similarly to a VAT.

Table 3: Sensitivity - refunds US variables and world trade

Deviation from no policy scenario	Policy for 4 years			No refund to exporters			Some goods exempted from the tax base		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
GDP (%)	2.4	3.0	3.0	0.3	0.5	0.9	2.7	3.3	3.0
Inflation (%)	1.1	1.8	2.1	0.7	1.1	1.2	0.8	1.4	1.6
NEER (%) (+ appreciation)	11.2	8.7	4.7	7.2	5.6	3.2	8.1	6.1	2.8
World trade (%)	-1.4	-1.5	-1.2	-2.7	-3.9	-4.4	0.2	0.9	1.5

Source: Simulation results and author calculations. Note: World trade includes the United States;

Finally, Buiter (2017) points out that export pricing behaviour is important to determine how the economy would react to the border adjustment element of the DBCFT. Specifically, he argues that the exchange rate would in fact depreciate if export companies apply pricing to market (PTM) when setting optimal prices. In order to check the importance of the export pricing assumption, we relax our initial assumption of pricing to market and assume that export firms use instead local cost pricing (LCP), that is, using the reference of section 3.2, we assume that $\phi_{Pm} = 0$. With this pricing assumption, we run two additional simulations, one in which agents see the border adjustment as lasting for four years and another in which they see the policy as permanent. As figure 15 shows, the exchange rate movements are similar, regardless of firm's export pricing behaviour, contradicting Buiter (2017)'s argument.

If agents perceive the border adjustment to be permanent, then there would be an immediate jump and full adjustment of the exchange rate to achieve neutrality. However, there is an important difference on the first year impact on GDP. While consumption, investment and exports are relatively similar, there is a substantial difference in real imports that fully explains the GDP differences. Under PTM, US importers have rigid prices in dollars, and they take an initial hit as they have to pay the tariff and have their costs rigid in dollars (unaffected by the initial depreciation). As importers can adjust their costs to reflect the lower exchange rate, this initial drop in imports vanishes and the initial positive impact on GDP disappears.

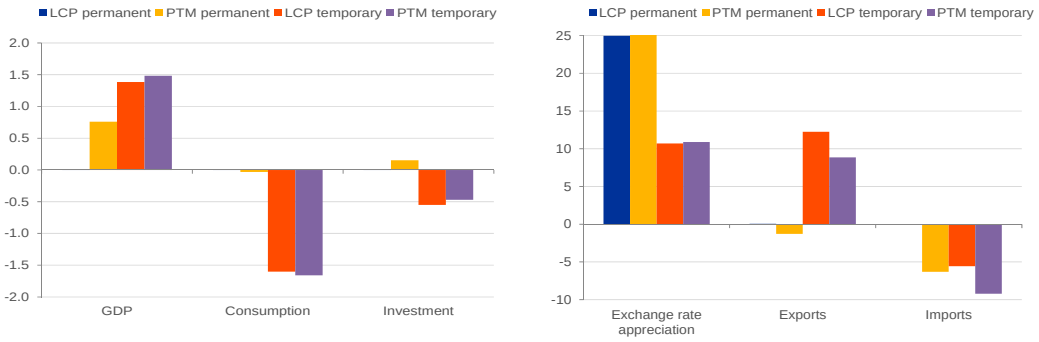
Instead, if agents perceive the border adjustment to only last for four years, then they adjust their consumption and investment decisions in the short term and there is a similar partial adjustment of the exchange rate, around 10% in the first year. Similar to the case where agents perceive the policy as permanent, the pricing assumption does not play much role in terms of consumption and investment responses, and imports fall by more under PTM. However, US exports improve by more under LCP. As importers from other countries price their imports from the US in dollars and not in the final destination currency, the gain in competitiveness of US exporters abroad is initially larger and there is a stronger exports response.

The assumption of no financial spillovers is an important caveat for the spillover results as the GIMF model only captures real sector spillovers. Should the tightening of financial conditions - that arises from higher US interest rates, the strong dollar appreciation - lead to severe financial stress in EMEs, the global spillovers could be substantially more negative. Strong dollar movements can trigger higher risk premia and capital flight from EMEs. Not only would this change affect terms-of-trade in several economies, it could stretch financial systems with currency mismatches. Assuming that risk premia increase by one standard deviation in the first two years in all emerging economies after the introduction of the DBCFT would drive EU GDP down by as much as 0.6% in the first year, which is almost twice as large as the initial negative spillovers from the US. The negative spillovers on China would

be amplified by 3 times, at 1.8% of GDP. Similarly, Mexico GDP would fall by twice as much at about 2% of GDP and the remaining countries by about four times more at about 1.3% of GDP in the second year

Figure 15: Export pricing assumption impact on border adjustment

(first year impact in %)



Source: Simulation results and author calculations.

Finally, in the policy perceived to last 4 years scenario it is assumed that all countries have a flexible exchange rate and respond to the exchange rate pressures from the introduction of the DBCFT by allowing exchange rates to appreciate. Moreover, it is also assumed that fiscal policy is allowed to offset negative impacts from this shock. Since in the real world China tries to peg its currency to the USD, we simulate a final scenario assuming that China resists the appreciation of the USD. Operationally, we ran this scenario assuming that China has a different monetary policy reaction function that reacts more strongly to USD bilateral exchange rate deviations. The last three columns of Table 4 show the results. As it is clear from the table, China would be damaged if it tries to keep this policy. The reason is that Chinese goods and services would lose competitiveness worldwide, as the USD strongly appreciates against all other currencies. Thus, while China usually tries to peg its currency to the dollar, it may be under strong pressure to allow the yuan to depreciate as a result from the introduction of the DBCFT.

Table 4: Sensitivity – spillovers

GDP (deviations from no policy scenario)	Policy for 4 years			Policy for 4 years + increase risk premium			Policy for 4 years + China pegging currency		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
USA	2.4	3.0	3.0	2.3	2.8	3.0	2.5	3.0	3.0
China	-0.6	-0.7	-0.7	-1.8	-1.8	-1.1	-2.2	-1.4	0.2
EU	-0.4	-0.5	-0.5	-0.6	-0.7	-0.6	-0.3	-0.5	-0.5
Japan	-0.3	-0.4	-0.4	-0.5	-0.6	-0.5	-0.4	-0.4	-0.4
Mexico	-0.9	-1.1	-1.6	-1.8	-1.9	-1.9	-0.8	-1.1	-1.6
World	0.2	0.3	0.2	-0.4	-0.3	0.0	0.0	0.2	0.3

Source: Simulation results and author calculations.

7 Robustness to key parameters

We now consider the sensitivity of the results to variation of key parameters in the model. One aspect relates to the parameters in the trade sector. Imbs and Mejean (2015) show that estimates of trade elasticities tend to be smaller in aggregate data than at sector level. Crucini and Davis (2016) also discuss the importance of the elasticity of substitution between home and foreign goods. They point to the large differences in the estimation of this parameter between international trade and macro literatures. While the international macro literature, which is more concerned with short-run business cycle fluctuations, assigns a low value to this parameter (values between 0.75 to 1.5), the international trade literature, more concerned with long-run changes, assigns a high value to this parameter (values between 3 to 6). Crucini and Davis (2016) reconcile this result arguing that the observed substitutability gets larger as the time passes. As the point of reference, in the initial simulations we use a value of 1.5, which is in the upper range of the macro literature values.

Burfisher et al. (2001) explains how the US and Mexico economy have already incurred adjustment costs related to NAFTA and this could also be interpreted as the US economy having a low elasticity of substitution between Mexican and domestic goods in the short term. Moreover, the data also seems to support this low elasticity hypothesis, since the import content of Mexican exports to the US is especially high in the most important export sectors, such as motor vehicles and electronics. Since this parameter is very important to determine the cost of policies that increase the price of imported goods, we run the same simulation assuming different values found in the literature for this parameter.

Table 5 shows the main results under different assumptions, with the lower value of the elasticity reflecting higher cost of replacing imported goods by domestic goods. We estimate 3 alternative scenarios in this section, i) the US' elasticity of substitution for final goods (consumption and investment) and intermediate goods is assumed to be about a third of the baseline calibration; ii) all the countries in the world have an elasticity about a third of the baseline estimation, and, finally, iii) all the countries in the world have an elasticity of 3 – similar to the ones calculated in the international trade literature.

The first thing to notice is that the larger the elasticity of substitution, the larger is the positive impact on the US economy. This mostly comes from the fact that other countries would substitute domestic production by the cheaper US goods. This is reflected in the US trade balance, which improves the most when the world's elasticity of substitution is higher. Similarly, the larger the elasticity of substitution, the larger the global spillovers are. Using the same argument, foreign countries produce less and import more goods from the US when the cost of replacing goods is lower. The exchange rate path is also affected by the elasticity of substitution. The larger the elasticity of substitution, the more the USD appreciates. This is expected, as the incidence of taxes and subsidies on consumers is lower as consumers can substitute away from imports more easily.

Finally, as we have shown in section 3.2, if the elasticity of substitution is large enough, then the assumption of pricing to market is less relevant, and there is a higher pass-through from import tariffs to import prices. So, if export firms in fact use domestic cost pricing, then there would be slightly larger GDP spillovers.

Table 5: Scenario robustness – Changing elasticity of substitution between domestic and foreign production

Deviation from no policy scenario	Baseline calibration			US less elastic substitution			All countries less elastic			All countries more elastic		
US	**2018**	**2019**	**2020**	**2018**	**2019**	**2020**	**2018**	**2019**	**2020**	**2018**	**2019**	**2020**
GDP (%)	2.4	3.0	3.0	2.2	2.7	3.0	2.0	2.4	2.5	2.6	3.3	3.4
Consumption (%)	-0.9	-1.3	-1.2	-1.4	-1.9	-1.7	-1.0	-1.4	-1.3	-1.0	-1.3	-1.2
Investment (%)	4.6	3.8	0.6	3.1	1.2	-2.6	3.7	3.1	0.7	5.2	4.5	0.8
Trade balance (%)	0.4	1.7	2.4	-0.2	1.4	2.4	0.0	1.0	1.5	0.5	2.1	3.0
Inflation (%)	-0.1	-0.2	-0.3	1.2	1.8	1.9	1.0	1.7	2.1	1.1	1.8	2.1
NEER (%) (+ appreciation)	11.2	8.7	4.7	10.4	7.8	3.8	9.3	6.7	2.8	13.5	11.1	7.0
GDP spillovers (%)												
Mexico	-0.9	-1.1	-1.6	-0.3	-0.4	-0.5	-0.1	-0.3	-0.4	-1.2	-1.6	-2.2
China	-0.6	-0.7	-0.7	-0.2	-0.3	-0.3	-0.5	-0.6	-0.6	-0.7	-0.8	-0.8
Japan	-0.3	-0.4	-0.4	-0.4	-0.4	-0.5	-0.3	-0.3	-0.3	-0.4	-0.5	-0.5
EU	-0.4	-0.5	-0.5	-0.2	-0.3	-0.4	-0.3	-0.4	-0.5	-0.4	-0.5	-0.6

Source: Simulation results and author calculations.

We now turn to the case of the possible low elasticity of substitution of the US economy. In the short run, we see that spillovers are substantially reduced when the US has a larger cost to replace foreign goods by domestic production. Not only is the US trade balance worse in this scenario, as imports do not fall as much even with the introduction of the tax, but also US consumption and investment are lower, as consumer and companies have to pay more for imported goods. Moreover, the exchange rate appreciates by about 1% less in this case. Spillovers on Mexico and China are 3 times as lower, as these economies do not see their foreign demand to fall as much and are able to pass more of the cost of this tax to the US taxpayers.

To sum up, the importance of this section is to show that the qualitative results of the policy perceived to last 4 years simulation on the US economy do not change because of different elasticity of substitutions between domestic and foreign production. On the other hand, spillovers are greatly reduced and the positive impacts on the US economy are diminished if the elasticity of substitution turns out to be lower than the one we assumed in our scenario where policy is perceived to last 4 years.

8 Conclusions

In this paper we have explored the implications of the corporate tax reform proposed by Republican members of the US House of Representatives; the so-called "destination-based border-adjusted cash-flow tax" (DBCFT). Static analysis shows that government revenues would decline if such a reform was implemented, mostly due to the cut in corporate tax rates, although the border adjustment would offset some of the loss in revenues.

Simulations using a structural global multi-country model suggest that the macroeconomic impact of the reform would depend primarily on how permanent agents perceive the policy to be. This perception determines if the desired net foreign asset position would change in the short term, and therefore directs the pressures on the US dollar to appreciate in order to offset the impact of the border adjustment. When agents perceive the policy to be more permanent, we find that the tax reform would lead to a short term boost to US GDP, stemming mostly from lower taxation on capital. Instead, when agents perceive the policy to be temporary, the border adjustment leads to an extra short term stimulus from the external sector because of the temporary disequilibrium in relative prices. Although employment increases as a result of the large subsidy to US exporters, higher inflation and limited substitutability of some products means US consumption is reduced. This implies a rebalancing away from domestic demand and imports towards exports.

The macroeconomic implications also depend on a number of other factors that are explored in the paper. These include: (1) whether US trading partners retaliate; (2) the extent to which export firms are reimbursed by tax liabilities related to their domestic costs; (3) the extent to which some categories of goods may be excluded from the DBCFT tax base; (4) how the government uses the revenues generated by the border adjustment; and (5) the pricing system used by exporters.

The robustness scenarios show that the short-term rise in US GDP and inflation would be substantially reduced in particular if exporters do not receive a rebate for the tax liability related to their domestic inputs. In addition, all the scenarios show that the US fiscal deficit would deteriorate over time, thus increasing the need for fiscal consolidation in the medium-term that could offset some of the positive short-term GDP impacts of this corporate tax reform.

The global spillovers of the DBCFT also depend on agents' subjective probability of policy reversal. Under a policy perceived as more permanent spillovers are limited. However, the spillovers to global GDP and world trade are sizeable and negative if the policy change is perceived as temporary and assuming no retaliation by other countries. The rest of the world consumption increases as a result of the implied subsidy on American produced goods. Moreover, there is a rebalancing in global trade deficits, with surplus regions experiencing deterioration and the US experiencing an improvement in its trade balance. Overall, world trade declines, particularly those hitting those countries with close trade links to the US. In the event of coordinated retaliation to the US border adjustment, spillovers could be materially different and would depend on the extent to which there is substitution away from US goods, leading to an increase in bilateral trade among other countries. Aside from retaliation, global spillovers will also depend on how easy it is to replace imported goods by domestic production, and on the extent to which the US dollar appreciation may cause stress in EME financial markets.

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