Abstract

We study the impact of unilateral economic disintegration, such as Brexit, on the design of national and international policies. First, we introduce firm mobility and business-tax policies into a highly tractable multi-sector, general-equilibrium trade model. In the Nash equilibrium, tax policies follow the inverse semi-elasticity of firm relocation. Then, we identify the model’s dimensions of economic disintegration, such as tariffs and non-tariff barriers, and analyze their differential effects on the domestic policies of asymmetric countries. Whereas the disintegrating country is likely to reduce its tax, business taxes tend to converge in the remaining economic area. Third countries’ ability to tax improves. At an international level, we predict a counterforce to deglobalization. A country’s exit from an economic union leads to a deeper integration inside the union. The departure from a customs union lowers tariffs worldwide, including those of the leaving country. In sum, the leaving country’s endogenous integration response with other countries may fully compensate for the disintegration-induced welfare losses.

Keywords: Trade Policy, Tax Policy, Economic Integration, Firm Delocation

JEL Classification: D78, D86, F13, F15, H25, R13
1 Introduction

After decades of international integration, recent unilateral movements toward economic disintegration have emerged. The United Kingdom’s decision to leave the European Union is a prominent example of such protective policy measures.\footnote{See Sampson (2017) for an early overview of the causes and consequences of Brexit.} Similarly, in 2018 the United States initiated a trade war with major trade partners.\footnote{This recent spread of protectionism has launched a considerable line of structural and empirical research (see, for instance, Amiti, Redding, and Weinstein (2019), Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020), Barattieri, Cacciatore, and Ghironi (2021), and Li and Whalley (2021)).} The emergence of protectionism and deglobalization alters nations’ economic structure along various dimensions, such as trade costs (broadly defined), production standards, business regulations, and investment opportunities. Thereby, economic disintegration significantly affects consumers’ and firms’ choices, as well as national tax and international trade policies. In this paper, we investigate the policy implications of deglobalization, particularly the unilateral kind, in which one country disintegrates from a set of other countries, as in the Brexit case. While we frequently speak about disintegration, our model speaks to both unilateral integration and disintegration. We do so in a framework with an arbitrary number of countries, implying that unilateral disintegration affects only a subset of countries directly but induces policy adjustments in all countries.

Tax Policies. We study the impact of unilateral economic disintegration on domestic policies worldwide. We focus on national tax policies in the presence of firm relocation, apparently a most relevant margin of adjustment available to governments for responding to economic disintegration.\footnote{A significant body of theoretical and empirical research suggests that countries use their taxes to attract internationally mobile capital, labor, and foreign direct investment. The ongoing globalization of the world economy is known to increase the mobility of production factors and firms across space. As a result, it has led to less progressive income tax schedules (Egger, Nigai, and Strecker (2019)) and lower taxes on corporations (Dyreng, Hanlon, Maydew, and Thornock (2017)), which fuels fears of a “race to the bottom” of taxes.} However, our main insights extend to the context of other domestic policy instruments influencing the spatial distribution of economic activity.

We introduce international firm relocation into the multi-sector, general-equilibrium trade model of Melitz and Ottaviano (2008) in a highly tractable way. We overcome critical challenges in the economic geography literature by reducing the dimensionality of individual relocation decisions without losing generality at an aggregate level. We allow for firm heterogeneity in relocation costs but assume that industries differ in the subset of countries in which the mobile firms can produce. Each country’s Nash equilibrium business-tax policy follows a familiar suffi-
cient statistic—the inverse firm relocation semi-elasticity—which is proportional to the country’s equilibrium firm number. Our parsimonious modeling of mobility allows us to derive this sufficient statistic and, hence, Nash equilibrium business-tax policies explicitly as a function of the set of country-pair-specific trade costs, firm-location fixed-cost distributions, country sizes, and consumer preferences. We demonstrate the effects of economic disintegration on domestic tax policies and analyze the underlying economic channels. Moreover, we highlight significant differences between unilateral economic disintegration and reverse multilateral integration. Thus, existing models of multilateral (dis)integration lack critical insights when applied to the effects of unilateral economic disintegration on national policies. Our workhorse example for disintegration is a country’s departure from an economic union, as in the Brexit case. However, the effects on national policies extend more broadly to any economic disintegration, such as a trade war, the exit from a free-trade area, a trade agreement, or another international treaty.

**Specific Results (1).** When a country’s departure (e.g., from an economic union) raises bilateral trade costs (*trade-cost effect*), the leaving country’s tax will decline because higher trade costs reduce the leaving country’s number of firms and increase the firm relocation semi-elasticity. The trade-cost effect on the business taxes in the remaining union-member countries depends on the union size. Considerable asymmetries among member countries’ size cause tax-policy reactions within the union to point in opposite directions and lead to a convergence of taxes inside the union. Since third countries outside the union become more attractive as business locations relative to other countries (higher number of firms), their ability to tax improves (lower relocation semi-elasticity). Underlying these tax adjustments, we identify three channels capturing governments’ incentives to attract firms, namely, to i) achieve lower domestic prices (price channel), ii) generate more tax revenues (tax-base channel), and iii) optimally respond to other countries’ tax policies (best vs. equilibrium response). We extend our results to various other dimensions of disintegration, including a mechanical reduction in the number of union-member countries (*union-size effect*), a divergence of production standards and business regulations (*de-harmonization effect*), and a unilateral deterioration of investment opportunities (*business-friction effect*).

**Trade Policies.** In addition to studying domestic policies, we employ a first-order approximation
approach to deal with the impact of unilateral disintegration on international policies, i.e., the readjustment of cooperative and noncooperative trade policies worldwide. Our analysis of trade policies builds on the idea that after the disintegration, the remaining union and the leaving country no longer jointly negotiate their trade policies. We show that the departure of one country from a union has repercussions for that country’s and the union’s trade policies. Going beyond the positive question of how disintegration affects trade policies, we study the quantitative readjustments of trade policies necessary to ultimately improve welfare, making economic disintegration normatively desirable from the leaving country’s perspective.

Specific Results (2). We demonstrate that both the leaving country and the remaining members intensify existing trade agreements with third countries and reduce protectionism, rejecting the hypothesis that a country’s disintegration triggers a domino effect of further disintegration. We focus on two important cases: the exit of a country from an integrated area or economic union (case 1), in which countries coordinate their internal non-tariff trade policies, and the exit from a customs union (case 2), where only the external trade policies are jointly set. In the first case, we predict that the countries inside the union further integrate with each other. They lower their internal non-tariff barriers to trade. In the second case, the remaining customs union negotiates lower tariffs with third countries in trade agreements. The leaving country also intensifies trade agreements with third countries. Similarly, noncooperative trade policies of the union members, as well as of the leaving country, become less protective. Overall, our results suggest a counterforce to deglobalization. The normative implications of disintegration are, therefore, subtle. We argue that similar to the rise in trade costs directly associated with the disintegration, the union members’ integration steps with each other and third countries generate sizable welfare losses in the leaving country. However, the country may fully compensate for these adverse effects by substantially reducing trade costs with third countries.

Brexit. Our model allows us to speak to the likely national and international policy consequences of the UK leaving the EU. Our results suggest that the UK will lower business taxes after Brexit, and business taxes in the remainder of the EU will converge. Third countries, such as the US, can tax more after Brexit. Moreover, we predict that the remaining EU members will further integrate with each other and reconsider protectionist policies toward third countries. The UK compensates for the rise in trade frictions with the EU by deepening trade relations with third countries.
Related Literature. Our paper relates to two strands of literature. First, we add to the debate on domestic policy in the presence of factor mobility. Usually, this literature addresses locally separated regions whose economic outcomes are linked to each other through the mobility of capital (Zodrow and Mieszkowski (1986) and Wilson (1986)), labor (Lehmann, Simula, and Trannoy (2014)), or foreign direct investment (Haufler and Wooton (1999) and Haufler and Wooton (2006)). Location rents incentivize governments to modify their domestic policy instruments, such as taxes, to attract these factors. As in our model, some authors—for instance, Bucovetsky (1991) and Haufler and Wooton (1999)—consider cross-country asymmetries. We show that, besides the relative size of a given market, as previous work has highlighted, the entire world’s economic structure, i.e., trade costs and market sizes worldwide, profoundly affects domestic policy differentials.

We investigate the relationship between regional taxes and trade costs, as Ottaviano and Van Ypersele (2005) and Haufler and Wooton (2010). In their two-country settings, a decline in trade barriers makes setting up an FDI platform in the larger market less critical to firms. Then, export costs to this market are low, and the firm can easily access both markets irrespective of its location. Conversely, if trade costs are high, firms would like to locate in the large market, regardless of the business-tax differential until the increased degree of regional competition absorbs the location rents in the large market. Although some of the literature has addressed this link, no work endogenizes national and international policies in a model with more than two geographically linked regions.5 Whereas the two-country and the partial three-country settings may conceptually address the impact of an integration that countries accomplish multilaterally, these models cannot examine a country’s unilateral decision to integrate or disintegrate from a set of other countries. As we show in our model, reversing the sign of existing conclusions about multilateral economic (dis)integration to speak to the effects of unilateral (dis)integration is misleading. Similarly, considering only a subset of disintegration dimensions may also be misleading.

So far, two key challenges have prevented progress toward more realistic multi-country models.

5For example, in the three-country models of Raff (2004) and Cook and Wilson (2013), one country’s government is presumed to be completely inactive. Darby, Ferrett, and Wooton (2014) consider a three-country model of tax policy and trade, but two of the three markets are connected only through a hub region. Most recently, Fuest and Sultan (2019) assume partial mobility of capital and examine tax policies in a three-country model but ignore trade costs. Complementary to this are more recent papers in which contributors estimate the effects of tax or subsidy competition in quantitative economic geography models, such as Ossa (2015). So far, this quantitative literature has not addressed the link to economic integration in further detail.
The first is that in a multi-country setting, firm relocation is a multinomial-choice problem. The equilibrium distribution of firms across regions is a function of relative location rents, which, in turn, are endogenous to the distribution of firms. As a result, deriving the objective function of the government in each country is difficult. Second, each country’s tax is the best response to all the other countries’ taxes. Therefore, the optimal tax in a country is a general-equilibrium object. We overcome both of these issues by reducing the dimensionality of the firm-level relocation problem. Nonetheless, on an aggregate level, the distribution of firms is a high-dimensional object that is still tractable enough to solve for general-equilibrium tax policies. While our setup of firm mobility is in itself theoretically interesting, we expect it to be helpful in quantitative models that otherwise would be computationally too intense—for instance, when they involve many layers of optimization.

The second strand is the literature on trade policy. As in Ossa (2011) and Bagwell and Staiger (2012), we deal with the effects of trade policies in the context of firm relocation. However, these authors do not consider domestic policies, which is a focus of our paper. Furthermore, we augment the classical debate on optimal tariffs, started by Bagwell and Staiger (1999), with two dimensions. First, instead of explicitly deriving globally optimal trade policies, we study the impact of economic disintegration on trade policies worldwide, taking existing imperfections of trade agreements as the premise. One can apply this approach to other contracting situations beyond trade policies, where agents renegotiate preexisting arrangements after one party leaves an agreement. Second, we examine other components of trade policy, i.e., non-tariff trade barriers. Contrary to tariffs, these non-tariff policy dimensions embrace no government revenue-collection motive while still affecting the terms of trade and the spatial distribution of economic activity. Thus, our paper adds to the growing literature on the economics of deep integration, moving beyond the notion of tariff-oriented trade agreements (for example, Grossman, McCalman, and Staiger (2021) and Staiger and Sykes (2021)).

Instead of interpreting our results in the context of unilateral economic disintegration, one can also relate them to the large literature on the gains from trade (see Costinot and Rodríguez-Clare (2014) and Ossa (2016) for two notable reviews). In this literature, contributors quantitatively investigate the effects of trade openness in multi-country, multi-sector, general-equilibrium trade models. A primary focus is on the quantitative effects of trade openness on welfare and optimal tariffs. In this paper, we depart from this focus by highlighting other policy margins—for example, business taxation and non-tariff trade barriers.
Outline of the Paper. The paper is structured as follows. In Section 2, we develop a multi-country, multi-sector, general-equilibrium trade model with firm mobility and noncooperative business taxation. Then, we derive the effects of economic disintegration via changes in trade costs (Section 3) and analyze the central economic channels. In Section 4, we endogenize trade policies to study the readjustment of tariff and non-tariff trade policies worldwide in reaction to economic disintegration. We also analyze when economic disintegration is welfare-improving. Section 5 applies the model to the Brexit case. In Section 6, we summarize various extensions to our baseline economy. Section 7 concludes the paper. We relegate all relevant proofs to the Appendix and provide an Online Appendix for model extensions.

2 The Model

2.1 Setup

Timing and Equilibrium Definition. We build a five-stage economy of trade and tax policies, for which we solve by backward induction. In the initial stage (Stage 0), $K$ countries choose their cooperative and noncooperative trade policies. For the moment, if not stated otherwise, we hold all trade policies fixed. Stages 1–4 feature a game of fiscal competition for a given set of trade policies. Let $\mathcal{K}$ denote the nonempty set of countries and $K := |\mathcal{K}| \in \mathbb{Z}^+$ its cardinality. Moreover, we define $\mathcal{K}_U \subseteq \mathcal{K}$ as the nonempty set of countries (“the union” $U$), from which the leaving country disintegrates, and $K_U := |\mathcal{K}_U| \in \mathbb{Z}^+$ as its cardinality. For example, the union can be a customs union, a free-trade area, or a set of countries in a trade agreement. Therefore, in the following, we refer to a country $m \in \mathcal{K}_U$ as a “member country.” Note that $1 \leq K_U \leq K$.

In the first stage, each government noncooperatively chooses a business tax, $t_i$, to maximize national welfare consisting of consumer surplus and tax revenues, taking trade policies as given. For given tax and trade policies, a continuum of mobile firms selects into countries in the second stage. In the third stage, each mobile firm from the continuum competes in an oligopolistic industry with two other immobile firms in general equilibrium. All firms are single-variety businesses and trade their products worldwide. To achieve tractability in the mobility decisions, we assume that in each industry, firms can produce in only two of several countries. Industries differ in the pair of countries in which firms produce and the country-specific fixed costs of setting up a firm. This describes the key modeling innovation of the paper. In the last stage, households
optimally choose their consumption of varieties. To fix ideas, we define the subgame-perfect Nash equilibrium of this game (Stages 1–4).

**Definition 1.** For given trade policies, the set of tax policies, \( \{ t_i \}_{i \in \mathcal{K}} \), location, and output choices form a subgame-perfect Nash equilibrium, if

1. consumers choose their consumption bundle to maximize utility, taking prices as given,
2. oligopolistic firms maximize their profits over quantities, taking location decisions of all firms and taxes of all countries as given,
3. mobile firms choose their location optimally, taking taxes as given and anticipating how firms and consumers react optimally in their output and consumption decisions, and
4. governments maximize national welfare over taxes, taking other countries’ taxes as given and anticipating the behavior of firms and consumers.

Our model environment shares some similarities and differences with standard international trade models. Like Melitz and Ottaviano (2008), we consider a multi-sector, general-equilibrium trade model, but we add firm mobility and business-tax policy. Moreover, firms are oligopolistic and face constant returns to scale instead of producing under monopolistic competition and increasing returns, as in Krugman (1980) and Melitz (2003). Firm heterogeneity plays a central role in Melitz (2003) and Melitz and Ottaviano (2008), who assume differences in labor requirements across firms, while in our setup, firms differ in relocation fixed costs. Thus, our model implies that firms producing in the same country export the same amount, which is not the case in the other papers.

These differences translate into the effects of trade liberalization via trade-cost changes. Since firms choose their production location according to international after-tax profit differentials, firm mobility amplifies the impact of rising bilateral trade costs. However, the governments may mitigate firm relocation by reducing business taxation. In contrast, in standard trade models, firms’ profit levels determine endogenous firm exit and entry. Altogether, in our model, bilateral trade costs determine each country’s price level, import volume, and local demand, similar to the standard trade model. Therefore, the subgame-perfect Nash equilibrium delivers allocations qualitatively similar to the model by Melitz and Ottaviano (2008).

**Unilateral Economic Disintegration.** We analyze unilateral economic disintegration by carrying out comparative statics of the subgame-perfect Nash equilibrium. Specifically, the trade costs between any pair of countries depend on the level of economic integration between them and
may differ across country pairs. We interpret trade costs in a broad sense as the degree of
economic integration. Trade costs refer to tariffs and non-tariff trade costs; the latter depend on
policies, such as consumer protection, quality requirements, health standards, and environmental
protection, and non-policy components, e.g., transport-cost differentials arising from geographical
characteristics. An increase in the trade costs of respective country pairs represents one way of
capturing economic disintegration. We label the resulting impact on tax policies as a trade-cost
effect. Our main result, Proposition 2, speaks to this trade-cost-induced change in business taxes.
Later, we will consider alternative dimensions of economic disintegration, such as relocation-
cost differentials, that affect equilibrium business taxes. Thus, this section speaks to the positive
effects of a country’s economic disintegration on countries’ business taxes. In Section 4, we turn
to the normative question of when it is welfare-improving for a country to disintegrate from a set
of other countries.

2.2 Households

Preferences. In each country $i \in \mathcal{K}$, a number $n_i$ of identical households consumes a continuum
of differentiated varieties and a numéraire commodity, $z_i$, produced under perfect competition.
Differentiated varieties, $x_i(\mu)$, are indexed by $\mu \in \Omega := [0, 1]$. Each variety is produced in an
oligopolistic industry with mobile and immobile firms. Households derive the following utility

$$u_i := z_i + \alpha \int_{\mu \in \Omega} x_i(\mu) \, d\mu - \beta \int_{\mu \in \Omega} x_i(\mu)^2 \, d\mu - \eta \left( \int_{\mu \in \Omega} x_i(\mu) \, d\mu \right)^2$$

from the consumption of products manufactured by the numéraire and the oligopolistic industries
with $\alpha, \beta > 0$ and, in the base version of our model, $\eta = 0$. These preferences are a particular case
of those in Melitz and Ottaviano (2008). In Section 6.4, we deal with cross-price effects ($\eta > 0$).
Household income comes from the business taxes the government rebates in lump-sum fashion
and inelastically supplying labor at a wage rate $w$.

Utility Maximization (Stage 4). Assuming that all consumers are price takers, the quadratic

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6 All the results carry over when one leaves out the immobile firms and considers only a single mobile firm that
produces a given variety, which mimics the firm structure in Melitz and Ottaviano (2008) (but now with endogenous
location choice). To endogenize the degree of local competition to firm relocation, we decided to conduct our
baseline analysis under an oligopolistic market structure (see Section 6.5 for an extension to an arbitrary number of
immobile firms).
utility function generates a system of linear aggregate demand functions

\[ X_i(\mu) = \frac{n_i(\alpha - p_i(\mu))}{\beta} \]

for each country and industry, where \( p_i(\mu) \) denotes the industry-specific local consumer price. Below, we state conditions under which solutions are interior.

### 2.3 Firms

**Production and Trade.** Each firm in the oligopolistic industries faces a linear production function with labor as the only input. Exporting one unit of the consumption good from country \( j \) to \( i \) costs \( \tau_{ij} \), where \( \tau_{ij} = \tau_{ji} \in \mathbb{R}^+ \) and \( \tau_{ii} = 0 \), such that the marginal costs of production read as \( w + \tau_{ij} \). For the time being, we assume trade costs to be exogenous, though subject to change with disintegration, and endogenize trade policies in Section 4. Moreover, we abstract from revenue effects of trade taxes/subsidies (in Section 6.2, we deal with revenue effects).

To avoid corner solutions in the production of differentiated varieties, we assume that \( \tau_{ij} \leq \frac{\alpha - w}{2} \), for all \( i, j \), so trade flows are weakly positive in equilibrium. Assuming that the production of the numéraire good takes place in every country, the numéraire industry pins down a wage rate \( w \) that equalizes across countries. Thereby, an interior solution for trade flows becomes meaningful. Our assumption on the production structure of the numéraire good appears restrictive, particularly in light of research that has shown the quantitative importance of trade shocks on labor-market outcomes (e.g., Artuç, Chaudhuri, and McLaren (2010) and Dix-Carneiro (2014)). However, assuming instead that trade in the numéraire commodity is not possible, and each country’s wage rate forms on the labor market, is not likely to overturn our results.\(^7\) Moreover, as Haufler and Wooton (2010), we assume that firm profits do not accrue to residents in \( \mathcal{K} \). As we describe in Section 6.4, our results are robust to the accrual of profits in residents’ incomes.

We assume three firms in each industry.\(^8\) One immobile firm produces in each of the two countries, say countries \( i \) and \( j \). A third, mobile firm can decide in which of these two countries it locates. In line with the Ricardian idea of international specialization, the production of that specific good does not take place in third countries, for instance, due to technological, regulatory, or geographical frictions (and consumption takes place through imports). Industries differ in

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\(^{7}\)For a more formal exposition, we refer to Section 6.3.

\(^{8}\)In Section 6.5, we relax this assumption.
which two countries firms produce and, inspired by Melitz (2003), there are multiple types of industries. For instance, in an $ij$-industry, firms produce in either country $i$ or $j$.\footnote{Throughout the analysis, superscripts will indicate the particular industry type. To rule out asymmetries in initial conditions, we let the mass of potential firms be ex ante equal across countries by partitioning the set of industries $\Omega$ into $K$ equal-size intervals.}

Altogether, an industry is a collection of firms producing a specific variety. There are two interpretations of this firm structure. On the one hand, one may think of a set of industries with three firms in each industry (e.g., the clothing sector and the car sector). Each industry differs in the countries that serve as a (potential) production location. On the other hand, the setting could refer to a continuum of varieties (e.g., in the food sector). Three firms produce a specific variety (e.g., apples and bananas). Varieties differ in the countries where firms can produce them.

**Profit Maximization (Stage 3).** A firm producing in country $i$ and belonging to industry $ij$ maximizes profits by choosing the sales in the home market, $x_{ii}$, and exports to $j$ and all other countries $k$, $x_{ji}$ and $x_{ki}$. Therefore, the maximization problem in the third stage is defined as

$$
\pi_{ij}^i(\mu) := \max_{(x_{ki}(\mu))_{k \in \mathcal{K}}} \sum_{k \in \mathcal{X}} \left[ p_k(\mu) - w - \tau_{ik} \right] x_{ki}(\mu)
$$

subject to the oligopolistic market structure. The solution to this translates into market prices that are linear in trade costs (see Appendix A.1). The industry structure implies a home market bias. In general, because trade costs are saved, prices are lower, and demand is higher in a country where a mobile firm locates, compared to the country where the firm could produce (but does not) and third countries. Prices are highest in countries without any production. This price pattern reflects the consequences of competition in markets segregated by trade costs. Pre-tax-variable profits of a firm located in country $i$ read as

$$
\pi_{ij}^i(\mu) = \begin{cases} 
\sum_{k \in \mathcal{K}} \frac{m_k(a-w-2\tau_{ik}+\tau_{jk})^2}{16\beta} & \text{if mobile firm locates in } i \\
\sum_{k \in \mathcal{K}} \frac{m_k(a-w-3\tau_{ik}+2\tau_{jk})^2}{16\beta} & \text{if mobile firm locates in } j.
\end{cases}
$$

Thus, mark-ups are endogenous to firms’ location decisions. The asymmetry in profits from markets $j$ and any other market $k \neq i, j$ is the consequence of our assumption that in an $ij$-industry, there is an immobile firm present in country $j$ that faces no trade cost in serving its home market, whereas in other countries $k \neq i, j$, there is no domestic firm active by assumption.\footnote{One may easily relax this assumption as long as the additional firms in the other countries are immobile. For instance, when there exists an (immobile) production firm in each country (irrespective of the industry type), profits...}

In each country $i$, firms are lump-sum taxed with $t_i$. Note that trade costs are partly but not fully...
passed on to consumers, thus partially borne by firm owners. Moreover, when the mobile firm locates in $i$, the impact of a trade-cost change between two countries $i$ and $j$ on the prices in $i$ is half as large as when the firm locates in $j$.

**Firm Heterogeneity and Location (Stage 2).** We now turn to the second stage: the location decision of mobile firms. Besides the geographical heterogeneity in industry locations, industries vary in a relative fixed cost $F_{ij}$ of the mobile firms—i.e., a firm pays $F_{ij}$ more in country $j$ than in $i$. Therefore, one can interpret this fixed cost as the cost of relocating from country $i$ to $j$, which includes policy and non-policy components. Formally, $F_{ij}$ is uniformly distributed with a CDF $G_{ij}(F_{ij}) = \frac{F_{ij} - F_{ij}^{-}}{F_{ij} - F_{ij}^{+}}$. In this section, for simplicity, we impose symmetry in relocation-cost distributions across country pairs (and relax this assumption in Section 6.1). That is, we assume $G_{ij}(F_{ij}) = G(F_{ij}) = \frac{F_{ij} - F}{F - F}$ and $F = F$. Altogether, mobile firms pay different fixed costs of production, giving rise to an extensive margin of firm relocation that affects local prices and production quantities.

A mobile firm in industry $ij$ produces in country $i$ as long as after-tax profits are larger in $i$ than in $j$:

$$\pi_{ij}^{i}(\mu) - t_i \geq \pi_{ij}^{j}(\mu) - t_j - F^{ij}. \quad (5)$$

In other words, a firm prefers country $i$ if the advantage in gross profits exceeds the tax differential corrected by the relative fixed cost.

We have introduced the main ingredients of the production and trade structure of our model. Figure 1 illustrates the supply side for the case of three countries. We now turn to solving the locational equilibrium. Since a continuum of industries differs in fixed costs, we can characterize the mass of industries and firms in a country. For this, we define the threshold industry in which the mobile firm is indifferent between the two countries $\gamma_{ij} := \pi_{ij}^{i}(\mu) - t_j - \left[\pi_{ij}^{j}(\mu) - t_i\right]$.

\[ \pi_{ij}^{i}(\mu) = \sum_{k=1}^{n_k} \left( \alpha - w + \sum_{l \neq i, j} \tau_{lk} - (k + 1 - k_i) \tau_{ik} + k_i^{ij} \tau_{jk} \right) \left( k + 1 \right)^{2} \beta, \]

where $k = K + 1$ is the total number of firms and $k_i^{ij} = k_j^{ij} + 1 = 2$ ($k_i^{ij} = k_j^{ij} - 1 = 1$), if the mobile firm locates in country $i$ (country $j$).

\[ \text{This is the main difference from Melitz and Ottaviano (2008). In their setting, firms vary by their marginal cost draw, giving rise to endogenous firm exit and entry. Here, firm heterogeneity comes from relocation cost draws, which leads to endogenous firm relocation.} \]

\[ \text{While pre-tax variable profits (4) are nonnegative, we cannot guarantee directly that net profits (after tax and fixed cost) are as well. In simulations, we could verify for various parameter-value combinations (including our baseline parametrization) that profits of all firms were nonnegative. The requirement seems to hold more easily when the range of fixed costs is not too broad. In the following, we assume throughout that net profits are nonnegative.} \]
Substituting from (4), we express the threshold in terms of variables exogenous from a firm’s viewpoint

\[
\gamma^{ij} = (n_j - n_i) \frac{6 (\alpha - w) - 3 \tau_{ij}}{16 \beta} + \sum_{l \in \mathcal{K} \setminus \{i, j\}} n_l (\tau_{il} - \tau_{jl}) \frac{6 (\alpha - w) - 3 (\tau_{il} + \tau_{jl})}{16 \beta} + t_i - t_j. \tag{6}
\]

Therefore, our concept of mobility allows us to write the threshold industry level in closed form as a function of the model parameters. A convenient property of the lump-sum taxation and the uniform cost distribution is that the equilibrium firm distribution is linear in the tax differential. Partial-equilibrium comparative statics are given by

\[
\frac{\partial \gamma^{ij}}{\partial t_i} = -\frac{\partial \gamma^{ij}}{\partial t_j} = 1, \quad \frac{\partial \gamma^{ij}}{\partial \tau_{ij}} = \frac{3 (n_j - n_i) (\alpha - w - \tau_{ij})}{8 \beta}, \quad \frac{\partial \gamma^{ij}}{\partial \tau_{il}} = \frac{3 n_l (\alpha - w - \tau_{il})}{8 \beta}, \quad \text{and} \quad \frac{\partial \gamma^{ij}}{\partial \tau_{jl}} = -\frac{3 n_l (\alpha - w - \tau_{jl})}{8 \beta}
\]

for \( j \neq l \). Observing that the sign of \( \frac{\partial \gamma^{ij}}{\partial \tau_{ij}} \) depends on the country’s relative size, one may recognize a partial-equilibrium feature of economic disintegration, discovered in earlier work: As in Ottaviano and Van Ypersele (2005) and Haufler and Wooton (2010), a rise in trade costs
pushes firms to move to larger countries. In this case, market-access considerations become more important than business-tax differentials for mobile firms. Moreover, if trade becomes more costly for firms located abroad, firms move to country \( i \) \( \left( \frac{\partial \gamma^{ij}}{\partial \tau^{il}} > 0 \right. \) and \( \frac{\partial \gamma^{ij}}{\partial \tau^{jl}} < 0 \). 

Since \( \gamma^{ij} = -\gamma^{ji} \) and \( G() \) is symmetric with \( \overline{F} = -F \), Lemma 1 directly follows. It will prove convenient when deriving the objective function of the government.

**Lemma 1.** Suppose that \( \overline{F} = -F \). Then, \( G(\gamma^{ij}) = 1 - G(\gamma^{ij}) \). Moreover, the number of firms in country \( i \) is given by \( k_i := (K - 1) + \frac{1}{2\overline{F}} \sum_{j \in \mathcal{K}\{i\}} \left( \overline{F} - \gamma^{ij} \right) \).

Lemma 1 shows that the number of firms in a country is linear in the weighted tax differential of country pairs via the fixed-cost threshold levels shown in (6). This property is also present in Haufler and Wooton (2010), albeit in a model with only two countries and many mobile firms. However, a difference exists in our model, namely, the tax differential is not weighted by trade costs, as it is in Haufler and Wooton (2010).

### 2.4 Governments

Here, we describe the first stage of our economy. For a given level of trade costs, we derive Nash equilibrium business taxes set by benevolent social planners in each country, who take account of the effect of taxes on households’ consumption choices and location and output decisions of all firms and industries. As mentioned, the trade costs partly result from trade negotiations, whose endogenous formation is studied in detail in Section 4.

The benevolent social planner in country \( i \) maximizes the sum of consumer surplus \( S_i \) and tax revenues \( T_i \) (recall that profits go to absentee owners) and, therefore, solves the following optimization problem

\[
W_i := \max_{t_i} S_i + T_i + n_i w, \tag{7}
\]

taking \( \{t_j\}_{j \in \mathcal{K}\{i\}} \) as given. Similarly, welfare is maximized in countries \( j \in \mathcal{K}\{i\} \) over \( t_j \). As usual, the wage income enters welfare linearly due to the quasi-linear utility function. The term is constant, given that wages are pinned down by the numéraire sector. In Appendix A.1, we show that consumer surplus is given by

\[
S_i := \sum_{j \in \mathcal{K}\{i\}} \left[ \delta^{ij}_i + \frac{\gamma^{ij}_i - F}{2\overline{F}} \Delta^{ij}_i \right] + \frac{1}{2} \sum_{j \in \mathcal{K}\{i\}} \sum_{l \in \mathcal{K}\{i, j\}} \left[ \delta^{jl}_i + \frac{\gamma^{jl}_i - F}{2\overline{F}} \Delta^{jl}_i \right], \tag{8}
\]
where $\Delta_{ij}^k$, $\Delta_{ij}^{jl}$, $\delta_{ij}^l$ and $\delta_{ij}^{jl}$ are defined as functions of the model’s primitives

$$
\Theta := (\alpha, \beta, w, (n_i)_{i \in \mathcal{K}}, (\tau_{ij})_{i, j \in \mathcal{K}, F}, \bar{F}).
$$

Each country’s total consumer surplus is the sum of consumer surplus of all markets relating to the various industry configurations—i.e., i) the market in which a mobile firm produces, ii) the market in which a mobile firm could produce but does not, and iii) the market in which the mobile firm could not produce from the start. The delta parameters capture consumer-surplus differentials that firm relocation induces. They involve quadratic terms of the relevant bilateral trade costs. The quadratic nature comes from the fact that utility is quadratic in the quantity of the differentiated goods, whose demand is linear in prices that, in turn, are linear in trade costs. Interestingly, business taxes enter consumer surplus in a linear fashion, as the threshold fixed-cost levels enter linearly in (8) and are themselves simple linear functions of tax differentials (see (6)). We conclude that an increase in country $i$’s business tax reduces consumer surplus only in those industries in which a mobile firm could locate in $i$. This is intuitive, as a rise in the tax makes production in that country less attractive and, thereby, makes consumers worse off because local prices rise when goods are imported rather than produced at home.

Using Lemma 1, tax revenues read as $T_i := t_i k_j$. Because the number of firms $k_i$ is linear in tax-rate differentials, tax revenues are quadratic in tax rates. Taken together, social welfare (7) is a relatively simple function of trade costs and business taxes.

**Noncooperative Tax Policies (Stage 1).** The first-order condition of the social planner problem yields a reaction function $t_i \left( \{ t_j \}_{j \in \mathcal{K} \setminus \{ i \}}, \Theta \right)$ for each country $i$. As we prove in Appendix A.2, the reaction functions are linear in taxes, and there is a unique intersection of the reaction functions, $t_i (\Theta)$ for $i \in \mathcal{K}$, forming the solution to the tax-competition game.

**Proposition 1.** Suppose that $\bar{F} = -F$. Then, the subgame-perfect Nash equilibrium of the tax-competition game is given by

$$
t_i = 3\bar{F} + \frac{1}{2K - 1} \sum_{j \in \mathcal{K} \setminus \{ i \}} \Delta_{ij} + \frac{1}{2K - 1} \sum_{j \in \mathcal{K} \setminus \{ i \}} \left( \pi_{ij} - \pi_{jj} \right) + \frac{1}{(K - 1)(2K - 1)} \sum_{j \in \mathcal{K}} \sum_{l \in \mathcal{K} \setminus \{ j \}} \Delta_{jl}^l
$$

for any $i \in \mathcal{K}$.

In the remainder of this section, we analyze how changes in one country pair’s trade cost
affect tax policies. Thereby, we draw on a key object, i.e., the firm relocation semi-elasticity,
\[
\frac{-\partial \ln (k_i)}{\partial t_i} = -\frac{1}{k_i} \frac{\partial k_i}{\partial t_i},
\]
that will inform about the effects of economic disintegration described in Section 3. The left panel of Figure 2 depicts the effect of two countries’ bilateral trade costs on Nash equilibrium business taxes. As one can observe from Proposition 1, the equilibrium tax depends on international profit and consumer-surplus differentials. Bilateral trade costs profoundly shape these differentials, as we discuss in Section 3 in more detail. Intuitively, a rise in trade costs, e.g., \(\tau_{12}\) and \(\tau_{21}\), makes the respective countries less attractive and raises the firm relocation semi-elasticity. As a result, countries 1 and 2 compensate by taxing businesses less (black and red lines). Interestingly, the larger country 2 experiences a less-pronounced decline due to its population size. This is the described partial-equilibrium effect where a rise in trade costs pushes firms to move to larger countries (Ottaviano and Van Ypersele (2005) and Haufler and Wooton (2010)). Third countries become more attractive as a business location, allowing them to tax more (orange line). Moreover, the relatively simple, closed-form structure of the equilibrium tax reveals that \(\frac{dt_i}{dF} > 0\). A rise in \(F\) widens the range of relative fixed costs. Some industries will stay in country \(i\) regardless of the tax differential, resulting in a lower firm relocation semi-elasticity and increasing business taxes.

The right panel of the figure makes this reasoning transparent: Business taxes are inversely
related to the firm relocation semi-elasticity. Each government’s primary objective is to attract firms, to increase tax revenues (larger tax base) and consumer surplus (lower prices). For the lump-sum taxation considered here, the firm relocation semi-elasticity serves as a sufficient statistic, describing firms’ responsiveness to the level of business taxation.\(^\text{14}\) Observe that this semi-elasticity has a particular transparent form for the given uniform relocation-cost distribution. It is equal to the inverse of the equilibrium number of firms, \(-1/\partial \ln(k_i) / \partial t_i = k_i\). Thus, the semi-elasticity can be directly estimated from the data, e.g., using each country’s firm share.\(^\text{15}\)

However, note that the semi-elasticity is an equilibrium object and, therefore, structurally depends on the model’s primitives. For instance, bilateral trade costs change the equilibrium distribution of firms and, hence, the relocation semi-elasticity. Higher trade costs increase the smaller country’s and reduce the third countries’ semi-elasticity (black and orange lines). Their inverse values closely follow the shape of equilibrium business taxes (left figure). For the large country, the semi-elasticity is substantially lower initially and declines with bilateral trade costs (red line), contrasting with the slight decline in the equilibrium business tax.\(^\text{16}\)

We conclude that each country’s firm relocation semi-elasticity well characterizes the level of equilibrium business taxation, in line with earlier insights in the tax-competition literature about the similarity between revenue and welfare maximization (e.g., Janeba and Smart (2003)). However, asymmetries in country sizes may lead to qualitatively opposing results (see red lines in left and right figures).

3 The Impact of Economic Disintegration on Tax Policies

Analyzing the effect of one country pair’s bilateral trade costs on domestic policies, while interesting, delivers an incomplete picture of economic disintegration. Now, we study the effects of economic disintegration on tax policy via changes in the costs of bilateral trade between multiple countries. In Section 6.1, we augment the debate by other dimensions of disintegration,\(^\text{17}\)

\(^\text{14}\)Formally, if governments were purely revenue-maximizing, \(\max_t t_i k_i\), the equilibrium business tax would be precisely equal to the inverse of the equilibrium firm relocation semi-elasticity, \(t_i = -1/\partial \ln(k_i) / \partial t_i\).

\(^\text{15}\)For any alternative specification of the cost distribution, the semi-elasticity would still be proportional to the equilibrium firm number but scaled by its partial-equilibrium response to business taxation \(-1/\partial \ln(k_i) / \partial t_i = \partial k_i / \partial t_i k_i\). Also, note that the empirical literature usually estimates the semi-elasticity (e.g., of inward FDI) from proportional taxation instead of the lump-sum taxation considered here. Thus, in a model calibration that targets this semi-elasticity, one would have to premultiply with the average level of domestic profits. In our baseline parametrization, we arrive at a converted semi-elasticity of 0.3, which is at the lower bound of estimated values (see Feld and Heckemeyer (2011)).

\(^\text{16}\)This observation hints at the underlying channels, which we analyze in the next section.
including a change in the international mobility of firms via location fixed costs (de-harmonization and business-friction effects). In contrast to Melitz (2003) and Melitz and Ottaviano (2008), our focus here is not on intra-industry reallocation effects, as our firms are identical, conditional on location. Rather, it is on the extensive margin of firm location and the effects induced on and by tax policies.

For instance, suppose that countries \( m \in \mathcal{K}_U \) are in an economic union and have similar trade costs. What happens to taxes when trade between country \( l \) and the economic union becomes more costly? As Proposition 2 shows, the answer depends on the relative sizes of the markets.\(^{17}\)

It is useful to define the average population of the member countries as \( \bar{n}_U = \frac{1}{K_U} \sum_{m \in \mathcal{K}_U} n_m \). We relegate the proof and a more technical statement of the proposition to the Appendix B.2.

**Proposition 2 (trade-cost effect).** Let trade costs between the leaving and the remaining member countries be initially symmetric.\(^{18}\) Country \( l \in \mathcal{K} \setminus \mathcal{K}_U \) disintegrates from the member countries \( m \in \mathcal{K}_U \) via a rise in trade costs. In the subgame-perfect Nash equilibrium, this

(a) decreases the leaving country’s business tax if its population is small relative to the union’s average country size: \( n_l < 8 \bar{n}_U \),

(b) decreases (increases) a member country’s tax if it is sufficiently large (small), that is \( n_m > (<) \phi_1 \bar{n}_U - \phi_2 n_l \), where \( \phi_1 > 0 \) and \( \phi_2 > 0 \) are functions of the number of countries in the union and the world. Under symmetric population sizes, it decreases taxes in the remaining member countries if the number of countries in the union is small: \( K \geq 2K_U \), and

(c) raises taxes in third countries \( k \in \mathcal{K} \setminus (\mathcal{K}_U \cup l) \).

Trade disintegration between \( l \) and \( \mathcal{K}_U \) makes third countries relatively more attractive and lowers their relocation semi-elasticity, allowing them to tax more (part (c)). The tax of the leaving country \( l \) will decrease in the aftermath of its disintegration (e.g., from the economic union) provided that it is not too large relative to the average member country (part (a)). The reaction of taxes in member countries depends on the sizes of the leaving country, the respective member country, and the average member country. Under symmetric population sizes, the member countries’ taxes decline if \( K \geq 2K_U \). We depict this symmetric case in the first panel of Figure 3, showing the equilibrium taxation as a function of trade costs between the leaving country and (two) union-member countries (\( \tau_{lm} = \tau_{l_{m1}} = \tau_{l_{m2}} \)).

\(^{17}\)Observe that, for now, we only consider direct effects of economic disintegration, i.e., changes in the trade relations of the leaving country with \( \mathcal{K}_U \). In particular, we hold trade relations with third countries fixed.

\(^{18}\)In Appendix B.2, we deal with initially asymmetric trade costs.
\textbf{Figure 3:} Left Panel: Trade-Cost Effect under Symmetric Country Sizes; Middle Panel: Trade-Cost Effect in the Leaving Country under Asymmetric Country Sizes; Right Panel: Trade-Cost Effect in the Union under Asymmetric Country Sizes; Parameters: $\alpha = 7$, $\beta = 1$, $w = 1$, $F = -F = 0.5$, $K = 5$, $K_U = 2$, $\tau_{m_1 m_2} = \tau_{m_2 m_1} = 0.5$, $\tau_{ij} = \tau_{ji} = 1$, $\forall j \notin \mathcal{U}$, $\sum_{j \in \mathcal{U}} n_j = 1$; Full Symmetry: $n_i = \frac{K}{K-1}$, $\forall i$; Small Union: $n_{m_2} = \frac{n_i}{K-1}$, $\forall i \neq m_2$; Large Union: $n_{m_2} = (K-1) n_i$, $\forall i \neq m_2$.

The middle panel shows the effect of asymmetric populations, i.e., three different sizes of a member country $m_2$: $n_{m_2} \in \{ n_i, \frac{n_i}{K-1}, (K-1) n_i \}$. The larger the union is, the more the leaving country’s tax declines. The intuition is that with a large union, the leaving country suffers a more severe market-access loss, translating into a more-pronounced rise in the relocation semi-elasticity. Changing the size of a member country $m_2$ generates asymmetries within the union and affects the size of the union relative to the rest of the world. In a large union, a convergence of business taxes occurs, which we show in the third panel of Figure 3 (dotted lines). The larger country in the union has a lower relocation semi-elasticity and a higher tax initially but experiences a tax reduction as trade costs rise (blue dotted line). Conversely, the smaller union member’s taxation rises (red dotted line). However, holding fixed the relative country sizes inside the union, business taxes decline if the union is small (dashed lines). Altogether, the convergence of taxes inside the union depends on the union’s relative size.

To further illustrate this dependence, we impose cross-country symmetry in market sizes ($n_m = \bar{n}_U = n_1$). Then, the derivative in $(b)$ simplifies, and the sign depends only on the number of countries in the union and the world. The member countries’ taxes decrease if the number of countries in the world is large relative to the number of countries in the union. Thus, taxes inside the union rise when it has many member countries, again mirroring the market-access argument. This case corresponds to a particularly strong internal market that covers most of the demand.
for tradeable goods and services, resulting in a low relocation semi-elasticity. Furthermore, one can observe the effects of globalization, here interpreted as the number of countries in the world that are connected through trade and firm investment. The more competing countries the union faces, the more sensitive are the members’ tax bases (higher relocation semi-elasticity) and taxes to a member country’s disintegration. In a globalized world, the union is vulnerable to the fiscal consequences of economic disintegration.

**Unilateral Disintegration vs. Reverse Unilateral Integration vs. Multilateral Disintegration.**

In our static model, unilateral disintegration (moving from parameter vector $\Theta^A$ to $\Theta^B$) does not differ from reverse unilateral integration (moving from $\Theta^B$ to $\Theta^A$). However, the initial level of economic integration ($\Theta^A$ vs. $\Theta^A'$) can change the sign and size of tax responses. For instance, the sign of the member countries’ response hinges on the relative number of competing markets ($K$ vs. $K_U$).

Moreover, our multi-country setup speaks to several effects of disintegration that two-country models, such as the previous literature often studied, fail to capture. First, we can investigate the effects on third countries outside the initial union. Second, the model addresses asymmetric reactions among remaining member countries. Even absent asymmetries, e.g., in population sizes, considering a multi-country setup is relevant for taxation of the leaving country and a given member country. As a result, unilateral disintegration differs from multilateral disintegration.

There are several ways to highlight this difference. We reconsider the case where the leaving country departs from a large union, as in the right panel of Figure 3. As a first thought experiment, we remove third countries from our analysis (making it a model with $K = 3$ countries) and then restrict attention to a simple two-country setup ($K = 2$). This is a first step toward understanding the economic mechanisms behind Proposition 2 and connect to previous papers studying two- and three-country settings. Figure 4 depicts the leaving and the small member country’s equilibrium business taxes for each model specification, holding population sizes and other model primitives constant.

The figure demonstrates that the business taxes of the leaving and the member country are sensitive to the model misspecification (with solid lines depicting the correct model). The adjustment appears unsystematic across countries. For instance, after the disintegration ($\tau_{ml} = \tau_{lm} > 0.5$), the three-country model delivers the lowest business taxation for the leaving country (dashed black line). In contrast, the member’s business tax is lowest in the three-country model,
Figure 4: Business Taxation of Leaving Country (Left Panel) and Small Member Country (Right Panel) in Correct Model ($K = 5$) vs. Model w/o Third Countries ($K = 3$) vs. Two-Country Model ($K = 2$) vs. Multilateral Disintegration ($K = 5$); Parameters: $\alpha = 7$, $\beta = 1$, $w = 1$, $F = -F = 0.5$, $K^{\text{correct}} = 5$, $\tau_{m1m2} = \tau_{m2m1} = 0.5$, $\tau_{ij} = \tau_{ji} = 1$, $\forall j \notin \mathcal{K}_U$, $\sum_{j \in \mathcal{K}^{\text{correct}}} n_j = 1$, $n_{m2} = (K^{\text{correct}} - 1) n_i$, $\forall i \neq m2$.

only up to a certain level of trade costs (dashed red line). However, for both countries, the most significant misspecification error manifests under the two-country model (dotted lines). Whereas tax responses of the leaving country vary quantitatively in this parametrization, model misspecification leads to qualitatively opposing results for the member country. The three-country model would correctly predict the rise in the member’s taxation, albeit too pronounced, while there would be a reduction in the business tax according to the two-country model.

Second, we specify a multi-country setup ($K = 5$) but consider changes in trade costs across all countries instead of a subset of countries. We add the resulting tax-policy responses into the figures (dash-dotted lines). This provides a direct comparison between multilateral and unilateral disintegration. In this parameter specification, multilateral disintegration delivers an even larger misspecification error than the two-country setup. Altogether, unilateral disintegration differs from multilateral disintegration, and removing a subset of countries from the analysis of disintegration is not innocuous.

Comparing the two- and three-country models also hints at another important dimension—disintegration-induced trade creation and diversion. In the two-country model, changes in bilateral trade costs affect all countries and firms symmetrically, as firms do not differ in productivity (marginal production cost), and there is no comparative advantage within industries. However,
in our three-country setup, a change in trade costs between two union countries arising from disintegration makes trade with the third country relatively more attractive when holding firm location and tax policies constant. More production and exports are created for the third country at the expense of trade between the (former) union countries. Since we assume that firms face identical marginal costs, the efficiency implications of disintegration differ from those in standard models of trade creation and diversion. Nonetheless, there are efficiency effects because the relocating firms pay the relocation fixed costs and the international tax differential when the third country is a high-tax location. Future research may address the role of heterogeneous marginal costs and the implications for trade creation and diversion.

**Economic Channels.** Having evaluated the performance of alternative models, we now directly investigate the economic forces behind the trade-cost effect. Each country’s best-response function (Equation (14)) allows for a decomposition of the equilibrium tax response. First, changing trade costs between the leaving and the member countries alter the government’s incentive to attract firms to reduce local consumer prices (consumer-surplus differential measured by $\Delta_{ij}^i$, for $i, j \in \mathcal{K}$). We label this as a “price channel.” Moreover, the tax base, determined by the country-specific profit differentials, $\pi_{ij}^i - \pi_{ij}^j$, for $i, j \in \mathcal{K}$, responds to adjustments in trade costs (“tax-base channel”). The sum of price and tax-base channels forms each country’s “best response.” Finally, in the Nash equilibrium, countries adjust their tax rates in response to each other (“equilibrium response”). Corollary 1 analytically characterizes tax base and price channels in the symmetric case.

**Corollary 1.** Let trade costs between the leaving and remaining member countries be initially symmetric, impose cross-country symmetry in market sizes, and consider the trade-cost effect from Proposition 2. Then, in the leaving country, the tax-base channel is negative and in absolute value stronger than the negative price channel. The price channel in the union is also negative, but the tax-base channel is positive if and only if $2K_U > K$. In third countries, the tax-base channel is positive, and the price channel is zero.

In Figure 5, we depict the channels in our baseline parametrization ($2K_U < K$). For the leaving country (left panel), the tax-base channel (dash-dotted black line) primarily drives the best response (dashed black line). This does not mean that consumer surplus is not adversely affected, since the equilibrium tax is inversely related to the firm relocation semi-elasticity, a very similar exercise would apply to this sufficient statistic.
but consumer-surplus differentials respond (via price changes) in less-pronounced fashion to the disintegration than profit differentials. In the figure, the relative strength of tax base and price channels is in the figure more balanced for a member country (middle panel). Overall, the response is more substantial in the leaving country than in the member country because the leaving country loses firms to the remaining member countries and third countries. Under symmetric population sizes, firms in member countries relocate only to third countries, and an inflow from the leaving country partly offsets this outflow. Also, note that third countries’ consumer-surplus differentials are independent of the other countries’ bilateral trade costs. Therefore, in the third country, the price channel is zero, and the tax-base channel and best response coincide (right panel).

The adjustment from the best response to the equilibrium seems moderate in both the leaving and member countries because from each country’s perspective, tax cuts and tax hikes abroad balance each other. For example, the leaving country faces a tax hike in third countries and tax cuts in the member countries. For third countries, the equilibrium response in the figure is sizably lower than the best response due to the leaving and member countries’ tax cuts.

\[^{20}\text{The reason is that the cost of lost firms enters the consumer surplus linearly and the tax revenues convexly (see Section 2.4).}\]
4 The Impact of Economic Disintegration on Trade Policies

So far, we have studied the effects of a country’s disintegration on endogenous national business-tax policies, taking international trade policies as given. In this section, we extend our analysis and endogenize trade policies, with the aim of studying the effect of economic disintegration on tax and trade policies. While this could be a purely positive analysis, our interest also has a normative foundation relating to the welfare effects of economic disintegration.

In Table 1, we illustrate in our base model the aggregate effects of a large rise in trade costs on the leaving country, holding all other trade costs fixed. Even though in our model only one firm per industry is internationally mobile, and the leaving country reduces its business taxation (e.g., −11.6% after a doubling of trade costs), the leaving country loses a nonnegligible share of firms (in this case, −6.7%). As a result, tax revenues substantially decline (−17.5%). The even more-pronounced decline in consumer surplus (−22.1%) is due to the increasing prices of imports from remaining member countries and the firm losses forcing the leaving country to rely more heavily on (costly) imports.21 Altogether, the lower business-tax revenues and higher local consumer prices make the leaving country’s disintegration ceteris paribus welfare-detrimental (−19.6%).22

However, a prominent argument in favor of such disintegration as Brexit is that the leaving country may counteract the adverse consequences of disintegration by integrating more with third countries (see Section 5 for examples from the Brexit policy debate). Therefore, considering the endogenous adjustment of trade policies worldwide in response to economic disintegration is

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21This is the gains-from-trade argument, well-documented in the model by Melitz and Ottaviano (2008) and other standard trade models (e.g., Krugman (1980)).

22Observe that in our model, welfare declines approximately linearly with trade costs.
important. Referring to our model that Section 2 describes, the setting of cooperative and noncooperative trade policies can be modeled as the initial stage of our economy (Stage 0). Our noncooperative approach to tax policies and the partially cooperative approach to trade policies is in line with the observation that for the most part, business-tax policies have rarely been coordinated internationally.\textsuperscript{23} In contrast, several countries have coordinated trade policies in trade agreements and multilateral organizations, such as the WTO.\textsuperscript{24}

We start our trade-policy analysis with the positive question of how unilateral economic disintegration affects countries’ endogenous trade policies (Section 4.1). Then, we turn to the normative question of when endogenous trade-policy responses make a country’s disintegration welfare-improving—i.e., under what circumstances a country should disintegrate from a welfare perspective, taking all policy responses into account (Section 4.2).

### 4.1 Positive Analysis

In the following, we analyze the effects of disintegration on trade policies around the world: How do (non-tariff) trade policies inside the union change? What are the effects on trade agreements between the leaving country and third countries, as well as between the union and third countries?

In the previous section, we characterized unilateral economic disintegration by exogenous changes in trade costs between the respective country pairs. Now, we turn to the endogenous adjustment of trade costs following economic disintegration. The idea is that after the disintegration, the leaving country and the remaining member countries no longer jointly set their trade policies vis-à-vis third countries. The leaving country and the remaining union are free to reoptimize trade policies in their own interest, thus endogenously adjusting the trade costs.

We employ a first-order approximation approach for studying this readjustment of trade policies worldwide. Trade costs between two countries

\[
\tau_{ij} = \tau_{ij} + \tau_{ij}^p + \tau_{ij}^n
\]

consist of tariffs $\tau_{ij}$ (trade taxes) and non-tariff trade costs, which, in turn, have a policy compo-

\textsuperscript{23}An exception is the recent two-pillar OECD initiative (global minimum tax) to combat profit shifting and improve the collection of tax revenues in member states.

\textsuperscript{24}In the context of the EU, business-tax policies are de facto a national matter whereas the establishment of the internal market through the Single European Act of 1987 results from a cooperative agreement.
nent $\tau_{ij}^p$ and a non-policy component $\tau_{ij}^n$. Thus, non-tariff trade costs entail local characteristics (such as geographical frictions) and non-tariff trade policies (such as environmental protection and product standards) that do not have government revenue effects, unlike tariffs. Nevertheless, similar to tariffs, governments may negotiate non-tariff trade policies in an international agreement, which the non-tariff policy component $\tau_{ij}^p$ expresses.

Altogether, trade policies $\tau_{ij}^t$ and $\tau_{ij}^p$ form either cooperatively or noncooperatively. We draw on the idea that cooperative trade policies result from efficient bargaining (see Grossman and Helpman (1995) and subsequent literature). Accordingly, under the transferability of utilities, cooperative trade policies maximize the aggregate welfare of the countries involved. Governments choose the other trade policies noncooperatively to maximize the individual country’s welfare. Our approach considers trade policies before the disintegration (labeled “old” optimum) and after (“new” optimum).

**Exit from an Economic Union.** Denote the vector of non-tariff trade policies between all union members as $\tau_{U,U}^p$, and between the leaving country and the union as $\tau_{U,L}^p$. In the old optimum, these are chosen to maximize the leaving country’s and members’ joint welfare

$$\left(\tau_{U,U}^{p,old}, \tau_{U,L}^{p,old}\right) := \arg \max_{\left(\tau_{U,U}^p, \tau_{U,L}^p\right) \in \mathcal{A}_{U,U} \cup \{l\}} \sum_{m \in \mathcal{K}_U} W_m(\cdot).$$

In the new optimum, the objective function changes because member countries no longer consider the leaving country’s welfare in their optimization

$$\left(\tau_{U,U}^{p,new}\right) := \arg \max_{\tau_{U,U}^p \in \mathcal{A}_{U,U}} \sum_{m \in \mathcal{K}_U} W_m(\cdot).$$

While trade costs between the leaving and the member countries rise by the definition of economic disintegration (see previous section), we are now interested in the readjustment of the union’s internal trade policies ($\tau_{U,U}^{p,old}$ vs. $\tau_{U,U}^{p,new}$).

**Exit from a Customs Union.** When the leaving country departs from a customs union, one may ask how external trade policies of the union and the leaving country change because they no longer jointly sit at the negotiating table with third countries. Let $\mathcal{K}_{TA}$ be the set of countries

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25This definition of trade costs also allows us to incorporate tariffs that affect government revenues into our model of Section 2 (see Section 6.2).

26We suppose that each $\tau_{ij}^t$ and $\tau_{ij}^p$ can be chosen from a closed interval and, in the following, restrict attention to “interior policy solutions,” disregarding trade policies selected from the endpoints of the trade-policy space.
that form trade agreements. Accordingly, define \( \tau_{U,TA}^{t} \) (\( \tau_{I,TA}^{t} \)) as the vector of cooperative
tariffs between the union (leaving country) and any country in \( \mathcal{K}_{TA} \). Similarly, denote as \( \tau_{U,Rest}^{t} \) (\( \tau_{I,Rest}^{t} \)) the respective vector of noncooperative trade policies vis-à-vis all other countries
\( \mathcal{K} \setminus (\mathcal{K}_{TA} \cup \mathcal{K}_{U} \cup \{l\}) \). In the old optimum,

\[
\left( \tau_{U,TA}^{t,old}, \tau_{I,TA}^{t,old} \right) := \arg \max_{\tau_{U,TA}^{t}, \tau_{I,TA}^{t}} \sum_{m \in \mathcal{K}_{U} \cup \{l, TA\}} W_{m}(\cdot)
\]

and

\[
\left( \tau_{U,Rest}^{t,old}, \tau_{I,Rest}^{t,old} \right) := \arg \max_{\tau_{U,Rest}^{t}, \tau_{I,Rest}^{t}} \sum_{m \in \mathcal{K}_{U} \cup \{l\}} W_{m}(\cdot),
\]

whereas, in the new optimum,

\[
\left( \tau_{U,TA}^{t,new} \right) := \arg \max_{\tau_{U,TA}^{t}} \sum_{m \in \mathcal{K}_{U} \cup \{TA\}} W_{m}(\cdot) \quad \text{and} \quad \left( \tau_{I,TA}^{t,new} \right) := \arg \max_{\tau_{I,TA}^{t}} W_{l}(\cdot) + W_{TA}(\cdot)
\]

and

\[
\left( \tau_{U,Rest}^{t,new} \right) := \arg \max_{\tau_{U,Rest}^{t}} \sum_{m \in \mathcal{K}_{U}} W_{m}(\cdot) \quad \text{and} \quad \left( \tau_{I,Rest}^{t,new} \right) := \arg \max_{\tau_{I,Rest}^{t}} W_{l}(\cdot).
\]

Thus, in the case of an exit from a customs union, we ask how external tariffs of the union and the
leaving country change (\( \tau_{U,TA}^{t,old} \) vs. \( \tau_{U,TA}^{t,new} \), \( \tau_{U,Rest}^{t,old} \) vs. \( \tau_{U,Rest}^{t,new} \) and, respectively, \( \tau_{I,TA}^{t,old} \) vs. \( \tau_{I,TA}^{t,new} \), \( \tau_{I,Rest}^{t,old} \) vs. \( \tau_{I,Rest}^{t,new} \)). Before presenting our results on trade policies in more detail, we make the
following assumption about the effect of trade costs on welfare.

**Assumption 1** (terms-of-trade effect of bilateral trade costs). Suppose that any rise in bilateral trade costs between two countries raises welfare in a third country \( k \neq i, j \):

\[
\frac{dW_{k}}{dT_{ij}^{p}} > 0 \quad \text{and} \quad \frac{dW_{k}}{dT_{ij}^{r}} > 0.
\]

In Lemma 2, we show conditions under which Assumption 1—that is, the terms-of-trade effect of bilateral trade costs—holds in our model. The proof (in the Appendix) employs the optimality of a country’s business taxes and the Nash equilibrium comparative statics, capturing the impact of other countries’ adjustment in tax policies on a country’s welfare.

**Lemma 2.** Let country \( k \)’s business tax be positive and tariff revenues negligible in the initial
subgame-perfect Nash equilibrium. Moreover, suppose that country \( k \)’s trade costs with other
countries are the same \( \tau_{ki} = \tau_{kj} \), \( \forall i, j \). Then, Assumption 1 holds:

\[
\frac{dW_k}{d\tau_{ij}^p} = \frac{dW_k}{d\tau_{ij}^t} = \frac{\partial W_k}{\partial \tau_{ij}} + \sum_{l \neq k} \frac{\partial W_k}{\partial t_l} \frac{dt_l}{d\tau_{ij}} > 0.
\]

Assumption 1 and Lemma 2 have an intuitive appeal. Any protective measure (i.e., tariffs \( \tau_{ij}^t \) as well as non-tariff barriers summarized in \( \tau_{ij}^p \)) between two countries proves beneficial to third countries (positive gradient of the welfare function). The reason is that the third country becomes more attractive to businesses as trade costs between the two other countries rise. Not even the reduction in the latter countries’ business taxes resulting from the rise in trade costs can compensate for this. Firms move to the third country. As a result, prices decline there and tax revenues go up.\(^{27}\) The fact that third countries benefit from a rise in trade costs between two other countries is more general and well-known in the literature on trade policy. Usually, contributors to this literature refer to it as the terms-of-trade effect of bilateral trade costs (in particular tariffs) on the world price and, in turn, on third countries’ welfare. It may result in bilateral opportunism (as in Bagwell and Staiger (2004)).

Equipped with Lemma 2, we now study the readjustment of trade policies that economic disintegration triggers. We take an arbitrary and predetermined set of trade agreements, disregarding the destruction of old and the formation of new trade agreements (fixed set \( K_{TA} \)), and focus on the renegotiation of these existing agreements. We assume that trade policies are formed by concave optimization problems leading to interior solutions in the trade-policy space.\(^{28}\) Moreover, suppose that trade-policy changes are small, allowing us to evaluate welfare changes by using a first-order approximation of welfare in the new equilibrium after disintegration. Our approach relies on the observation that the objective function of the economic union (the customs union, respectively) changes when one member country leaves, consequently affecting the optimal choice

\(^{27}\)To guarantee the latter, we must assume that firms are not subsidized (negative business tax in country \( k \)). Likewise, we suppose that tariff revenues are negligible because, otherwise, inward FDI could lead to a massive decline in imports and tariff revenues, thereby potentially reducing welfare. We consider this an empirically unrealistic case. Last, assuming similar trade conditions with other countries is sufficient to eliminate another unlikely case: Despite the local price reductions and the revenue gains that inward FDI induces, a country’s welfare still declines because firms in all other countries reallocate in a highly unfavorable fashion, substantially raising import costs in the country.

\(^{28}\)To gain an intuition for why solutions to trade policies are interior, consider, for instance, the multilateral negotiation of bilateral non-tariff trade costs, \( \tau_{m1m2} \), inside a union. On the one hand, a rise in \( \tau_{m1m2} \) may reduce welfare in countries \( m_1 \) and \( m_2 \). On the other hand, other member countries, e.g., \( m_3, \ldots, m_K \), inside the union benefit from a higher \( \tau_{m1m2} \) (Lemma 2). As a result, there is a trade-off when choosing \( \tau_{m1m2} \) to maximize joint welfare.
of the internal non-tariff and external trade policies, such as tariffs. In addition, one should note that the described economic disintegration means effectively, although not legally, the presence of a new trading partner for all countries worldwide, with whom they may bargain over trade policies. We compare cooperatively- and noncooperatively-chosen trade policies in the old optimum (before disintegration) to those in the new optimum (after disintegration). We summarize our findings in Proposition 3. For a more detailed exposition, we refer to the Appendix.

**Proposition 3** (endogenous trade-policy responses to disintegration). Let Assumption 1 hold. Consider a fixed set of trade agreements. Assume that each optimization problem is concave and trade-policy solutions are interior, and let trade-policy changes be small.

(a) Suppose countries \( l \) and \( m \) \( \in \mathcal{K}_U \) initially form an economic union (old optimum), where all member countries jointly bargain over their internal non-tariff trade policies \( \tau_{U,U}^{p,old}, \tau_{U,I}^{p,old} \). When country \( l \) disintegrates from the economic union (new optimum), the remaining member countries integrate more with each other (lower non-tariff trade costs \( \tau_{U,U}^{p,new} < \tau_{U,U}^{p,old} \)).

(b) Suppose countries \( l \) and \( m \) \( \in \mathcal{K}_U \) initially form a customs union (old optimum), jointly setting external tariffs vis-à-vis third countries \( n \in \mathcal{K} \setminus (\mathcal{K}_U \cup \{l\}) \) \( \tau_{m,n}^{t,old}, \tau_{l,n}^{t,old} \). When country \( l \) leaves the customs union (new optimum), the leaving country lowers cooperative and noncooperative tariffs toward third countries \( \tau_{U,TA}^{t,new} < \tau_{U,TA}^{t,old} \) and \( \tau_{U,Rest}^{t,new} < \tau_{U,Rest}^{t,old} \). Likewise, cooperative and noncooperative tariffs by the customs union vis-à-vis third countries decline \( \tau_{l,TA}^{t,new} < \tau_{l,TA}^{t,old} \) and \( \tau_{l,Rest}^{t,new} < \tau_{l,Rest}^{t,old} \).

To gain an intuition for Proposition 3, observe that after the disintegration, the leaving country \( l \) and the remaining member countries do not align their trade policies in each others’ interests. Thus, the departure from an economic union means that the member countries no longer coordinate their internal non-tariff trade policies with the leaving country (despite retaining the customs union). As a member of the economic union (old optimum), a country \( l \) asks the other countries to raise their non-tariff trade barriers, because this raises \( l \)’s welfare \( \left( \frac{dW_l}{d\tau_{m,m}^{p}} > 0 \right) \) by Lemma 2). After the disintegration (new optimum), the remaining member countries reoptimize, not considering country \( l \)’s welfare anymore. As a result, the remaining members undertake efforts to lower their internal non-tariff barriers to trade (part (a)), and the leaving country bears a first-order welfare loss induced by the change in trade costs inside the union.

When the leaving country also exits the customs union, the union-member countries lower cooperatively- and noncooperatively-set trade barriers toward third countries (part (b)). Similarly,
the leaving country reduces trade barriers vis-à-vis third countries. The intuition for these results is the same as the one for part (a). Before disintegration, the union-member countries and the leaving country jointly negotiate their external trade barriers toward third countries. They set higher tariffs between the remaining member and third countries (between the leaving country and third countries) to improve welfare in the leaving country (member countries). Following disintegration, the leaving country’s welfare does not enter the customs union’s objective function. Likewise, the leaving country does not consider member countries’ welfare in its trade-policy making. Consequently, when disintegrated from each other, the leaving country and the remaining customs union set lower external trade barriers than they would if they were integrated. Therefore, the departure of a country from an economic union leads ceteris paribus to a deeper integration inside the union, and exiting a customs union lowers protectionism worldwide. This suggests a counterforce to deglobalization.

**Limitations.** While our result is intuitive and robust to the underlying economic model (as long as a version of Lemma 2 holds), we note several caveats to Proposition 3. First, we fix the set of trade agreements, disregarding the possibility that economic disintegration may lead to the destruction of other trade agreements or, alternatively, the creation of novel agreements (‘‘domino effect’’). For instance, the leaving country may form new trade agreements with countries with which the union has no formal trade agreements. Moreover, we restrict attention to interior trade-policy solutions, omitting trade policies from the endpoints of the trade-policy space. Finally, by linearizing welfare functions around an initial optimum, we only speak to small changes (at odds with our motivating example) and disregard larger policy changes and higher-order welfare effects. Similarly, the first-order approximation only allows for qualitative predictions.

Departing from a first-order approximation would make it necessary to impose more structure on the underlying economy to know the sign and the size of all second and higher derivatives of welfare functions, with respect to trade policies. In Appendix C.1, we present the second derivatives of the welfare function in our model. We also simulate the leaving country’s welfare as a function of other countries’ trade costs (solid and dashed lines in Figure 6). In our model, welfare appears approximately linear, reinforcing the linearization method. However, we admit that different model parametrizations may give rise to considerable nonlinearities.

**Repercussions on Tax Policies.** Disintegration affects the formation of trade policies in the initial stage (Stage 0). For instance, when a country leaves an economic union and stays in the
customs union, the trade-cost effect in Proposition 2 must be augmented by the readjustment of non-tariff trade costs, as follows.\footnote{For mathematical details, see the Online Appendix of our older working-paper version Janeba and Schulz (2021), where we formally describe an augmented trade-cost effect.}

The impact on the leaving country’s business tax remains qualitatively unchanged. By Proposition 2 (a), a rise in trade costs between the leaving country and the remaining union members reduces the leaving country’s tax (if \( n_l < 8 \bar{n}_U \)). However, when member countries further integrate in response to the disintegration, the leaving country’s tax further declines, because any bilateral trade-cost reduction lowers other countries’ taxes (Proposition 2 (c)). Intuitively, the endogenous reduction in non-tariff trade costs inside the union raises the firm relocation semi-elasticity in the leaving country and, thereby, puts additional downward pressure on its business tax.

As before, the business taxes inside the remaining union may react asymmetrically. Having said this, under symmetric population sizes, the response of taxes inside the union will be positive. The intuition is that despite the leaving country’s disintegration, the decline in internal trade costs (between several countries) makes each union member more attractive as a business location (lower firm relocation semi-elasticity and net inward FDI).

Third countries may now experience a decline in their business taxes. On the one hand, as trade barriers between the member countries and the leaving countries rise, firms move to third countries, increasing taxes there. On the other hand, the decline in member countries’ trade
costs pushes firms from third to union-member countries, lowering third countries’ relocation semi-elasticity, a sufficient statistic for their business taxation. If the economic union is large enough relative to the leaving country, the latter effect dominates the former, leading to lower taxes in third countries.

4.2 Normative Analysis

The above-described combination of rising trade costs the disintegration induces, followed by the endogenous trade-cost reductions in its response, raises an important normative question: When is economic disintegration welfare-improving for the leaving country? Even if global free trade is efficient and countries generally gain from economic integration, economic disintegration allows a country to readjust trade policies solely in its own interests. In general, endogenous trade-policy adjustments make the normative implications of economic disintegration ambiguous because several effects add up. First, leaving aside tariff revenue changes, adverse welfare effects of disintegrating from the union result, due to higher consumer prices, lower inward FDI, and a higher relocation semi-elasticity reducing business taxes (see Table 1).\textsuperscript{30} Second, as described, the leaving country counteracts these tax-revenue and consumer-surplus losses (see dotted line in Figure 6) by integrating further with other countries. Last, the remaining union members also respond by deepening trade relations with each other and third countries. These policy responses reduce the leaving country’s welfare, according to Lemma 2 (also see dashed line in Figure 6).

In Figure 7, we illustrate how these effects add up. We stick to our previous symmetric parametrization with a total of five countries, and one country leaving two union countries (and two third countries $|\mathcal{K}_T A| = 2$). We then ask which adjustment of trade costs between the leaving country vis-à-vis the third countries is necessary, taking tax-policy responses into consideration, to at least compensate for the leaving country’s welfare losses resulting from disintegration from the union. Thus, we identify the set of trade-policy responses that makes economic disintegration welfare-improving from the leaving country’s perspective. We consider three scenarios.

In the first, we only consider the disintegration-induced rise in trade costs between the leaving country and the union (within the range of 10% to 50%), holding all other trade policies constant. The compensating policy response becomes stronger in the degree of disintegration. The leaving

\textsuperscript{30}Here we abstract from huge asymmetries in country sizes: If the leaving country is very sizable relative to the economic union, it is possible that in sum, firms move to the leaving country to supply the large market.
country must reduce trade costs with third countries by 25.9% to compensate for a 50%-increase in trade costs with the union (solid line). In the second scenario, we incorporate the internal (non-tariff) trade-policy response by the remaining union members simulating the situation where the leaving country exits the economic union but remains in the customs union (dashed line). The resulting trade-cost reduction inside the remaining economic union (Proposition 3 (a)) adjusts the compensating policy response of the leaving country downward. For instance, a 50%-reduction in the union’s internal trade costs (in addition to a disintegration-induced rise in trade costs by 50%) requires a decline of 32.5% in the leaving country’s trade costs with third countries. If the leaving country can reduce the trade costs by more, exiting the economic union becomes desirable from the leaving country’s perspective (welfare improvements bottom left). The third scenario incorporates member countries’ external trade-policy response (when the leaving country exits a customs union). Adding the decline in external trade costs (Proposition 3 (b)) necessitates an even stronger policy response, further narrowing the space of welfare-improving economic disintegration (dotted line). For instance, for a 50%-decline in the customs union’s external trade costs, the leaving country must lower trade costs vis-à-vis third countries by at least 80.0%. Thus, the initial disintegration triggers a trade-cost reduction process similar to the race-to-the-bottom in the literature on tax competition.

In the Appendix (Figure 9), we contrast the fully symmetric setting with a situation where
the leaving country is twice as large as the other countries, demonstrating the role of relative market sizes. Initially, the large country is home to most firms, faces a lower firm relocation semi-elasticity, and taxes more than the other countries. As a result, the leaving country is less vulnerable, and the compensating policy response to disintegration is slightly less pronounced than in the symmetric case. However, this market-size advantage becomes a disadvantage when accounting for union members’ (internal and external) trade-policy responses. Intuitively, two countries’ integration resembles an increase in relative market size (with zero trade costs as an extreme case): Member countries’ trade-policy responses induce gains in market access there. As a result, most of the initially large share of firms in the leaving country relocates to member countries. Then, the leaving country needs a much more substantial trade-cost reduction with third countries to still be attractive enough as a business location and to compensate for the welfare losses from member countries’ trade-policy responses.\footnote{This result can also be seen from the welfare gradient in Equation (26) (Appendix C.1).}

Altogether, the normative implications of economic disintegration are far from obvious, even if one considers only first-order effects, which our approach addresses.\footnote{This finding holds under the economic conditions described in Bagwell and Staiger (1999) and the subsequent literature. In particular, the efficiency of global free trade remains valid in our approach, which takes existing inefficiencies in trade policies as given and then studies the readjustment of trade policies.} In our simulations, we identify the set of trade-policy responses such that economic disintegration leads to welfare improvements. Departing from a customs union seems to require much stronger integration steps with third countries than an exit from an economic union. The reason is that the union members do not only integrate more with each other; they also lower their external trade barriers with all other countries. At first glance, a larger country may absorb a disintegration shock more easily, but it is also more vulnerable to other countries’ endogenous trade-policy responses.

To summarize, in this section, we have endogenized different dimensions of trade policy, namely, tariffs and non-tariff trade costs. Altogether, the remaining countries of an economic union take further steps toward integrating their internal market when confronted with a former member’s disintegration. After the disintegration from a customs union, the leaving country, as well as the remaining union, intensify their trade relations with other countries.

Of course, these further economic integration steps do not necessarily mean that economic disintegration stabilizes multilateral institutions. Leaving a union may possibly be beneficial from a unilateral perspective, though it is multilaterally detrimental. Moreover, each loss of a member country jeopardizes the credibility of these institutions and increases the uncertainty of economic
policy (see Davis (2016), Steinberg (2019), and Caldara, Iacoviello, Molligo, Prestipino, and Raffo (2020)). Also, note that these considerations assume a fixed set of trade agreements. After disintegrating, the leaving country could negotiate trade agreements with countries that do not form an agreement with member countries, and vice versa. Without imposing more structure on the underlying economy, it is a priori unclear whether countries breach existing or form new trade agreements. However, an important lesson is that even absent this margin of adjustment, a country’s economic disintegration may lead to welfare gains if it integrates further with third countries.

5 Application: Brexit

Our framework and results could apply to different scenarios of disintegration and are not context-specific. However, they can be interpreted in a specific case, namely, in light of Brexit. With 27 member countries and a total population of 447 million inhabitants (2022), the average country size in the EU is 16.6 million, while the United Kingdom’s population is about 68 million. Using these values, Proposition 2 \((a)\) predicts a decline in the UK’s business taxes. As for the EU members, we note that the EU is small relative to the rest of the world: 27 member countries and almost 200 countries worldwide (2022). Based on Proposition 2 \((b)\), member states would also decrease their business taxation. On the other hand, third countries are predicted to raise business taxes (Proposition 2 \((c)\)).

While a reduced-form evaluation of these predictions is feasible, causally linking trends in business taxes to Brexit is not trivial. UK’s formal exit from the EU occurred at the end of January 2020, coinciding with the Coronavirus pandemic that led to exceptional economic circumstances and policy interventions. However, one may argue that, in anticipation, tax policy responded well before the formal Brexit date, starting in the summer of 2016 after the Brexit referendum took place. Taking this approach and using different measures of tax burdens, we depict in Table 2 tax-rate changes from 2016 to 2019 (negative values indicate a decline in tax rates).

The UK has decreased taxes between 2016 and 2019 more than the average EU country, which increased its implicit tax rate (effective average tax burden). According to the Tax Foundation, worldwide statutory tax rates declined minimally over the same period (unweighted average) or decreased (GDP-weighted average) by several percentage points. By contrast, the US considerably
Table 2: Change in Taxation of Corporate Incomes in Percentage Points (2016-2019); Source: European Commission (2021), Tables 6–10.

<table>
<thead>
<tr>
<th>Country</th>
<th>Top Tax Rate (statutory)</th>
<th>Implicit Tax Rate (traditional)</th>
<th>Implicit Tax Rate (no dividends)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>−1.0</td>
<td>−5.3</td>
<td>−3.6</td>
</tr>
<tr>
<td>EU27 (unweighted)</td>
<td>−0.7</td>
<td>+0.6</td>
<td>+2.2</td>
</tr>
<tr>
<td>EU27 (pop.-weighted)</td>
<td>−0.8</td>
<td>+0.6</td>
<td>+1.8</td>
</tr>
</tbody>
</table>

reduced its business taxation which, at first glance, contradicts the effect on third-countries’ taxes described in our main proposition. At the same time, the trade war with major trading partners that the Trump administration initiated substantially raised trade costs for US corporations, making the contemporaneous tax cuts consistent with Proposition 2 (a). However, one should view all these changes in light of the relatively short observation period.

Moreover, recall that Nash equilibrium business taxes follow the equilibrium firm number (proportional to inverse firm relocation semi-elasticity). Therefore, our model also predicts changes in the location of firms. In particular, it suggests that firms move to the larger market (and third countries) when trade costs between two trade partners increase. This prediction is in line with the estimated FDI effects of Brexit in Siedschlag and Tong Koeckling (2019). Using FDI greenfield investment in the EU between 2003 and 2015, they calculate a reduction in the UK by 1.8% to 3.6%. Overall investment declined in the UK following the Brexit vote, according to Bloom, Bunn, Chen, Mizen, Smietanka, and Thwaites (2019), which uncertainty surrounding the Brexit terms may partly have driven. Brakman, Garretsen, and Kohl (2021) (Figure 1) find that UK trade has suffered more due to Brexit than other countries’. By comparing 2019 and 2020 as well as the UK with non-EU countries, Coronavirus effects are plausibly extracted, so that the remaining difference is attributable to Brexit. Gutiérrez Chacón, Lacuesta, and Martín (2021) show that the UK’s import and export shares from Spain have decreased since 2016.

Besides domestic tax policies, our model also speaks to the policy implications regarding international trade policies. In the context of the “hard Brexit” in 2020, Proposition 3 (a) and (b) apply because the UK exited the economic union and the customs union. Thus, we predict that the remaining EU members will integrate more with each other (lower non-tariff trade costs) and reconsider protectionist policies toward third countries (lower external trade costs). The UK also deepens trade relations with third countries, (partly) offsetting the welfare losses from the
rise in trade frictions vis-à-vis the EU\textsuperscript{33} and the endogenous trade-policy adjustments of the EU. Therefore, Brexit may, ceteris paribus, lead to welfare improvements if the UK is ahead of the curve in this race-to-the-bottom of trade costs with the EU.

So far, the UK has signed new trade agreements with Australia, New Zealand, and Singapore. Trade negotiations with other WTO members, such as Canada, India, and the US, are still in progress. The Conservative Party in the UK brings forward the possibility of these integration steps with third countries and, in particular, has endorsed the formation of new international relations: “We will build upon our existing special relationship with the United States, and forge new economic and security partnerships that make us more prosperous at home and more secure abroad.” And, “We believe the UK must seize the unique opportunities it has to forge a new set of trade and investment relationships around the world, building a global, outward-looking Britain” (The Conservative and Unionist Party Manifesto (2017)). This view finds support by Griswold and Salmon (2020) and Jessop (2018), who outline the gains from a US-UK agreement. At the same time, the departure of the UK from the EU may make trade agreements between the EU and certain third countries, in particular those with historically close ties with the UK, less attractive. Roy and Mathur (2016) and Winters (2018) discuss this aspect regarding trade agreements of India and Australia, respectively, with the EU.

6 Extensions

We can extend and generalize our framework in various directions. We relegate the proofs of additional results to the Online Appendix.\textsuperscript{34} The extensions in this section refer to the base model of Section 2.

6.1 Other Dimensions of Disintegration

Union-Size Effect. An alternative way to examine the consequences of economic disintegration for tax policy is to impose some symmetry assumptions across countries and directly differentiate taxes with respect to $K_U$, as if the number of member countries were defined on a continuous

\textsuperscript{33}Dhingra, Huang, Ottaviano, Paulo Pessoa, Sampson, and Van Reenen (2017) and Portes and Forte (2017), for instance, estimated welfare losses up to 10\% of GDP.

\textsuperscript{34}The Online Appendix is available at ???.
domain, while holding trade costs constant.\footnote{This procedure is similar in flavor to the literature on the effects of federalism and government decentralization on private investment (e.g., Kessing, Konrad, and Kotsogiannis (2006)).} In particular, we assume symmetry in country sizes \((n := n_i \text{ for all } i \in \mathcal{K})\) as well as in internal and external trade costs as in a customs or an economic union \((\tau^* := \tau_{ij} \text{ for all } i, j \in \mathcal{K}_U \text{ and } \tau := \tau_{kn} > \tau^* \text{ for all } k \in \mathcal{K} \text{ and } n \in \mathcal{K} \setminus \mathcal{K}_U)\). Trade costs within the union are lower than those involving non-members.

In the Online Appendix, we express the tax of member countries, \(t_m\), and non-member countries, \(t_n\), as functions of a reduced set of model primitives \(\tilde{\Theta} := \left(\alpha, \beta, w, n, \tau^*, \tau, F, K, K_U\right)\). We prove that business taxes inside the union are greater than outside, and disintegration in the form of a decline in \(K_U\) decreases (increases) business taxes in member (non-member) countries.

Intuitively, being part of the union makes countries more attractive to firms, lowering the degree of tax competition, measured by the firm relocation semi-elasticity. Thus, ceteris paribus the tax of a country that leaves the union declines. Moreover, when the union loses member countries, the taxes inside the union fall, and those outside the union rise. The latter mirrors Proposition 2 \((c)\). The former, however, will only be in line with Proposition 2 \((b)\) if the union is small compared to the rest of the world. This conflicting finding is due to the cross-country symmetries imposed here.\footnote{Regarding the effects of globalization on taxes, one may differentiate the average worldwide business tax with respect to \(K\). In the Online Appendix, we show that the derivative is positive. That is, overall taxes decline as globalization increases the number of competing markets.}

**De-Harmonization Effect.** So far, we have considered features of disintegration that directly affect firms’ production choices—that is, the intensive margin. Through pre-tax profit differentials, these asymmetries also change cutoff industries, determining the distribution of firms across countries. By contrast, we can also address the direct effects of economic disintegration on firm relocation. Recall from Equation (5) that a firm in industry \(ij\) locates in country \(i\) only if \(\pi_j^i(\mu) - t_i \geq \pi_j^i(\mu) - t_j - F_{ij}\). That is, the firm must cover a location cost drawn from a cost distribution. Unlike before, this cost distribution may now differ between country pairs. Thus, \(F_{ij} := v^i - v^j + \epsilon_{ij}^i + \epsilon \in \left[E_{ij}, \overline{F}_{ij}\right]\) is drawn from a uniform distribution \(G_{ij}(F_{ij}) = \frac{F_{ij} - F_{ij}^i}{\overline{F}_{ij} - F_{ij}^i}\) with \(F_{ij}^i := v^i - v^j + \epsilon_{ij}^i + \epsilon\) and \(\overline{F}_{ij} := v^i - v^j + \overline{\epsilon}_{ij} + \overline{\epsilon}\). In particular, we account for the fact that relocation within a union is typically cheaper than going from the inside of the union to the outside. Thus, the relocation-cost distribution parameters measure another dimension of economic integration. The policy components come from the country-specific level of frictions when setting up a business, \(v^i\) and \(v^j\), determined by factors such as bureaucracy, regulatory
complexity, infrastructure access, and land availability. Another policy component is the degree of harmonization in production standards and business regulations between two countries, \( \epsilon^{ij} \). The former affects the level of relative relocation costs, whereas the latter alters their variance. An idiosyncratic location preference shock, \( \epsilon \), pins down the non-policy component.

Raising \( \nu^l \) leads to a business-friction effect of economic disintegration, whereas a rise in \( \bar{\epsilon}^{ij} = -\epsilon_{ij} \) results in a de-harmonization effect. Imposing cross-country symmetry in the level of business frictions (\( \nu^l = \nu^j \) such that \( \bar{F}^{ij} = -F_{ij} \)), we start with the latter, where economic disintegration induces a mean-preserving spread in the cost distribution. When country \( l \) disintegrates from the union, \( \bar{\epsilon}^{lm} = \bar{\epsilon}^{ml} \) rises, \( \forall m \in \mathcal{K}_U \), in our model.\(^{37}\)

To show the effect of de-harmonization, we suppose that two countries \( l \) and \( m \) are fully symmetric in their country sizes and trade costs, and we let all countries be initially symmetric in their relocation-cost distributions \( \bar{F}^{ij} = \bar{F}^{ik} = \bar{F}, \forall i \neq j \neq k \) and their business frictions \( \nu^l = \nu^j, \forall i, j \). Then, a rise in the degree of harmonization between the two countries \( i \) and \( j \), \( \bar{\epsilon}^{lm} = -\bar{\epsilon}_{lm} \), reduces all countries’ business taxes (see Online Appendix). Hence, the disintegration of country \( l \) via a de-harmonization between countries raises taxes everywhere.

Intuitively, the higher \( \bar{\epsilon}^{lm} \) (and, accordingly, \( \bar{F}^{lm} = -F_{lm} \)), the more firms—and, in this setting, also industries—are attached to countries \( l \) and \( m \), and the less should business-tax differentials matter for location decisions. Alternatively, the de-harmonization widens the range of relocation costs, increasing the cost of relocating a business from one country to the other (and vice versa). As a result, firms’ cross-country mobility, measured by the firm relocation semi-elasticity, decreases, and the respective countries tax more, ceteris paribus. Due to the strategic complementarity of tax policies, this spills over to the Nash equilibrium business taxation in third countries, which experience no change in the relocation-cost distribution.

**Business-Friction Effect.** An alternative aspect of economic disintegration might be that production frictions in country \( l \) increase unilaterally, so firm relocation from \( m \in \mathcal{K}_U \) to \( l \) becomes more costly than the reverse. Therefore, we consider the case where the disintegration causes firm relocation-cost distributions to shift to the leaving country’s disadvantage. By considering comparative statics of taxes with respect to \( \nu^l \), we can study the effects of such a shift in the

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\(^{37}\)An increase in \( \bar{\epsilon}^{lm} = \bar{\epsilon}^{ml} \) characterizes the economic disintegration of country \( l \) only for a fixed total number of firms, i.e., those firms that already exist and decide to relocate after the disintegration of \( l \). For example, when firms anticipate country \( l \)’s exit from the union, the country’s disintegration may discourage prospective entrepreneurs from investing in a firm located in \( l \) initially, endogenously reducing the number of potential firms.
relocation-cost distributions. We demonstrate in the Online Appendix that an increase in the average cost of setting up a business in a country relative to another country induces a lower tax in the former country and increases the tax in the latter one. Hence, the disintegration of country $l$ via a rise in business frictions lowers the business tax in the leaving country and increases taxes elsewhere.

Intuitively, when $\nu^l$ increases, the cost of locating in the leaving country $l$ relative to other countries goes up on average. Consequently, firms move out of the leaving country, the firm relocation semi-elasticity increases there, and country $l$ must lower its business tax. Conversely, other countries, i.e., union member and third countries, gain industry shares, and their ability to tax rises.

We note that the de-harmonization and the business-friction effects make opposing predictions for the business tax in the leaving country. This makes clear that the nature of economic disintegration is an important aspect to consider when assessing its effects.

6.2 Policy Instruments

Tariff Revenues. We can explicitly incorporate revenue effects from tariffs into our tax-competition model. That is, aside from non-tariff trade barriers, we allow for the presence of import tariffs. Like non-tariff trade barriers, trade taxes affect consumer surplus and business-tax revenues. However, tariffs generate additional fiscal revenues. We show that for nonnegative import tariffs and export subsidies, a country’s business tax is revised upwards. The intuition is as follows: When business taxes in a country rise, firms move away from that country. As a result, the government generates extra tariff revenues (more imports). For export subsidies, a similar logic applies due to expenditure savings from fewer exports.

By contrast, the reaction of Nash equilibrium business taxes to a rise in non-tariff trade costs is downwards adjusted compared to our baseline setup. The reason is that higher trade costs reduce trade volumes such that the extra gains in tariffs (respectively, expenditure savings) decline. Nonetheless, the key trade-offs, especially the above-described effects of economic disintegration, carry over. Another remarkable feature is that the business tax of country $i$ is U-shaped in foreign trade taxes. This pattern is similar to Proposition 1 in Haufler and Wooton (2010) but, in our extended setup, for trade-policy instruments that have revenue effects.

Competition in Regulations. In addition to the competition over business taxes in the first stage
of our economy, we introduce competition in regulations. We endogenize each country’s level of 
business frictions/regulations, $v^i$, similar to the noncooperative setting of business-tax policies. 
In our model, any rise in regulations is, ceteris paribus, welfare-detrimental as it triggers firm 
relocation, reducing consumer surplus and tax revenues. Therefore, to obtain interior solutions, 
we introduce a country-specific reduced-form regulation surplus function $V_i(v^i)$ that is increasing, 
concave, and, for simplicity, independent from taxes. For example, in the context of environmental 
protection, this surplus function could measure the value of clean air. Then, each government 
chooses the set of domestic policies $(t_i, v^i)$ to maximize aggregate welfare, taking all the other 
countries’ business taxes and regulations as given.

Even absent cross-country complementarities in the surplus function ($\frac{dV_i}{dv_j} = 0$), each country’s 
optimal level of regulations will be inefficiently low since a country’s government does not 
consider the positive externality of business regulations on other countries’ welfare ($\frac{dW_j}{dv_i} > 0$). 
Thus, just as in the tax-competition game, countries would gain from the international coordination 
of business regulations. We further demonstrate that the domestic policies interact. The level 
of regulations not only affects equilibrium business taxes, as we emphasize in Proposition 3, 
but vice versa. Interestingly, their (partial-equilibrium) comparative statics with respect to trade 
costs may point in opposite directions. For example, whereas a rise in $\tau_{jk}$ improves country $i$’s 
ability to tax, it reduces the regulation level $v^i$. The reason is that higher trade costs enlarge the 
size of marginal welfare losses from $v^i$ (above-described loss in tax revenues), reducing country 
$i$’s optimal level of business regulations. Altogether, the impact of economic disintegration on 
other domestic policies may significantly differ from those on business taxes, even if the domestic 
policy closely resembles a business tax from mobile firms’ perspective, as is the case for the 
business regulation level considered here.

**Harmonization of Business Taxes.** We also study the scenario of partial harmonization (e.g., 
Conconi, Perroni, and Riezman (2008)), where a subset of countries in a harmonized area, 
$\mathcal{K}_H \subset \mathcal{K}$, coordinates their level of business taxes to maximize their joint welfare. We demonstrate 
the existence of a unique Nash equilibrium in taxes set by members of the harmonized area and 
all other countries, determined by a system of (modified) reaction functions. The best response 
functions of countries outside the harmonized area are unaltered relative to the case without 
tax harmonization. The reaction function in the harmonized area, $t_H$, accounts for the effects 
on consumer surplus and tax revenues aggregated over member countries in $\mathcal{K}_H$. In line with
conventional wisdom, the coordination of business taxes among some countries reduces, ceteris paribus, the degree of tax competition relative to the setting without harmonization. Conceptually, the harmonized area behaves in business taxation like a large country. Therefore, the impact of economic disintegration (via a rise in trade costs between a leaving country, e.g., the UK, and the coordinated area, e.g., the EU) on the coordinated business tax resembles that of a large country.

Another way to think about economic disintegration is the departure from the harmonized area. To analyze this case, we impose cross-country symmetry in market sizes and trade costs. This assumption yields a symmetric tax outside of the harmonized area in addition to the one inside. Since the harmonized area acts as a large market and, as such, is more attractive as a business location than the other isolated markets, the business tax inside the area is higher than outside. Similar to the union-size effect, we differentiate business taxes with respect to the number of members in the harmonized area, $K_H$, as if it were defined on a continuous domain. We find that business taxes inside and outside the area are positively associated with $K_H$. Hence, a country’s departure from $\mathcal{X}_H$ decreases taxes worldwide. The reason is that any reduction in $K_H$ is equivalent to creating a new player in the tax-competition game and, as a result, amplifies the degree of competition.

**Proportional Tax on Profits.** Furthermore, one may replace the lump-sum tax $t_i$ with a proportional profits tax $\tilde{t}_i (\mu)$. Observe that the latter tax is equivalent to the former if $\tilde{t}_i (\mu) = t_i / \pi_{ij}^i (\mu)$ in a given industry $\mu \in [0, 1]$. Then, a rise in the lump-sum tax is ceteris paribus associated with a higher proportional tax. Accordingly, our analysis above can also address the level of proportional taxes. The proportional tax affects firm relocation (threshold industries $\gamma_{ij}$) similarly to the lump-sum tax. Country $i$’s tax rate $\tilde{t}_i (\mu)$ is the same for all industries with the same firm-relocation choices and, thus, with the same profit level $\pi_{ij}^i (\mu)$ (e.g., for all $F_{ij} < \gamma_{ij}$). However, it declines in the industry’s profit level $\pi_{ij}^i (\mu)$. This is because domestic firms in sectors with fewer competing firms in their home market realize higher profits (e.g., $F_{ij} < \gamma_{ij}$), whereas firms with more local competition have lower profits (e.g., $F_{ij} \geq \gamma_{ij}$). Thus, for a unique tax rate $\tilde{t}_i (\mu)$, a country $i$’s government would give a tax discount on high-profit industries. These are those sectors in which the government tries to attract firms that nevertheless choose the other country. Conversely, the government levies a higher tax on more competitive/low-profit industries where the government can attract firms in any case.
6.3 Richer Labor Market

The quantitative importance of trade shocks for labor-market outcomes is demonstrated by Artuç, Chaudhuri, and McLaren (2010), Dix-Carneiro (2014), and others. In the following, we describe how a richer labor-market model affects our insights.\footnote{In the Online Appendix, we provide formal statements.} In our economy, free trade in the numéraire commodity equalizes the wage rate across countries, and labor supply is inelastic. Suppose instead that trade in the numéraire commodity is not possible, and labor supply and demand determine a country’s wage level on the labor market. We demonstrate that for a fixed labor supply\footnote{It is straightforward to incorporate endogenous labor supply responses.} and production technology, labor-market clearing implies that each country’s aggregate production quantities remain constant. Then, a country’s wage level goes down when trade with other countries becomes more costly. The intuition is that rising trade costs reduce a country’s export volume and inward FDI. The resulting decline in aggregate production shifts down the domestic labor demand curve, lowering wages, ceteris paribus. Conversely, a country’s wage level increases with other countries’ trade costs because they raise domestic production.

Tax policies also have intuitive effects on wage levels. Any decline in a country’s business taxation raises wages in that country (and reduces them abroad) because inward FDI expands the country’s aggregate production and labor demand. Interestingly, wage responses have opposing effects on domestic welfare. On the one hand, national income rises with a country’s wage level. On the other hand, higher wages raise firms’ unit production costs, leading to higher domestic prices (smaller consumer surplus) and a more narrow tax base (fewer firms, lower tax revenues). We show in the Online Appendix how these effects add to governments’ reaction functions. Altogether, endogenous wages intensify governments’ incentives to attract businesses (more tax competition) when the impact on national income dominates the effects on the tax base and consumer surplus.

We note several directions for future research. First, labor is an internationally mobile factor, as in Caliendo, Dvorkin, and Parro (2019). The mobility of labor endogenizes the labor-supply curve (adding to the firm mobility that affects labor demand). Our comparative statics show that even in the absence of wage effects, the number of residents strongly affects national policies and their connection to economic integration through market size (migration effect). Thus, labor mobility can be an important aspect of business taxation. Second, our representative household
setup disregards the distributional effects of economic disintegration. The resulting equity considerations may then affect the optimal taxation of businesses. For instance, one may argue that specific workers gain or lose from economic disintegration (in the context of integration, see Autor, Dorn, and Hanson (2013)). Finally, disintegration may prevent (skill-biased) technical change in the long run, which would substantially affect the wage distribution (e.g., Acemoglu and Autor (2011)). While our framework may encompass such effects in reduced form, it would be interesting to model them explicitly. We consider studying the interplay of national and international policies in light of the full mobility of firms, heterogeneous workers, and capital a promising area of future research.

6.4 Consumers

Accrual of Profits. Recall that, in our baseline economy, firm profits accrue to citizens in third countries or at least do not enter social welfare. The latter is perhaps only reasonable for very wealthy investors and a government with a strongly redistributive objective, but not necessarily for smaller entrepreneurs or investors. Therefore, we now deal with the domestic accrual of profits. We distinguish two polar cases of firm ownership. The first considers internationally mobile entrepreneurs who only enter a country’s social welfare when they decide to locate their business there. Usually, this is the case for smaller businesses. In the second case, citizens directly hold a diversified portfolio of enterprises worldwide. This assumption is realistic for mid- and big-cap companies with shares traded on international financial markets. In both cases, the marginal social welfare weight of firm ownership modifies the optimal business tax. Moreover, in the former case, taxes are revised downward by the accrual of domestic profits and, in the Nash equilibrium, foreign profits. In the latter case, taxes account for the accrual of international profit differentials. This distinction is intuitive; in the first case, social welfare is a function of national income. However, when citizens are shareholders of firms worldwide, they only care about the size, not the location of accrued profits. We point out that in both cases, our main insights about economic disintegration carry over.

Cross-Price Effects. We generalize the model by allowing for cross-price effects in the demand for differentiated goods, as initially studied in Melitz and Ottaviano (2008). For \( \eta > 0 \), the Nash equilibrium business taxes are revised upwards because the substitutability between the differentiated varieties and the numéraire rises with \( \eta > 0 \). Put differently, the presence of cross-
price effects shifts down the demand for differentiated varieties, thereby lowering the welfare loss from firm relocation in the differentiated industries. Moreover, in the Online Appendix, we show that cross-price effects make firm relocation self-limiting as it leads to higher domestic prices and profit levels, reducing the incentives to relocate. These two adjustments tend to reduce the semi-elasticity of firm relocation and raise each country’s business tax.

6.5 Firms

**Industry Structure.** In footnote 10, we provide an explicit expression for profits when, on the industry level, production takes place worldwide (rather than in only two countries). Moreover, we extend our two-country industry structure to an arbitrary number of immobile firms in each industry. Our results hold as long as the distribution of immobile firms is similar across countries. A rise in the number of immobile firms in one country has opposing effects on the optimal business tax there. On the one hand, more firms in the country mechanically raise the government’s ability to tax. On the other hand, a larger number of firms increases the degree of local intra-industry competition, such that the country becomes less attractive as a business location to mobile firms. These two effects point in the same direction for other countries’ Nash equilibrium business taxes.

**Firm Location across Multiple Countries.** Finally, one may relax the assumption of binary firm-location choices. To achieve the degree of tractability necessary to solve explicitly for the Nash equilibrium business-tax policies, we have restricted our analysis to a firm’s location choice between two countries. If, by contrast, firm location were a multinomial-choice problem, mobile firms would relocate across multiple countries. This additional firm mobility in each industry would intensify tax competition as it scales up each country’s semi-elasticity of firm relocation: Since each mobile firm can relocate to any other country instead of one specific country that may be relatively unattractive as a business location, a rise in a country’s trade costs would induce stronger firm-relocation responses. Conversely, a decline in a country’s trade costs triggers additional inward FDI because firms from all industries (also those where the country is not part of the relocation choice set in our model) can move into the country. Therefore, we expect that firm relocation across multiple countries strengthens our economic channels.
7 Conclusion

In this paper, we study the policy implications of economic disintegration. We identify several empirically testable dimensions along which disintegration affects nations’ economic environment and, in turn, national policies. We set up an analytically highly tractable multi-country, multi-sector, general-equilibrium trade model where a set of internationally mobile firms generates fiscal competition over business taxes. This particular policy represents any domestic policy affecting the location of economic activity.

Thereby, the firm relocation semi-elasticity is a sufficient statistic for the optimal tax in a given country. This elasticity crucially depends not only on the economic conditions in that country but also on those worldwide. This observation even holds when minimal mobility is introduced, modeled as a bilateral location choice by one firm per industry. As a result, the whole economic structure influences domestic policies in each country. An important lesson from our approach is that a two-country analysis is potentially misleading when studying the effects of disintegration on national policies. By considering an arbitrary number of countries, our model takes a broader perspective. In sum, four policy predictions about unilateral economic disintegration emerge from our analysis:

1. The leaving country reduces its business tax.

2. Business taxes in the remaining member countries converge.

3. Third countries’ ability to tax improves.

4. Governments worldwide counter a country’s economic disintegration by deepening their existing trade relations—a counterforce to deglobalization.

References


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A Proofs for Section 2

A.1 Government Objective Function

Consider a mobile firm in country $i$ and industry $ij$. Inserting the first-order condition for optimal quantities into the profit function (3), delivers pre-tax profits (4) as a function of primitives. The mobile firm locates in country $i$ if and only if $P^{ij} \geq \pi^{ij}_l(\mu) - t_j - \left(\pi^{ij}_l(\mu) - t_i\right) = \gamma^{ij}$. Expanding this expression, the industry threshold becomes (6). Taking derivatives, the partial-equilibrium comparative statics directly follow.

Since there are $K$ countries, one has to consider $\binom{K}{2} = \frac{K(K-1)}{2}$ continuums of industries yielding $K(K-1)$ different prices. These read as

$$ p_i^{ij}(\mu) = \frac{\alpha + 3w + k_j^*(\mu)\tau_{ij}}{4} \quad \text{and} \quad p_i^{jl}(\mu) = \frac{\alpha + 3w + k_j^*(\mu)\tau_{ij} + k_l^*(\mu)\tau_{il}}{4}, $$

for $k_j^*(\mu) \in \{1, 2\}$ with $j \neq i$ and $(k_j^*(\mu), k_l^*(\mu)) \in \{(1, 2), (2, 1)\}$ with $j, l \neq i$, respectively. Plug these into the demand functions $x_i^{ij}(\mu) = \frac{\alpha - p_i^{ij}(\mu)}{\beta}$ and $x_i^{jl}(\mu) = \frac{\alpha - p_i^{jl}(\mu)}{\beta}$ and sum over all households in a country. The aggregate surplus in country $i$ derived from consumption of goods in $ij$- and $jl$-industries simplify to

$$ S_i^{ij}(\mu) = n_i \left( ax_i^{ij}(\mu) - \frac{\beta}{2} \left( x_i^{ij}(\mu) \right)^2 - p_i^{ij}(\mu) x_i^{ij}(\mu) \right) = \begin{cases} n_i \left( \frac{3\alpha - 3w - \tau_{ij}}{32\beta} \right)^2 & \text{w/ prob } (1 - G(\gamma^{ij})) \\ n_i \left( \frac{3\alpha - 3w - 2\tau_{ij}}{32\beta} \right)^2 & \text{w/ prob } G(\gamma^{ij}) \end{cases} \quad (9) $$

and

$$ S_i^{jl}(\mu) = n_i \left( ax_i^{jl}(\mu) - \frac{\beta}{2} \left( x_i^{jl}(\mu) \right)^2 - p_i^{jl}(\mu) x_i^{jl}(\mu) \right) = \begin{cases} n_i \left( \frac{3\alpha - 3w - 2\tau_{ij} - \tau_{il}}{32\beta} \right)^2 & \text{w/ prob } (1 - G(\gamma^{jl})) \\ n_i \left( \frac{3\alpha - 3w - 2\tau_{ij} - 2\tau_{il}}{32\beta} \right)^2 & \text{w/ prob } G(\gamma^{jl}) \end{cases}. \quad (10) $$

Summing over industries gives a country’s total consumer surplus

$$ S_i = \sum_{j \in \mathcal{X} \setminus \{i\}} \left( 1 - G(\gamma^{ij}) \right) n_i \left( \frac{3\alpha - 3w - \tau_{ij}}{32\beta} \right)^2 + G(\gamma^{ij}) n_i \left( \frac{3\alpha - 3w - 2\tau_{ij}}{32\beta} \right)^2 + \frac{1}{2} \sum_{j \in \mathcal{X} \setminus \{i\}} \sum_{l \in \mathcal{X} \setminus \{i, j\}} \left( 1 - G(\gamma^{jl}) \right) n_i \left( \frac{3\alpha - 3w - 2\tau_{ij} - \tau_{il}}{32\beta} \right)^2 + G(\gamma^{jl}) n_i \left( \frac{3\alpha - 3w - 2\tau_{ij} - 2\tau_{il}}{32\beta} \right)^2 $$

52
... = \sum_{j \in \mathcal{X} \setminus \{i\}} \left[ n_i \frac{(3\alpha - 3w - \tau_{ij})^2}{32\beta} + \frac{\gamma_{ij} - F}{2F} \frac{(3\alpha - 3w - 2\tau_{ij})^2 - (3\alpha - 3w - \tau_{ij})^2}{32\beta} \right]

+ \frac{1}{2} \sum_{j \in \mathcal{X} \setminus \{i\}} \sum_{l \in \mathcal{X} \setminus \{i, j\}} \left[ n_i \frac{(3\alpha - 3w - 2\tau_{ij} - \tau_{il})^2}{32\beta} \right]

+ \frac{1}{2} \sum_{j \in \mathcal{X} \setminus \{i\}} \sum_{l \in \mathcal{X} \setminus \{i, j\}} \left[ \frac{\gamma_{jl} - F}{2F} n_i \frac{(3\alpha - 3w - \tau_{ij} - 2\tau_{il})^2 - (3\alpha - 3w - 2\tau_{ij} - \tau_{il})^2}{32\beta} \right],

where the factor $\frac{1}{2}$ is applied to avoid double count. Therefore, consumer surplus in country $i$ can be written as

$$S_i = \sum_{j \in \mathcal{X} \setminus \{i\}} \left[ \delta_{ij} + \frac{\gamma_{ij} - F}{2F} \Delta_{ij} \right] + \frac{1}{2} \sum_{j \in \mathcal{X} \setminus \{i\}} \sum_{l \in \mathcal{X} \setminus \{i, j\}} \left[ \delta_{ij} + \frac{\gamma_{jl} - F}{2F} \Delta_{ij} \right]$$

where $\Delta_{ij}$, $\Delta_{jl}$, $\delta_{ij}$ and $\delta_{jl}$ are functions of the model primitives $\Theta$. Accordingly, the social planner in country $i$ faces the following maximization problem

$$\max_{t_i} S_i + T_i + n_i w,$$

where tax revenues follow from Lemma 1

$$T_i = t_i \left[ (K - 1) + \frac{1}{2F} \sum_{j \in \mathcal{X} \setminus \{i\}} (\bar{F} - \gamma_{ij}) \right].$$

A.2 Proof of Proposition 1

Since the wage sum is exogenous, the first-order condition is given by

$$\frac{d (S_i + T_i + n_i w)}{d t_i} = \frac{1}{2F} \sum_{j \in \mathcal{X} \setminus \{i\}} \frac{d \gamma_{ij}}{d t_i} \Delta_{ij} + (K - 1) + \frac{1}{2F} \sum_{j \in \mathcal{X} \setminus \{i\}} (\bar{F} - \gamma_{ij}) + t_i \frac{1}{2F} \sum_{j \in \mathcal{X} \setminus \{i\}} \left( - \frac{d \gamma_{ij}}{d t_i} \right) = 0$$

(13)
which is sufficient by the second-order condition
\[
\frac{d^2 (S_i + T_i + n_j w)}{dt_i^2} = \frac{1}{2F} \sum_{j \in \mathcal{X} \setminus \{i\}} \left( -\frac{dy^{ij}}{dt_i} \right) + \frac{1}{2F} \sum_{j \in \mathcal{X} \setminus \{i\}} \left( -\frac{dy^{ij}}{dt_i} \right) = -\frac{(K-1)}{F} < 0.
\]

The reaction function of country \( i \) can be simplified to
\[
t_i = \frac{1}{2(K-1)} \left( \sum_{j \in \mathcal{X} \setminus \{i\}} \Delta_i + 3F (K-1) + \sum_{j \in \mathcal{X} \setminus \{i\}} \left( \pi_{ij} - \pi_{ij}^i + t_i - t_j \right) \right).
\]

Business taxes are strategic complements, the relation is linear, and the slope is less than 1. Thus, there will be a unique interior intersection of reaction functions in this tax-competition game. In the following, we derive this intersection. First of all, plug
\[
t_i - t_l = \frac{1}{K-1} \left( \sum_{j \in \mathcal{X} \setminus \{i\}} \Delta_i - \sum_{j \in \mathcal{X} \setminus \{i\}} \Delta_i \right) + \sum_{j \in \mathcal{X} \setminus \{i\}} \left( \pi_{ij} - \pi_{ij}^i + t_i - t_j \right) + \sum_{j \in \mathcal{X} \setminus \{i\}} (t_i - t_j) - (t_l - t_i) + \sum_{j \in \mathcal{X} \setminus \{i\}} (t_j - t_i) - (t_i - t_l)
\]
\[
= \frac{1}{K-1} \left( \sum_{j \in \mathcal{X} \setminus \{i\}} \Delta_i - \sum_{j \in \mathcal{X} \setminus \{i\}} \Delta_i \right) + \sum_{j \in \mathcal{X} \setminus \{i\}} \left( \pi_{ij} - \pi_{ij}^i \right) + \sum_{j \in \mathcal{X} \setminus \{i\}} \left( \pi_{ij} - \pi_{ij}^i \right) + K (t_l - t_i)
\]
\[
= \frac{1}{2(K-1)} \left( \sum_{j \in \mathcal{X} \setminus \{i\}} \Delta_i - \sum_{j \in \mathcal{X} \setminus \{i\}} \Delta_i \right) + \sum_{j \in \mathcal{X} \setminus \{i\}} \left( \pi_{ij} - \pi_{ij}^i \right) + \sum_{j \in \mathcal{X} \setminus \{i\}} \left( \pi_{ij} - \pi_{ij}^i \right)
\]
into
\[
t_i = \frac{1}{K-1} \left( \sum_{j \in \mathcal{X} \setminus \{i\}} \Delta_i + 3F (K-1) - \sum_{j \in \mathcal{X} \setminus \{i\}} \left( \pi_{ij} - \pi_{ij}^i \right) - \sum_{j \in \mathcal{X} \setminus \{i\}} (t_i - t_j) \right)
\]
We now derive comparative statics of business taxes with respect to trade costs and country sizes.

\[ \pi_i^{ij} - \pi_j^{ij} = (n_i - n_j) \frac{6 \tau_{ij} (\alpha - w) - 3 \tau_{ij}^2}{16 \beta} - \sum_{l \in \mathcal{K} \setminus \{i, j\}} n_l \frac{6 (\alpha - w) (\tau_{il} - \tau_{jl}) - 3 (\tau_{il}^2 - \tau_{jl}^2)}{16 \beta}, \]  

(16)

differentiation with respect to trade costs yields

\[ \frac{d(\pi_i^{ij} - \pi_j^{ij})}{d\tau_{ij}} = 6 (n_i - n_j) \frac{\alpha - w - \tau_{ij}}{16 \beta}, \quad \frac{d(\pi_i^{il} - \pi_j^{il})}{d\tau_{il}} = 6 (n_i - n_l) \frac{\alpha - w - \tau_{il}}{16 \beta}, \quad \frac{d(\pi_i^{il} - \pi_j^{il})}{d\tau_{jl}} = -6 n_j \frac{\alpha - w - \tau_{jl}}{16 \beta}, \quad \text{and} \quad \frac{d(\pi_i^{il} - \pi_j^{il})}{d\tau_{ij}} = 6 n_i \frac{\alpha - w - \tau_{ij}}{16 \beta}. \]

It is more convenient to write \( t_i \) as

\[ t_i = 3 \bar{F} + \frac{K}{(K-1)(2K-1)} \sum_{l \in \mathcal{K} \setminus \{i\}} \Delta_i^l + \frac{1}{2K-1} \sum_{l \in \mathcal{K} \setminus \{i\}} (\pi_i^{il} - \pi_j^{il}) + \frac{1}{(K-1)(2K-1)} \sum_{j \in \mathcal{K} \setminus \{i\}} \sum_{l \in \mathcal{K} \setminus \{j\}} \Delta_j^l \]  

(17)

To obtain Proposition 1, notice that

\[ \sum_{j \in \mathcal{K}} \sum_{m \in \mathcal{K} \setminus \{j\}} (\pi_m^{jm} - \pi_j^{jm}) = \sum_j \sum_{m > j} (\pi_m^{jm} - \pi_j^{jm}) - \sum_j \sum_{m < j} (\pi_m^{jm} - \pi_j^{jm}) = 0. \]  

(15)
such that

\[
\frac{dt_i}{d\tau_{ij}} = \frac{K}{(K-1)(2K-1)} \left( -3n_i \alpha - w - \tau_{ij} \right) + \frac{1}{2K-1} \left( \frac{\alpha - w - \tau_{ij}}{16\beta} \right) + \frac{1}{2K-1} \sum_{l \in \mathcal{X} \setminus \{i, j\}} \left( -6n_j \alpha - w - \tau_{ij} \right) + \frac{1}{(K-1)(2K-1)} \left( -3n_j \alpha - w - \tau_{ij} \right)
\]

and

\[
\frac{dt_i}{d\tau_{jk}} = \frac{1}{2K-1} 6n_j \alpha - w - \tau_{jk} + \frac{1}{2K-1} 6n_k \alpha - w - \tau_{jk}
\]

\[
+ \frac{1}{(K-1)(2K-1)} \left( -3n_j \alpha - w - \tau_{jk} \right) + \frac{1}{(K-1)(2K-1)} \left( -3n_k \alpha - w - \tau_{jk} \right).
\]

Furthermore, since

\[
\tau_i = 3\bar{l} + \frac{K}{(K-1)(2K-1)} 3n_i \sum_{j \in \mathcal{X} \setminus \{i\}} \frac{\tau_{ij}^2 - 2\tau_{ij} (\alpha - w)}{32\beta}
\]

\[
+ \frac{1}{2K-1} \sum_{j \neq i} \left( n_i - n_j \right) \frac{6\tau_{ij} (\alpha - w) - 3\tau_{ij}^2}{16\beta} + \frac{1}{2K-1} \sum_{l \in \mathcal{X} \setminus \{i, j\}} n_l \frac{6(\alpha - w) (\tau_{jl} - \tau_{il}) - 3(\tau_{jl}^2 - \tau_{il}^2)}{16\beta}
\]

\[
+ \frac{1}{(K-1)(2K-1)} \sum_{j \in \mathcal{X} \setminus \{i\}} \sum_{m \in \mathcal{X} \setminus \{j\}} 3n_j \frac{\tau_{jm}^2 - 2\tau_{jm} (\alpha - w)}{32\beta},
\]

the comparative statics with respect to market size are

\[
\frac{dt_i}{dn_i} = \frac{K}{(K-1)(2K-1)} 3 \sum_{j \in \mathcal{X} \setminus \{i\}} \tau_{ij}^2 - 2\tau_{ij} (\alpha - w) \frac{32\beta}{3} + \frac{1}{2K-1} 6(\alpha - w) - 3\tau_{ij}^2
\]

\[= \frac{K - 2}{(K-1)(2K-1)} 3 \sum_{j \in \mathcal{X} \setminus \{i\}} \tau_{ij}^2 (\alpha - w) - \tau_{ij} \frac{32\beta}{3}
\]

\[= \frac{K - 2}{(K-1)(2K-1)} 3 \sum_{j \in \mathcal{X} \setminus \{i\}} \tau_{ij}^2 (\alpha - w) - \tau_{ij} \frac{32\beta}{3}
\]

\[+ \frac{1}{(K-1)(2K-1)} \sum_{m \in \mathcal{X} \setminus \{i\}} \sum_{l \in \mathcal{X} \setminus \{j\}} 3n_j \frac{\tau_{jm}^2 - 2\tau_{jm} (\alpha - w)}{32\beta}
\]

\[= \frac{6(K-1)^2 + 3}{(K-1)(2K-1)} \frac{2\tau_{ik} (\alpha - w) - \tau_{ik}^2}{32\beta} + \frac{6(K-1) - 3}{(K-1)(2K-1)} \sum_{j \in \mathcal{X} \setminus \{i, k\}} \frac{2(\alpha - w) \tau_{jk} - \tau_{jk}^2}{32\beta}.
\]

\[56\]
Simplify these expressions to obtain the following Nash equilibrium comparative statics of $t_i$

(a) with respect to population sizes

$$\frac{dt_i}{dn_i} = \frac{3(K - 2)}{(K - 1)(2K - 1)} \sum_{j \in \mathcal{X} \setminus \{i\}} \tau_{ij} \frac{2(\alpha - w) - \tau_{ij}}{32\beta} \quad \text{and}$$

$$\frac{dt_i}{dn_k} = \frac{6(K - 1) - 3}{(K - 1)(2K - 1)} \sum_{j \in \mathcal{X} \setminus \{i,k\}} \tau_{jk} \frac{2(\alpha - w) - \tau_{jk}}{32\beta} - \frac{6(K - 1)^2 + 3}{(K - 1)(2K - 1)} \tau_k \frac{2(\alpha - w) - \tau_{ik}}{32\beta} \quad (21)$$

(b) with respect to trade costs

$$\frac{dt_i}{d\tau_{ij}} = \left(n_i(K - 2) - n_j \left[2(K - 1)^2 + 1\right]\right) \frac{3}{(K - 1)(2K - 1)} \frac{\alpha - w - \tau_{ij}}{16\beta} \quad \text{and}$$

$$\frac{dt_i}{d\tau_{jk}} = (n_j + n_k) \frac{3(2K - 3)}{(K - 1)(2K - 1)} \frac{\alpha - w - \tau_{jk}}{16\beta}. \quad (22)$$

A country’s size positively affects its ability to tax, whereas it is not clear how $t_i$ reacts to an expansion of market $k$. The answer to the latter depends on whether trade costs vis-à-vis market $k$ are low (decline in $t_i$). Furthermore, when trade costs between $j$ and $k$ rise, country $i$ becomes relatively more attractive, which gives the latter country the leverage to tax more. Moreover, $\frac{dt_i}{d\tau_{ij}}$ will be negative if market $i$ is not too large ($n_i < n_j \frac{2(K - 1)^2 + 1}{(K - 2)}$). Interestingly, the more countries there are, the larger market $i$ has to be relative to $j$ to have $\frac{dt_i}{d\tau_{ij}} > 0$. These expressions directly imply Corollary 2.

**Corollary 2.** Define $\bar{t} := \frac{1}{K} \sum_{k \in \mathcal{X}} t_k$, $\bar{t}_U := \frac{1}{K_U} \sum_{k \in \mathcal{X}_U} t_k$, and $\bar{t}_{\text{non}U} := \frac{1}{K - K_U} \sum_{k \in \mathcal{X} \setminus \mathcal{X}_U} t_k$. Then,

(a) for any $i, j, k \in \mathcal{X}$,

$$\frac{d\bar{t}}{d\tau_{ij}} = -\frac{3(n_i + n_j)}{K(K - 1)} \frac{\alpha - w - \tau_{ij}}{16\beta}$$

(b) for $i, j \in \mathcal{X}_U$,

$$\frac{d\bar{t}_U}{d\tau_{ij}} = -\frac{3 [(K - K_U + 1)(2K - 3) + 2]}{K_U(K - 1)(2K - 1)} \frac{(n_i + n_j) \alpha - w - \tau_{ij}}{16\beta} \quad \text{and} \quad \frac{d\bar{t}_{\text{non}U}}{d\tau_{ij}} = \frac{3(2K - 3)(n_i + n_j)}{(K - 1)(2K - 1)} \frac{\alpha - w - \tau_{ij}}{16\beta}.$$ 

(c) for $i \in \mathcal{X}_U$ and $j \in \mathcal{X} \setminus \mathcal{X}_U$,

$$\frac{d\bar{t}_U}{d\tau_{ij}} = \frac{3(n_i [K - 2 + (K_U - 1)(2K - 3)] - n_j [2(K - 1)(K - K_U) + K_U]) \alpha - w - \tau_{ij}}{K_U(K - 1)(2K - 1)} \frac{16\beta}.
and
\[ \frac{d\tilde{\tau}_{\text{non}U}}{d\tau_{ij}} = \frac{3(n_j[K-2+(K-K_U-1)(2K-3)]-n_i[2(K-K_U+K-K_U)])\alpha-w-\tau_{ij}}{(K-K_U)(1)(2K-1)} \] for \( i, j \in \mathcal{K} \setminus \mathcal{K}_U \).

\( (d) \) for \( i, j \in \mathcal{K} \setminus \mathcal{K}_U \),
\[ \frac{d\tilde{\tau}_U}{d\tau_{ij}} = \frac{3(2K-3)(n_i+n_j)\alpha-w-\tau_{ij}}{(K-1)(2K-1)} \] and \[ \frac{d\tilde{\tau}_{\text{non}U}}{d\tau_{ij}} = \frac{-3[(K_U+1)(2K-3)+2](n_i+n_j)\alpha-w-\tau_{ij}}{(K-K_U)(1)(2K-1)} \] are not shown.

The corollary describes the effects of a rise in bilateral trade costs on average taxes. For instance, when trade between two member countries becomes more costly, members’ taxes fall on average, whereas the average tax of non-member countries increases (part \( (b) \)). On the contrary, the higher the bilateral trade costs for two non-member countries, the lower (higher) is the average tax of non-member (member) countries (part \( (d) \)). Part \( (c) \) shows that the effects of a rise in trade costs between a member and a non-member country are unclear. They depend on relative sizes of the respective countries as well as the number of member countries.

### B.2 Proof of Proposition 2

**Symmetry in Trade Costs.** We now provide the formal expressions for Proposition 2 in the main text. Suppose that trade costs between the leaving country \( l \in \mathcal{K} \setminus \mathcal{K}_U \) and countries \( m \in \mathcal{K}_U \) are the same, \( \tau = \tau_{ml}, \forall m \in \mathcal{K}_U \), and let country \( l \) disintegrate from the member countries via a rise in trade costs. To show Proposition 2, we use (22).

For part \( (a) \), take country \( l \) which is supposed to leave, in the sense that all bilateral trade costs between members and country \( l \) are going to increase, and sum \( \frac{dt_l}{d\tau_{ml}} \) over all relevant country combinations (i.e., over the set \( \mathcal{K}_U \))

\[ \sum_{m \in \mathcal{K}_U} \frac{dt_l}{d\tau_{ml}} = \sum_{m \in \mathcal{K}_U} \left( n_l(K-2)-2n_m[(K-1)^2+0.5] \right) \frac{3}{(K-1)(2K-1)} \frac{\alpha-w-\tau}{16\beta} \]

\[ = \left( n_lK_U(K-2)-\sum_{m \in \mathcal{K}_U} n_m[2(K-1)^2+1] \right) \frac{3}{(K-1)(2K-1)} \frac{\alpha-w-\tau}{16\beta}. \]  

(23)

For \( n := n_m = n_l \), we obtain a simpler expression \[ \sum_{m \in \mathcal{K}_U} \frac{dt_l}{d\tau_{ml}} = \frac{(5K-5-2K^2)K_U}{(K-1)(2K-1)} \frac{3n(\alpha-w-\tau)}{16\beta} < 0. \]

Proceed similarly to obtain the reaction of a member country \( m \in \mathcal{K}_U \) to the disintegration of \( l \). It is important to note that two effects play a role here. First of all, there is a direct effect induced by the increase in bilateral trade costs between the countries \( m \) and \( l \). At the same time,
trade costs between \( l \) and the other member countries rise. Therefore, the overall effect on the business tax in country \( m \) reads as

\[
\frac{dt_m}{d\tau_{ml}} + \sum_{j \in \mathcal{U} \setminus \{m\}} \frac{dt_m}{d\tau_{lj}} = \left( n_m (K - 2) - 2n_l \frac{[K - (K - 1)^2 + 0.5]}{(K - 1)(2K - 1)} \right) \frac{3}{16\beta} (\alpha - w - \tau) + \sum_{j \in \mathcal{U} \setminus \{m\}} (n_j + n_l) \frac{3(2K - 3)}{(K - 1)(2K - 1)} \frac{\alpha - w - \tau}{16\beta}
\]

\[
= \left( (K - 1) \left[ 2 \sum_{j \in \mathcal{U}} n_j - 2n_l (K - K_U) - n_m \right] \right) \frac{3}{(K - 1)(2K - 1)} \frac{\alpha - w - \tau}{16\beta}.
\]

Under symmetric population sizes \( \frac{dt_m}{d\tau_{ml}} + \sum_{j \in \mathcal{U} \setminus \{m\}} \frac{dt_m}{d\tau_{lj}} = \frac{(4K_U - 2K - 1)(K - 1)^2 - 2K_U}{(K - 1)(2K - 1)} \frac{3n(\alpha - w - \tau)}{16\beta} \). Therefore, the effect on member countries is negative for \( 2K_U \leq K \).

For the proof of part (c) we only need to consider one set of effects, namely that the rise in trade costs considered here is a third country effect for non-member countries. That is, for any \( k \in \mathcal{U} \setminus (\mathcal{U} \cup \{l\}) \) the effect on business taxation is given by

\[
\sum_{j \in \mathcal{U}} \frac{dt_k}{d\tau_{lj}} = \sum_{j \in \mathcal{U}} (n_j + n_l) \frac{3(2K - 3)}{(K - 1)(2K - 1)} \frac{\alpha - w - \tau}{16\beta} = \left( \frac{1}{K_U} \sum_{j \in \mathcal{U}} n_j + n_l \right) \frac{3K_U (2K - 3)}{(K - 1)(2K - 1)} \frac{\alpha - w - \tau}{16\beta} > 0.
\]

(25)

**Asymmetries in Trade Costs.** The main insights regarding market sizes carry over when dealing with asymmetries in trade costs. By Equation (22), the positive effect on third countries’ taxes (part (c)) is fully robust with respect to including initially asymmetric trade costs. The trade-cost effect on the leaving and the member countries’ taxes involves a correction term:

\[
\sum_{j \in \mathcal{U}} \frac{dt_l}{d\tau_{lj}} = \sum_{j \in \mathcal{U}} \frac{dt_l}{d\tau_{lj}} |\{\tau_{m'l'}: m' \in \mathcal{U}, \tau_{m'l'} = \tau\} + \frac{\sum_{m \in \mathcal{U}} \left( n_l (K - 2) - n_m [2(K - 1)^2 + 1] \right)}{(K - 1)(2K - 1)} \frac{\tau - \tau_{ml}}{K_U (\alpha - w - \tau)} \frac{3(\alpha - w - \tau)}{16\beta},
\]

and

\[
\frac{dt_m}{d\tau_{ml}} + \sum_{j \in \mathcal{U} \setminus \{m\}} \frac{dt_m}{d\tau_{lj}} = \frac{dt_m}{d\tau_{ml}} |\{\tau_{m'l'}: m' \in \mathcal{U}, \tau_{m'l'} = \tau\} + \sum_{j \in \mathcal{U} \setminus \{m\}} \frac{dt_m}{d\tau_{lj}} |\{\tau_{m'l'}: m' \in \mathcal{U}, \tau_{m'l'} = \tau\} + \sum_{j \in \mathcal{U}} (n_j + n_l) \frac{(2K - 3)}{(K - 1)(2K - 1)} \frac{\tau - \tau_{lj}}{\alpha - w - \tau} - (K - 1) \frac{2K n_l + n_m}{(K - 1)(2K - 1)} \frac{\tau - \tau_{ml}}{\alpha - w - \tau} \frac{3(\alpha - w - \tau)}{16\beta}
\]

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Figure 8: Trade-Cost Effect and Asymmetries in Trade Costs; Parameters: \( \alpha = 7, \beta = 1, w = 1, F = -F = 0.5, K = 5, K_U = 2, \tau_{m_1m_2} = \tau_{m_1m_2} = 0.5, \tau_{ij} = \tau_{ji} = 1, \forall j \notin \mathcal{K}_U, n_i = \frac{1}{K}, \forall i \)

where \( \frac{dt_l}{d\tau_{ml}}(\tau_{m'i})_{m' \in \mathcal{K}_U} = \tau \) and \( \frac{dt_m}{d\tau_{ml}}(\tau_{m'i})_{m' \in \mathcal{K}_U} = \tau \) are the respective derivatives in the symmetric case that lead to Proposition 2.

\[
\sum_{m \in \mathcal{K}_U} \frac{dt_l}{d\tau_{ml}}(\tau_{m'i})_{m' \in \mathcal{K}_U} = \tau = \frac{3 \left( K_U (K - 2) n_l - K_U \left[ 2 (K - 1)^2 + 1 \right] \bar{n}_U \right) \alpha - w - \tau}{(K - 1) (2K - 1)} \]

denotes the response around the symmetric case. If trade flows are positive \( 0 \leq \tau_{ij} \leq \frac{\alpha - w}{3} \), the adjustment terms are bounded from above and from below \( \frac{\tau - \tau_{ml}}{\alpha - w - \tau} \in \left[ -\frac{1}{3}, \frac{1}{2} \right] \). Therefore, under symmetric population sizes \( (n_m = \bar{n}_U = n_l) \), the effect on the leaving country’s tax lies between

\[
\sum_{m \in \mathcal{K}_U} \frac{dt_l}{d\tau_{ml}}(\tau_{m'i})_{m' \in \mathcal{K}_U} = \tau = \frac{3 \left( K_U (K - 2) n_l - K_U \left[ 2 (K - 1)^2 + 1 \right] \bar{n}_U \right) \alpha - w - \tau}{(K - 1) (2K - 1)}
\]

and initial asymmetries in trade costs do not qualitatively change the trade-cost effect on the leaving country.

In Figure 8, we plot equilibrium business taxes (of the leaving, the member, and third country) over the full range of trade costs, illustrating the trade-cost effect for an arbitrary initial set of trade costs and arbitrary changes in trade costs. The solid black, red, and orange lines on the diagonal represent the symmetric case (Proposition 2). Off-diagonal, one may observe the decline (rise) in the leaving (third) country’s business tax that we show above. Starting from an off-diagonal point in the hyperplane, the effect on a member country is ambiguous.
B.3 Economic Channels

The reaction functions (14) allow for a decomposition of the trade-cost induced change in business taxation

\[
\sum_{m' \in \mathcal{U}} \frac{dt_{ij}}{d\tau_{lm'}} = \frac{1}{2(K-1)} \sum_{m' \in \mathcal{U}} \sum_{j \in \mathcal{N}_\{i\}} \frac{d\Delta^{ij}_{lm'}}{d\tau_{lm'}} + \frac{1}{2(K-1)} \sum_{m' \in \mathcal{U}} \sum_{j \in \mathcal{N}_\{i\}} \frac{d(\pi^{ij}_{lm'} - \pi^{ij}_{lm})}{d\tau_{lm'}} + \frac{1}{2(K-1)} \sum_{m' \in \mathcal{U}} \sum_{j \in \mathcal{N}_\{i\}} \frac{dt_{ij}}{d\tau_{lm'}}.
\]

price channel  
tax-base channel  
best vs. equilibrium response

In the following, we are interested in the price and tax-base channels. We impose cross-country symmetry in market sizes \(n_i = n_j, \forall i, j \in \mathcal{N}\) and let trade costs between the leaving country and the union be symmetric, \(\tau = \tau_{m'l}, \forall m \in \mathcal{U}\). Then, any member country’s price channel reads as

\[
-\frac{1}{2(K-1)} \frac{3n(\alpha - w - \tau)}{16\beta} < 0
\]

and the tax-base channel is given by

\[
-\frac{(K-2K_U)}{2(K-1)} \frac{6n(\alpha - w - \tau)}{16\beta} > 0 \iff 2K_U > K.
\]

The leaving country’s tax-base channel

\[
-\frac{K_U(K-2)}{2(K-1)} \frac{6n(\alpha - w - \tau)}{16\beta} < 0
\]

is larger in absolute value than the price channel

\[
-\frac{K_U}{2(K-1)} \frac{3n(\alpha - w - \tau)}{16\beta} < 0.
\]

Finally, third countries’ price channel is always zero (irrespective of the symmetry assumptions) and the tax-base channel is positive

\[
\frac{K_U}{2(K-1)} \frac{12n(\alpha - w - \tau)}{16\beta} > 0.
\]
C Proofs for Section 4

C.1 Proof of Lemma 2

**First-Order Welfare Effects.** To show Lemma 2, first note that welfare of country $k \neq i, j$ depends on $t_k$ only up to second order (envelope theorem). Moreover, observe that trade costs $\tau_{ij}$ affect welfare solely through the equilibrium firm distribution. If $\tau_{ik} = \tau_{jk}, \forall i, j$, a trade-cost induced relocation of firms between two countries does not alter a third country’s welfare $\Delta_{ij}^k = 0, \forall i, j$. Accordingly, for positive business taxes and negligible tariff revenues,

$$
\frac{dW_k}{d\tau_{ij}} = \frac{dW_k}{d\tau_{ij}} = \frac{dW_k}{d\tau_{ij}} = \frac{1}{2F} \left[ (t_k - \Delta_{ki}^k) \frac{dy_{ik}}{d\tau_{ij}} |_{t_k} + (t_k - \Delta_{kj}^k) \frac{dy_{jk}}{d\tau_{ij}} |_{t_k} \right] > 0 \quad (26)
$$

since

$$
\frac{dy_{ik}}{d\tau_{ij}} |_{t_k} = \frac{\partial y_{ik}}{\partial \tau_{ij}} + \frac{dt_i}{d\tau_{ij}} = \frac{2(K-1)^2 + 2(K-1) - 1}{(K-1)(2K-1)} n_j + (K-2) n_i \frac{3(\alpha - w - \tau_{ij})}{16\beta} > 0
$$

and

$$
\frac{dy_{jk}}{d\tau_{ij}} |_{t_k} = \frac{\partial y_{jk}}{\partial \tau_{ij}} + \frac{dt_j}{d\tau_{ij}} = \frac{2(K-1)^2 + 2(K-1) - 1}{(K-1)(2K-1)} n_i + (K-2) n_j \frac{3(\alpha - w - \tau_{ij})}{16\beta} > 0.
$$

Interestingly, $\frac{dW_i}{d\tau_{ij}}$ is ceteris paribus larger, the more sizable country $k$’s market, since $t_k, -\Delta_{ki}^k$, and $-\Delta_{kj}^k$ rise in $n_k$.

**Second-Order Welfare Effects.** Figure 6 shows that welfare (here, of the leaving country) is approximately linear in trade costs. However, one may still be interested in the sign and size of second derivatives. Using the previous expression, one may derive higher-order welfare effects. Differentiate (26) with respect to trade costs to obtain

$$
\frac{d^2W_k}{d\tau_{ij}^2} = \frac{1}{2F} \left( \frac{dy_{ik}}{d\tau_{ij}} |_{t_k} + \frac{dy_{jk}}{d\tau_{ij}} |_{t_k} \right) \frac{dt_k}{d\tau_{ij}} - \frac{1}{2F} \left( \frac{2(K-1)^2 + 2(K-1) - 1}{(K-1)(2K-1)} \right) \frac{3(n_i + n_j)}{16\beta} \tau_{ik},
$$

$$
\frac{d^2W_k}{d\tau_{ij} d\tau_{ik}^2} = \frac{1}{2F} \left( \frac{dy_{ik}}{d\tau_{ij}} |_{t_k} + \frac{dy_{jk}}{d\tau_{ij}} |_{t_k} \right) \frac{dt_k}{d\tau_{ij}} - \frac{1}{2F} \frac{dy_{ik}}{d\tau_{ij}} |_{t_k} \frac{3n_k (\alpha - w - \tau_{ik})}{16\beta},
$$

$$
\frac{d^2W_k}{d\tau_{ij} d\tau_{jk}^2} = \frac{1}{2F} \left( \frac{dy_{ik}}{d\tau_{ij}} |_{t_k} + \frac{dy_{jk}}{d\tau_{ij}} |_{t_k} \right) \frac{dt_k}{d\tau_{ij}} - \frac{1}{2F} \frac{dy_{jk}}{d\tau_{ij}} |_{t_k} \frac{3n_k (\alpha - w - \tau_{jk})}{16\beta},
$$

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and
\[
\frac{d^2 W_k}{d\tau_{ij}^s d\tau_{lm}^s} = \frac{1}{2F} \left( \frac{d^2 y^{i_k}}{d\tau_{ij}^s} \bigg|_{y^{i_k}} + \frac{d^2 y^{i_k}}{d\tau_{ij}^s} \bigg|_{y^{i_k}} \right) \frac{dt_k}{d\tau_{lm}^s}
\]
for \( k \neq i, j, l, m \neq i, j, k \), and \( s, s' \in \{p, t\} \). Observe that
\[
\frac{d^2 W_k}{d\tau_{ij}^s d\tau_{lm}^s} \leq 0,
\]
if \( \frac{dt_k}{d\tau_{lm}^s} > 0 \), and
\[
\frac{d^2 W_k}{d\tau_{ij}^s d\tau_{lm}^s} < 0,
\]
if \( \frac{dt_k}{d\tau_{ij}^s} < 0 \). Finally,
\[
\frac{d^2 W_k}{d\tau_{ij}^s d\tau_{lm}^s} > 0
\]
because \( \frac{dt_k}{d\tau_{lm}^s} > 0 \).

C.2 Proof of Proposition 3

Define \( \mathcal{K}_{TA} \) as the set and \( K_{TA} \) as the number of countries which participate in trade agreements (e.g., the WTO) but are not part of \( \mathcal{K}_U \) or \( l \). Let \( \tau_{t,old} \) denote the vector of tariff policies before the disintegration of country \( l \) from the union abbreviated U. That is,
\[
\tau_{t,old} = \begin{pmatrix} \tau_{t,old}^{U,U} & \tau_{t,old}^{U,l} & \tau_{t,old}^{U,TA} & \tau_{t,old}^{l,TA} & \tau_{t,old}^{TA,TA} & \tau_{t,old}^{TA,Rest} \\ \end{pmatrix}
\]
is a vector of trade taxes consisting of (i) the null vector \( \tau_{t,old}^{U,U} \), which summarizes zero bilateral tariffs in the union, (ii) another vector \( \tau_{t,old}^{U,TA}, \tau_{t,old}^{l,TA}, \tau_{t,old}^{TA,TA} \) which summarizes cooperatively-chosen tariffs within the set of countries \( \mathcal{K}_{TA} \), the leaving country, and the union, and (iii) another vector of tariffs which are set noncooperatively
\[
\tau_{t,old}^{Rest} = \begin{pmatrix} \tau_{t,old}^{Rest}^{U,Rest} & \tau_{t,old}^{Rest}^{l,Rest} & \tau_{t,old}^{Rest}^{TA,Rest} & \tau_{t,old}^{Rest,Rest} \\ \end{pmatrix}
\]
vis-à-vis countries from the rest of the world (e.g., Iran). Moreover, let
\[
\tau_{p,old} = \begin{pmatrix} \tau_{p,old}^{U,U} & \tau_{p,old}^{U,l} & \tau_{p,old}^{U,TA} & \tau_{p,old}^{l,TA} & \tau_{p,old}^{TA,TA} & \tau_{p,old}^{TA,Rest} \\ \end{pmatrix}
\]
\]
denote the vector of bilateral non-tariff trade costs.

Internal Non-Tariff Trade Policies. A feature of an economic union is that member countries can cooperatively set these non-tariff trade costs. That is, \( \tau_{p,old}^{U,U}, \tau_{p,old}^{U,l} \) is the outcome of efficient Nash bargaining. Before the disintegration of country \( l \),
\[
\left( \tau_{p,old}^{U,U}, \tau_{p,old}^{U,l} \right) = \arg\max_{\tau_{p,old}^{U,U}, \tau_{p,old}^{U,l}} \sum_{m \in \mathcal{K}_{U} \cup \{l\}} W_m(\cdot).
\]
After the disintegration, the remaining members negotiate their internal trade costs without
consideration of country $l$’s welfare

\[
\left( \tau_{U,U}^{p,\text{new}} \right) := \arg \max_{\tau_{U,U}^{p}} \sum_{m \in \mathcal{K}_U} W_m(\cdot).
\]

Do the remaining member countries integrate more with each other after the disintegration of $l$? In other words, how do the vectors $\tau_{U,U}^{p,\text{old}}$ and $\tau_{U,U}^{p,\text{new}}$ compare with each other? Consider the first-order Taylor approximation of members’ welfare in the new optimum

\[
\sum_{m \in \mathcal{K}_U} W_m\left( \tau_{U,U}^{p,\text{new}}, \tau_{U,U}^{p,\text{new}}, \cdot \right) = \sum_{m \in \mathcal{K}_U} W_m\left( \tau_{U,U}^{p,\text{old}}, \tau_{U,U}^{p,\text{new}}, \cdot \right) \\
+ \sum_{m \in \mathcal{K}_U} \nabla_{\tau_{U,U}^{p}} W_m\left( \tau_{U,U}^{p,\text{old}}, \tau_{U,U}^{p,\text{new}}, \cdot \right) \left( \tau_{U,U}^{p,\text{new}} - \tau_{U,U}^{p,\text{old}} \right)' + h.o.t.
\]

\[> \sum_{m \in \mathcal{K}_U} W_m\left( \tau_{U,U}^{p,\text{old}}, \tau_{U,U}^{p,\text{new}}, \cdot \right) \]

where the inequality holds by the optimality of the new solution ($\tau_{U,U}^{p,\text{new}}$ is the only non-tariff trade cost vector that maximizes members’ welfare). Rewrite the previous expression to obtain

\[
\sum_{m \in \mathcal{K}_U} \nabla_{\tau_{U,U}^{p}} W_m\left( \tau_{U,U}^{p,\text{old}}, \tau_{U,U}^{p,\text{new}}, \cdot \right) \left( \tau_{U,U}^{p,\text{new}} - \tau_{U,U}^{p,\text{old}} \right)' > 0.
\]

(31)

By the old solution’s first-order condition $\sum_{m \in \mathcal{K}_U \cup \{l\}} \nabla_{\tau_{U,U}^{p}} W_m\left( \tau_{U,U}^{p,\text{old}}, \tau_{U,U}^{p,\text{old}}, \cdot \right) = 0$ and, accordingly,

\[
0 = \sum_{m \in \mathcal{K}_U \cup \{l\}} \nabla_{\tau_{U,U}^{p}} W_m\left( \tau_{U,U}^{p,\text{old}}, \tau_{U,U}^{p,\text{old}}, \cdot \right) \left( \tau_{U,U}^{p,\text{new}} - \tau_{U,U}^{p,\text{old}} \right)' \\
= \sum_{m \in \mathcal{K}_U \cup \{l\}} \nabla_{\tau_{U,U}^{p}} W_m\left( \tau_{U,U}^{p,\text{old}}, \tau_{U,U}^{p,\text{new}}, \cdot \right) \left( \tau_{U,U}^{p,\text{new}} - \tau_{U,U}^{p,\text{old}} \right)' + h.o.t.
\]

Therefore,

\[-\nabla_{\tau_{U,U}^{p}} W_l\left( \tau_{U,U}^{p,\text{old}}, \tau_{U,U}^{p,\text{new}}, \cdot \right) \left( \tau_{U,U}^{p,\text{new}} - \tau_{U,U}^{p,\text{old}} \right)' > 0 \]

and one can conclude that, whenever $\nabla_{\tau_{U,U}^{p}} W_l\left( \cdot \right) > 0$ (i.e., the welfare of the leaving country is increasing in two member countries’ trade costs as in Assumption 1 and Lemma 2), $\tau_{U,U}^{p,\text{new}} < \tau_{U,U}^{p,\text{old}}$.

**External Tariff Policies.** By the construction of an economic union as a customs union trade taxes inside the union remain prohibited $\tau_{U,U}^{t,\text{old}} = \tau_{U,U}^{t,\text{new}} = 0$, whereas trade taxes between the leaving country and the economic union can be anything after the disintegration. That is, $\tau_{U,I}^{t,\text{old}} = 0$ and $\tau_{U,I}^{t,\text{new}} \geq 0$. Observe that this includes the case where country $l$ remains in the customs union.
Common external tariffs are an essential feature of the customs union. Therefore, when country \( l \) decides to remain a member of the customs union, there will be no first-order change in trade policies vis-à-vis third countries. To put it differently, the countries \( \mathcal{K}_U \) and \( l \) jointly decide on external trade taxes before and after the disintegration of \( l \). Objective functions and instruments of tariff policies remain the same. Only non-tariff trade barriers inside the customs union change. This change, however, has no first-order effect on the other trade policies. To determine the exact sign of second-order effects, one needs to know about higher derivatives of welfare functions with respect to the respective trade-policy instruments.

Now, suppose that country \( l \) departs from the customs union but stays within the set of countries that participate in trade agreements. Recall that before the disintegration member countries solve

\[
\left( \tau_{U,U}, \tau_{U,l}^{old} \right) := \arg \max_{\{ \tau_p^p, \tau_t^p \}} \sum_{m \in \mathcal{K}_U \cup \{ l \}} W_m (\cdot) \quad \text{subject to} \quad \left( \tau_{U,U}^{old}, \tau_{U,l}^{old} \right) = 0, \tag{32}
\]

but afterwards

\[
\left( \tau_{U,l}^{new}, \tau_{U,U}^{new} \right) := \arg \max_{\{ \tau_p^p, \tau_t^p \}} \sum_{m \in \mathcal{K}_U \cup \{ l \}} W_m (\cdot) \quad \text{subject to} \quad \left( \tau_{U,U}^{new}, \tau_{U,l}^{new} \right) = 0 \quad \text{and} \quad \left( \tau_{U,U}^{new} \right) = \arg \max_{\tau_p^p} \sum_{m \in \mathcal{K}_U} W_m (\cdot). \tag{33}
\]

Then, our approach delivers

\[
\sum_{m \in \mathcal{K}_U \cup \{ l \}} \nabla_{\tau_{U,l}} W_m (\tau_p^{old}, \tau_t^{old}, \tau_{U,U}^{new}) > 0.
\]

In principle, the sign of the relevant gradient and, therefore, the sign of post-disintegration trade taxes \( \tau_{U,l}^{new} \) are ambiguous. In our model, for example, introducing domestic import tariff in country \( l \) would mean higher prices and a lower consumer surplus there. At the same time, ceteris paribus some marginal firms move to country \( l \) to gain low-cost market access, which means a rise in business tax revenues in \( l \). In addition, country \( l \) generates tariff revenues.

Having dealt with the effects of economic disintegration on the trade policies between countries \( l \) and \( \mathcal{K}_U \), we now speak to the impact on trade agreements of the union and the leaving country with third countries. Fix a country \( TA \in \mathcal{K}_{TA} \). Once again, observe that the objective
function and the trade-policy instruments of the Nash bargaining change as follows:

\[
\left( \tau_{U,TA}^{\text{old}}, \tau_{I,TA}^{\text{old}} \right) := \underset{\left( \tau_{U,TA}^{\text{old}}, \tau_{I,TA}^{\text{old}} \right)}{\text{arg max}} \sum_{m \in \mathcal{X}_U \cup \{l, TA\}} W_m (\cdot) \tag{34}
\]

and

\[
\left( \tau_{U,TA}^{\text{new}} \right) := \underset{\tau_{U,TA}^{\text{new}}}{\text{arg max}} \sum_{m \in \mathcal{X}_U \cup \{TA\}} W_m (\cdot) \quad \text{and} \quad \left( \tau_{I,TA}^{\text{new}} \right) := \underset{\tau_{I,TA}^{\text{new}}}{\text{arg max}} W_l (\cdot) + W_{TA} (\cdot). \tag{35}
\]

Again, consider a first-order approximation of welfare in \(\mathcal{X}_U\) and \(TA\) in the new optimum and use the first-order conditions of the respective optimization to show that

\[
-\nabla_{\tau_{U,TA}^{\text{new}}} W_l \left( \tau_{U,TA}^{\text{new}}, \tau_{I,TA}^{\text{old}} \right) \left( \tau_{U,TA}^{\text{new}} - \tau_{U,TA}^{\text{old}} \right)^{\prime} > 0,
\]

which implies, together with Lemma 2, \(\tau_{U,TA}^{\text{new}} < \tau_{U,TA}^{\text{old}}\). By a similar reasoning,

\[
- \sum_{m \in \mathcal{X}_U} \nabla_{\tau_{I,TA}^{\text{new}}} W_m \left( \tau_{U,TA}^{\text{new}}, \tau_{I,TA}^{\text{old}} \right) \left( \tau_{I,TA}^{\text{new}} - \tau_{I,TA}^{\text{old}} \right)^{\prime} > 0.
\]

Therefore, for \(\sum_{m \in \mathcal{X}_U} \nabla_{\tau_{I,TA}^{\text{new}}} W_m \left( \tau_{U,TA}^{\text{old}}, \tau_{I,TA}^{\text{old}} \right) > 0\) (i.e., members of the union benefit from a trade war between \(l\) and \(TA\)), \(\tau_{I,TA}^{\text{new}} < \tau_{I,TA}^{\text{old}}\). Hence, both country \(l\) and union-member countries deepen their trade agreement with country \(TA\) by lowering trade taxes.

Consider, now, noncooperative trade policies by the economic union vis-à-vis a country \(Rest \in \mathcal{X} \setminus (\mathcal{X}_{TA} \cup \mathcal{X}_U \cup \{l\})\). Use bold letters for trade-policy instruments which are under the control of the respective government. Noncooperative trade policies before and after the disintegration of \(l\) are given by

\[
\left( \tau_{U,Rest}^{\text{old}}, \tau_{I,Rest}^{\text{old}} \right) := \underset{\left( \tau_{U,Rest}^{\text{old}}, \tau_{I,Rest}^{\text{old}} \right)}{\text{arg max}} \sum_{m \in \mathcal{X}_U \cup \{l\}} W_m (\cdot) \tag{36}
\]

and

\[
\left( \tau_{U,Rest}^{\text{new}} \right) := \underset{\tau_{U,Rest}^{\text{new}}}{\text{arg max}} \sum_{m \in \mathcal{X}_U} W_m (\cdot) \quad \text{and} \quad \left( \tau_{I,Rest}^{\text{new}} \right) := \underset{\tau_{I,Rest}^{\text{new}}}{\text{arg max}} W_l (\cdot). \tag{37}
\]

Again, linearize welfare in the new optimum and use the optimality conditions to demonstrate
that

\[-\nabla_{\tau_{U, \text{Rest}}} W_i \left( \tau_{P, \text{old}}, \tau_{t, \text{old}} \right) \left( \tau_{U, \text{Rest}}^{\text{new}} - \tau_{U, \text{Rest}}^{\text{old}} \right) > 0\]

and

\[-\sum_{m \in \mathcal{K} U} \nabla_{\tau_{I, \text{Rest}}} W_m \left( \tau_{P, \text{old}}, \tau_{t, \text{old}} \right) \left( \tau_{I, \text{Rest}}^{\text{new}} - \tau_{I, \text{Rest}}^{\text{old}} \right) > 0.\]

One can conclude that \( \tau_{U, \text{Rest}}^{\text{new}} < \tau_{U, \text{Rest}}^{\text{old}} \) and \( \tau_{I, \text{Rest}}^{\text{new}} < \tau_{I, \text{Rest}}^{\text{old}} \). Therefore, the disintegration of \( l \) reduces not only cooperatively-chosen tariffs but also noncooperative tariffs.

The effects of the economic disintegration on TAs between countries, which are not part of the union, as well as noncooperative trade policies by any third country, are of second order. The reason is that the objective functions and instruments of tariff policies remain the same. Therefore, policies are only indirectly altered. Cross derivatives of welfare functions measure the changes in these policies with respect to the respective trade-policy instruments.

\[ \text{Figure 9: Endogenous Trade Policies and Exit Incentives; Parameters: } \alpha = 7, \beta = 1, w = 1, \bar{F} = -F = 0.5, K = 5, K_U = 2, \tau_{m1m2} = \tau_{m2m1} = 0.5, \tau_{ij} = \tau_{ji} = 1, \forall j \notin \mathcal{K}_U, \text{ negligible tariff revenues; Full Symmetry: } n_i = \frac{1}{K}, \forall i \text{ vs. Large Country: } \sum_{j \in \mathcal{K}} n_j = 1, n_l = 2n_i, \forall i \neq l \]