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A Theory of Economic Disintegration

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Abstract

We develop a theory of economic disintegration with both endogenously formed tax and trade policies. We show very generally that the economic disintegration of a country from an economic union leads to a deeper integration of international trade institutions. Moreover, we set up a multi-country, multi-sector general equilibrium trade model with internationally mobile firms. We address the key dimensions of economic disintegration, such as tariffs, non-tariff barriers, the harmonization of production standards and regulations, business frictions, as well as household migration and analyze their effects on the domestic tax policies of asymmetric countries.

Keywords: Trade Policy, Tax/Subsidy Competition, Oligopolistic Markets, Economic Integration

JEL Classification: F13, F15, F22, F53, H25, H73

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1 Introduction

“We’re going to stop the ridiculous trade deals that have taken everybody out of our country and taken companies out of our country, and it’s going to be reversed.” – Donald Trump, President of the United States.

After decades of international integration, recent movements towards economic disintegration have emerged. The United Kingdom’s referendum to leave the European Union, as well as US President Trump’s threat to depart from the WTO, are prominent examples of such protective policy measures that have lately gained significant influence. Similarly, this is the case for the renegotiation of NAFTA and the failure to finalize trade agreements like TPP and TTIP.

The emergence of this protectionism raises several economic policy issues: First of all, is economic disintegration that takes place unilaterally the same as reverse integration that is usually a multilateral process? How are international trade agreements affected by such movements?

Contributors to the modern trade policy literature, as founded by Bagwell and Staiger (1999), highlight the advantages of forming international trade agreements to overcome the Prisoner’s Dilemma of mutual terms-of-trade manipulation. *Ceteris paribus*, in a state of economic disintegration, countries are, therefore, worse off compared to free trade.

However, the disintegration of one country from an economic union or a regional trade agreement has global repercussions for existing international agreements. In other words, international agreements react worldwide to economic disintegration. For example, it may well be the case that the UK and the remaining European Union are adversely affected as the conditions under which these countries trade with each other worsen due to Brexit. At the same time, depending on the legal implementation of Brexit, both the UK and the EU may now be free to (re)negotiate trade agreements with other countries (e.g., the US and China) without the need to consider each other. When reevaluating their trade policies towards these countries, the EU’s objective function changes as the UK does not sit at the negotiating table anymore. Similarly, the UK now sets its policies towards China and the US solely in its interest. In turn, cooperative and non-cooperative trade policies towards these countries are affected. As a consequence, the welfare implications of unilateral economic disintegration become less straightforward compared to those of a reverse

multilateral integration.

Another critical question is how domestic policies, such as business taxation, react to the degree of economic integration. A significant body of theoretical and empirical research suggests that countries lower their taxes to attract internationally mobile capital, labor, and foreign direct investment. The ongoing globalization of the world economy is known to make production factors and firms more mobile across space and, as a result, 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.

If disintegration were the opposite of integration, Brexit should lead to higher taxes according to conventional wisdom. However, many believe that the UK would have to lower taxes after Brexit to stay competitive, and this would also push down taxes in the remaining EU countries. The possible consequences for tax policies from the US exiting the WTO are also not clear a priori. Because the US is a large market which foreign firms want to serve, higher barriers to trade between the US and the rest of the world could induce higher capital inflows to the US (through FDI). These could make higher taxes in the US possible and put downward pressure on taxes elsewhere to prevent capital outflows.

To the best of our knowledge, this is the first paper that builds a comprehensive theory of economic disintegration. We develop a novel approach to study very generally the impact of unilateral disintegration on trade policies worldwide. That is, we not only speak to the effects on trade policies in countries that are directly affected by the disintegration of one country from an economic union, but also to the effects on trade policies in third countries. We address both tariff and non-tariff trade policies.

Moreover, we build a highly tractable multi-country, multi-sector general equilibrium trade model with international firm mobility and non-cooperative business tax policy. To keep the model analytically solvable, we adopt the idea of Fuest and Sultan (2019) that, in a given industry, firms can invest in only two out of several countries. The Ricardian idea of international specialization inspires the latter. Industries differ in the country pairs in which firms produce as well as in the country-specific location fixed costs. Competition on taxes arises from the fact that in each

industry there is an internationally mobile firm in addition to immobile firms in both countries. Thereby, the country-specific fixed cost distribution over industries has a direct bearing on the elasticity of firm relocation, as it determines the firms' degree of attachment to a particular country. Economically, we interpret the relative fixed costs as the degree of similarity in regulations across countries that apply when setting up a firm. The parsimony in the modeling of firm mobility allows us to characterize each country's Nash equilibrium business tax policy in closed form as a function of country-pair specific trade costs, firm-location fixed cost distributions, country sizes, and preferences.

We characterize economic disintegration by several comparative statics. Most prominently, we deal with a rise in bilateral trade costs between a leaving country and the remaining member countries of an economic union. Secondly, we directly refer to economic disintegration as a change in the number of member countries. Moreover, we link the degree of economic integration to relocation costs of mobile firms in a given country and address household migration.

We derive two sets of results. Firstly, when the disintegration of a country from an economic union (or a trade agreement) raises tariff and non-tariff trade costs (trade-cost effect), the tax in the leaving country decreases. The trade-cost effect on business taxes set by the remaining member countries depends on the size of the economic union. When the union is relatively large compared to the rest of the world, the disintegration of one country softens tax competition inside the union. That is the case when there is a large single market with few competing markets. The contrary is true when the economic union is small relative to the world market. That is, under a significant size of competing markets, which is the case at an advanced stage of globalization, the remaining member countries need to compete harsher for mobile firms after a member country leaves. Under considerable asymmetries in the size of member countries, tax policy reactions within the union point in opposite directions. Since third countries outside the economic union become more attractive as a business location relative to the other countries, their ability to tax improves. These observations hold for both tariffs and non-tariff barriers to trade.

Furthermore, when the economic disintegration of a country reduces the degree of international harmonization in regulations, firms, which seek to relocate, face higher costs of mobility (de-

harmonization effect). Thus, in the short run, when firms do not anticipate this cost change, they may become less mobile across countries which tends to raise taxes in our model. In the long run, economic disintegration discourages investment in the leaving country because it reduces the sum of future profits firms can realize in that country (business-friction effect). We model this by a shift in the relocation cost distributions to the detriment of the leaving country. We highlight substantial differences in the reaction of taxes depending on whether or not firms anticipate the economic disintegration.

Altogether, tax policies substantially interact with the economic disintegration along several dimensions. We identify a trade-cost effect, a de-harmonization effect, and a business-friction effect of economic disintegration. Moreover, we document a migration effect that, in its consequences, resembles the business-friction effect and a union-size effect that is similar to the trade-cost effect.

Secondly, as pointed out, we go beyond the initial model setup where trade policies are exogenous and change mechanically with disintegration. We consider the situation in which tariffs and non-tariff barriers are endogenously bargained over by countries initially, without relying on a specific model. We focus on the disintegration of one country from an economic union.

We predict that the countries inside the union integrate more with each other and with countries with which they form regional trade agreements. The leaving country also intensifies trade agreements with third countries. Similarly, non-cooperative trade policies by the economic union, as well as by the leaving country, become less protective. These trade policy responses have repercussions on the setting of optimal business taxes.

Our results suggest that the UK might indeed become a tax haven after Brexit and that the effects on business taxes in the remainder of the EU crucially depend on the trade policies the UK and the remaining EU member countries undertake subsequently. We predict from our model that both deepen their trade relations with other countries.

At the same time, our model applies beyond the case of Brexit. A similar argument applies to countries which consider leaving the WTO as threatened by the Trump administration. When the US exit the WTO, our model predicts that the US would need to lower business taxes to compensate for the loss in attractiveness as a business location. A reverse argument holds for

unilateral economic integration. Prominent examples were the 2004 and 2007 enlargement of the European Union with countries mostly from the former Eastern Bloc joining the EU. The dismantling of barriers to trade with the preexisting member countries improved market access for firms located in the joining countries such that the latter countries experienced a rise in their ability to tax corporations. Of course, as our model shows, this observation only holds for fixed trade policies, a given distribution of households across countries, and fixed firm-relocation costs. To give an example, if the free movement of workers in the EU causes citizens to emigrate from these Eastern European countries, their ability to tax may suffer as a consequence of the lost market size (migration effect).

Related literature. Our paper relates to three strands of the literature. First of all, we add to the debate on inter-jurisdictional tax competition. Usually, in this literature, there are 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 Tranno (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. Just as in our model, some of the authors, for instance, Bucovetsky (1991) and Haufler and Wooton (1999), address cross-country asymmetries. We show that not only the relative size of a given market but also the institutional structure of the world economy profoundly affects tax differentials. We develop a stylized model that can be explicitly solved. Complementary to this, there are a 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 very carefully.

Secondly, a related strand of the literature investigates the relation between regional taxes and trade costs, e.g., Ottaviano and Van Ypersele (2005) and Haufler and Wooton (2010). In these two-country settings, a reduction in trade barriers makes it less critical for a firm to set up an FDI platform in the larger market, as export costs to this market are then low, and the firm can easily access both markets irrespective of its location. Vice versa, if trade costs were high, firms would like to locate in the large market irrespective of the business tax differential until the the

location rents in the large market are absorbed by an increased degree of regional competition. Although some of the literature has addressed this link, no work endogenizes tax and trade policy in a model with more than two geographically linked regions. For example, in the three-country models of Raff (2004) and Cook and Wilson (2013), the government of one country 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.

Two key challenges have, so far, prevented the authors from progressing to more realistic multi-country models. The first one 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 are, in turn, endogenous to the distribution of firms. As a result, it is hard to derive the objective function of the government in each country. Secondly, each country's tax is a best response to all the other countries' taxes. Therefore, the optimal tax in a country is a general equilibrium object. Restricting attention to partial equilibrium responses lacks critical insights from the empirical literature on tax competition. We overcome both of these issues by reducing the dimensionality of the firm-level relocation problem. At the same time, 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.

Finally, our paper relates to the literature on trade policy. As in Ossa (2011) and Bagwell and Staiger (2012), we deal with the effects of trade policy including firm-relocation effects. However, these authors ignore the presence of non-cooperative tax policy, which is the focus of our paper. Furthermore, we extend the classical debate on optimal tariffs, started by Bagwell and Staiger (1999), by two dimensions. We study the impact of economic disintegration on trade policies worldwide, taking existing imperfections of trade agreements as given. Moreover, we endogenize various other components of trade policy, including non-tariff trade barriers and the harmonization in production standards and business regulations. Contrary to tariffs, the non-tariff dimensions embrace no revenue collection motive of the government while still affecting the terms of trade and

firm relocation.

Outline of the paper. This paper is structured as follows. In Section 2, we first develop a multi-country, multi-sector general equilibrium trade model with firm mobility and non-cooperative business taxation. Then, we derive the effects of economic disintegration along several dimensions. Moreover, we consider various model extensions. Finally, we endogenize trade policies to study the readjustment of tariff and non-tariff trade policies worldwide in reaction to economic disintegration. Section 3 concludes. We relegate all relevant proofs to the Online Appendix.

2 The Impact of Economic Disintegration on Tax and Trade Policies

In this section, we analyze the impact of economic disintegration on tax and trade policies. We refer to economic disintegration as the departure of one country from a trade agreement formed by a set of countries (e.g., an economic union). In Section 2.1, we build a highly tractable three-country, multi-sector general equilibrium trade model with firm selection and derive each country's optimal Nash equilibrium tax policies. We then identify several model-inherent dimensions of economic disintegration and analyze their effects on optimal tax policies (Section 2.2). In Section 2.3, we demonstrate that our three-country model and the derived economic insights readily extend to an arbitrary number of countries. Then, we consider various extensions to our model (Section 2.4). Finally, we develop a novel approach for studying the readjustment of trade policies worldwide triggered by economic disintegration (Section 2.5).

2.1 The Three-Country Model

Timing. We build a four-stage economy, \mathcal{E} , of fiscal competition with initially three countries, which we will later extend to an arbitrary set of countries, \mathcal{K} . In the first stage, taking trade policies as given, each government non-cooperatively chooses a business tax, t_i , to maximize national welfare consisting of consumer surplus and tax revenues. Given tax and trade policies, a continuum of mobile firms selects into countries in the second stage. In the third stage, each mobile firm competes in an oligopolistic industry with two other firms in general equilibrium. All firms are single-product businesses and trade their products worldwide. To achieve tractability, we assume that, in each industry, firms can produce in only two out of multiple countries. Industries differ in the pair of countries in which firms produce and the country-specific fixed costs of setting up a firm. In the fourth stage, households optimally choose their demand. To fix ideas, we define the subgame-perfect Nash equilibrium of this game.

Definition 1. Consider economy \mathcal{E} . 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 demand 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, respectively, and
- (4) governments maximize national welfare over taxes taking the other countries' taxes as given and anticipating the behavior of firms and consumers as described in (1) – (3).

Economic Disintegration. We analyze economic disintegration by carrying out comparative statics of this subgame-perfect Nash equilibrium. Specifically, the trade costs between any pair of countries depend on the level of economic integration between these two countries and may differ across country pairs. An increase in the trade costs of respective country pairs captures economic disintegration. Accordingly, we label the impact on tax policies as a trade-cost effect. Moreover, we consider country-pair specific distributions of fixed cost to set up a firm and derive a de-harmonization effect and a business-friction effect. Finally, we deal with migration between countries as a simultaneous offsetting change in the population between country pairs, which triggers a migration effect.

We now describe the model more formally. As mentioned, the economy denoted as \mathcal{E} includes four stages. Let \mathcal{K} denote the non-empty set of countries and $K := |\mathcal{K}| \in \mathbb{Z}^+$ its cardinality. In this section, we consider $K = 3$, but in Section 2.3, we extend the model to $K > 3$. Figure 1 illustrates the three-country economy.

2.1.1 Households

Preferences. In each country $i \in \mathcal{K}$, a number n_i of identical households consumes a continuum of differentiated varieties, which oligopolistic firms produce, and a numéraire commodity, z_i , which firms produce under perfect competition. Varieties, $x_i(\mu)$, are indexed by $\mu \in \Omega := [0, 1]$. Labor is the only production input. Under the assumption that the production of the numéraire good takes place in every country, the numéraire industry pins down a wage rate w which equalizes across

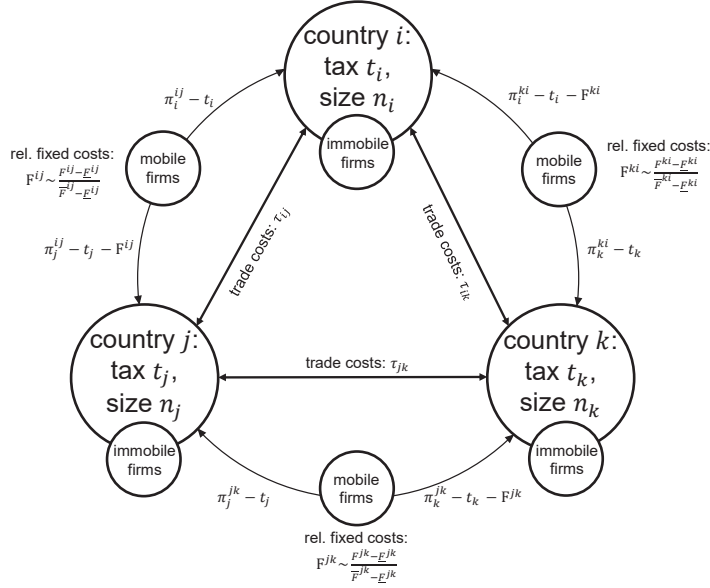


Figure 1: The three-country model

countries. Each variety is produced in an oligopolistic industry, which consists of three firms.¹ Households derive the following utility

$$u_i := z_i + \int_{\mu \in \Omega} (\alpha x_i(\mu) - \frac{\beta}{2} x_i(\mu)^2) d\mu \quad (1)$$

from the consumption of products manufactured by the numéraire and the oligopolistic industries. These preferences are a particular case of those in Melitz and Ottaviano (2008).² Household income comes from supplying labor inelastically and from the business taxes the government rebates in lump-sum fashion.

Utility Maximization (Stage 4). The quadratic utility function generates a system of linear aggregate demand functions

$$X_i(\mu) = \frac{n_i(\alpha - p_i(\mu))}{\beta} \quad (2)$$

¹All the results carry over when one considers monopolists which are mobile between two countries. To endogenize the degree of local competition to firm relocation, we decide to conduct our baseline analysis under an oligopolistic market structure. The immobility of two-out-of-three firms is assumed to maintain the tractability of the model.

²For simplicity, we shut down cross-price effects. As we will see, prices and mark-ups will be endogenous to the location decision of firms.

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

2.1.2 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 τ_{ij} , where $\tau_{ij} = \tau_{ji} \in \mathbb{R}^+$ and $\tau_{ii} = 0$, such that the marginal costs of production read as $w + \tau_{ij}$. We interpret trade costs in a broader sense as the degree of economic integration. These refer to all non-tariff barriers to trade of goods and services such as consumer protection, quality requirements, health standards, and environmental protection. Therefore, our definition of trade costs goes beyond the classical notion of tariffs, quotas, and transport cost differentials arising from geographical characteristics. For the time being, we assume trade costs to be exogenous, although subject to change with disintegration. In Section 2.4, we deal with tariffs and show that our results carry over. Moreover, we endogenize tariff and non-tariff trade policies (Section 2.5).

In order to avoid corner solutions, assume that $\tau_{ij} \leq \frac{\alpha-w}{3}$ for all i, j , so that consumption choices and trade flows are weakly positive in equilibrium. As Haufler and Wooton (2010), we assume that firm profits do not accrue to residents in \mathcal{H} . As we will show later on, our results are robust to the accrual of domestic profits.

Firm Heterogeneity. Inspired by Melitz (2003), we introduce firm heterogeneity as follows: In each industry, there are three firms.³ One immobile firm produces in one of two countries. A third mobile firm can decide in which of the two countries it locates. In the third country, the production of that specific good is not possible, perhaps due to technological, regulatory, or geographical frictions. This location structure is in line with the Ricardian idea of international specialization. However, industries differ in which two of the three countries they can produce. Specifically, there are three types of industries. In an ij -industry, firms are active either in country i or j . jk - and ki -industries are defined accordingly. Throughout the analysis, superscripts will indicate the particular industry type. To rule out asymmetries in initial conditions, let the mass

³In Section 2.4, we relax this assumption.

of potential firms be ex ante equal across countries. That is, we partition the set of industries Ω into K equally sized intervals.

Moreover, industries differ in a relative fixed cost F^{ij} that the mobile firm pays when comparing the two possible locations – i.e., a firm pays F^{ij} more in country j than in i . One can, therefore, interpret this fixed cost as the cost of relocating from country i to j . We assume that F^{ij} has policy and non-policy components. The policy components are given by the country-specific level of frictions when setting up a business, ν^i and ν^j , which are determined by factors such as bureaucracy, regulatory complexity, access to infrastructure, and the availability of land. Another policy component is the degree of harmonization in production standards and business regulations between two countries, ϵ^{ij} . Observe that the former affects the level of relative relocation costs, whereas the latter alters their variance. An idiosyncratic location preference shock, ϵ , pins down the non-policy component.

Formally, let $F^{ij} := \nu^j - \nu^i + \epsilon^{ij} + \epsilon$ where $\epsilon^{ij} + \epsilon \in [\underline{\epsilon}_{ij} + \underline{\epsilon}, \bar{\epsilon}^{ij} + \bar{\epsilon}]$ is drawn from a uniform cumulative distribution function with zero mean. Therefore, F^{ij} is also uniformly distributed with a CDF $G^{ij}(F^{ij}) = \frac{F^{ij} - \underline{F}^{ij}}{\bar{F}^{ij} - \underline{F}^{ij}}$, where $\underline{F}^{ij} := \nu^j - \nu^i + \underline{\epsilon}_{ij} + \underline{\epsilon}$ and $\bar{F}^{ij} := \nu^j - \nu^i + \bar{\epsilon}^{ij} + \bar{\epsilon}$. In this section, we impose, for simplicity, symmetry in relocation cost distributions across country pairs. That is, assume $G^{ij}(F^{ij}) = G(F^{ij}) = \frac{F^{ij} - \underline{F}}{\bar{F} - \underline{F}}$. In Section 2.2.2, we deal with the effects of the country- and country-pair-specific policy components that alter the mean and the variance of relocation costs. Altogether, each mobile firm pays different fixed costs of production, giving rise to an extensive margin of firm relocation, which affects local prices and production quantities.

Profit Maximization (Stage 3). A firm producing in country i and industry ij maximizes profits by choosing the sales in the home market, x_{ii} , and exports to j and k , x_{ji} and x_{ki} . The maximization problem in the third stage of our four-stage game is, therefore, defined as

$$\pi_i^{ij}(\mu) := \max_{x_{ii}(\mu), x_{ji}(\mu), x_{ki}(\mu)} (p_i(\mu) - w) x_{ii}(\mu) + (p_j(\mu) - w - \tau_{ij}) x_{ji}(\mu) + (p_k(\mu) - w - \tau_{ik}) x_{ki}(\mu) \quad (3)$$

subject to the oligopolistic market structure. Then, pre-tax variable profits of a firm located in

country i read as

$$\pi_i^{ij}(\mu) = \begin{cases} \frac{n_i(\alpha-w+\tau_{ij})^2}{16\beta} + \frac{n_j(\alpha-w-2\tau_{ij})^2}{16\beta} + \frac{n_k(\alpha-w-2\tau_{ik}+\tau_{jk})^2}{16\beta} & \text{if mobile firm locates in } i \\ \frac{n_i(\alpha-w+2\tau_{ij})^2}{16\beta} + \frac{n_j(\alpha-w-3\tau_{ij})^2}{16\beta} + \frac{n_k(\alpha-w-3\tau_{ik}+2\tau_{jk})^2}{16\beta} & \text{if mobile firm locates in } j. \end{cases} \quad (4)$$

The asymmetry in profits from markets j and k are 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 country k there is no domestic firm active by assumption.⁴ In country each i , firms are taxed lump-sum with t_i .

Firm Relocation (Stage 2). We now turn to the second stage, the location decision of mobile firms. The mobile firm in industry ij produces in country i as long as after-tax profits⁵ are larger in i than in j :

$$\pi_i^{ij}(\mu) - t_i \geq \pi_j^{ij}(\mu) - t_j - F^{ij}. \quad (5)$$

In other words, a firm prefers country i if the advantage in gross profits exceeds the tax differential corrected by the relative fixed cost. Since we have a continuum of industries that differ in fixed costs, we can now characterize the mass of industries and firms in a country. For this, we define the following threshold industries in which the mobile firm is indifferent between the two countries

$$\gamma^{ij} := \pi_j^{ij}(\mu) - t_j - (\pi_i^{ij}(\mu) - t_i), \quad \gamma^{ki} := \pi_i^{ki}(\mu) - t_i - (\pi_k^{ki}(\mu) - t_k). \quad (6)$$

In country i , the mass of industries with one regional firm (i.e., one immobile firm) is given by

$$G(\gamma^{ij}) + [1 - G(\gamma^{ki})], \quad (7)$$

where the first term refers to the industries where fixed costs in country j are relatively low compared to i , and similar for the second term, where fixed costs measure the set-up cost in

⁴One may easily relax this assumption.

⁵While pre-tax variable profits (4) are non-negative, we cannot rule out directly that net profits (after tax and fixed cost) are as well. In simulations, we showed for various parameter value combinations that there exist subgame-perfect equilibria in which the profits of all firms were non-negative. 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 non-negative.

country i relative to k . The mass of industries with two regional firms (i.e., one mobile and one immobile firm) in i reads as

$$\left[1 - G(\gamma^{ij})\right] + G(\gamma^{ki}). \quad (8)$$

Notice that households in country i consume goods produced by jk -industries, but there is no production in or relocation towards i , which significantly simplifies the analysis. Mobility between more than two countries would make necessary extensive numerical simulations, as in Ossa (2015). Our approach's main advantage is that, although the firm-level location decision is binary, the equilibrium firm distribution is a high-dimensional object that is tractable enough to derive clear-cut policy predictions. Our concept of mobility allows us to write the threshold industry level in closed form as a function of the model parameters

$$\gamma^{ij} = \tau_{ij} (n_j - n_i) \frac{6(\alpha - w) - 3\tau_{ij}}{16\beta} + n_k (\tau_{ik} - \tau_{jk}) \frac{6(\alpha - w) - 3(\tau_{ik} + \tau_{jk})}{16\beta} + t_i - t_j. \quad (9)$$

Comparative Statics. The partial equilibrium comparative statics are intuitive. The higher the tax in country i relative to j and k , the more firms move out of that country (γ^{ij} increases and γ^{ki} decreases, respectively). Observing that the sign of $\frac{\partial \gamma^{ij}}{\partial \tau_{ij}}$ depends on the country's relative size, already hints towards a critical effect of economic disintegration: As described earlier, a rise in trade costs pushes firms to move to larger countries. For mobile firms, market access considerations become more important compared to business tax differentials. If trade becomes more costly for firms located abroad, firms move to country i ($\frac{\partial \gamma^{ij}}{\partial \tau_{ik}} > 0$ and $\frac{\partial \gamma^{ij}}{\partial \tau_{jk}} < 0$).

2.1.3 Governments

Welfare Maximization (Stage 1). In this section, we consider the first stage of our economy. That is, for a given level of trade costs, we derive Nash equilibrium taxes set by benevolent social planners in each country, who take the effect of taxes on households' consumption choices and location and output decisions of all firms and industries into account. Then, we consider several potential sources of asymmetries that emerge in our model, including trade costs and country sizes, and discuss how these affect tax policy.

Consider country i . We can compute the total number of firms (as opposed to the mass of industries) by adding equation (7) and two times equation (8) to get $3 - G(\gamma^{ij}) + G(\gamma^{ki})$, and hence tax revenues $T_i := t_i (3 - G(\gamma^{ij}) + G(\gamma^{ki}))$. Moreover, the Online Appendix shows that consumer surplus is given by

$$S_i := G(\gamma^{ij}) \Delta_i^{ij} + G(\gamma^{jk}) \Delta_i^{jk} + G(\gamma^{ki}) \Delta_i^{ki} + \delta_i^{ij} + \delta_i^{jk} + \delta_i^{ki}, \quad (10)$$

where Δ_i^{ij} , Δ_i^{jk} , Δ_i^{ki} , δ_i^{ij} , δ_i^{jk} , and δ_i^{ki} are defined as functions of the model's primitives

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

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

$$W_i := \max_{t_i} S_i + T_i + n_i w \quad (11)$$

taking t_j and t_k as given. Similarly, welfare is maximized in countries j and k over t_j and t_k , respectively.

The first-order condition of the social planner problem yields a reaction function $t_i(t_j, t_k, \Theta)$ for each country i . As we show in the Online Appendix, 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. In the following, we consider the equilibrium of this game with three countries.

Nash Equilibrium Comparative Statics. Lemma 1 verbally summarizes comparative statics of Nash equilibrium taxes with respect to trade costs and country sizes. For a more technical statement, we refer to the Online Appendix.

Lemma 1 (trade cost change). *In the subgame-perfect equilibrium of economy \mathcal{E} ,*

(a) *a rise in country i 's population size, n_i , increases that country's business tax, whereas an increase in another country's population, n_j , reduces country i 's tax, as long as trade between these*

countries is not too cheap relative to the one between other countries ($\tau_{ij} \not\ll \tau_{jk}$), and

(b) a rise in country i 's trade costs vis-à-vis another country, τ_{ij} , decreases country i 's business tax, as long as it is not too large relative to the other country ($n_i \not\gg n_j$). An increase in the trade costs of other countries, τ_{jk} , raises country i 's business tax.

First of all, an increase in absolute market size, for instance, induced by population growth in a country, improves that country's ability to tax. Therefore, larger countries tend to tax more. The effect of a growing population in another country is less clear. The relationship between t_i and n_j is positive if the trade of country j with k is very costly compared to the one with country i . On the other hand, $\frac{dt_i}{dn_j} < 0$ if τ_{ij} and τ_{jk} are sufficiently similar. The same arguments apply to the effects of n_k on t_i . When i and j form an economic union (i.e., $\tau_{ik} = \tau_{jk} > \tau_{ij}$), an enlargement of market k reduces taxes inside the union.

Moreover, higher trade costs between countries j and k unambiguously lead to an increase the tax in country i . Intuitively, countries j and k lose attractiveness when their trade costs rise, which puts country i in the position to tax more. Moreover, provided that country i is not too large higher trade costs for firms in i put pressure on i 's government to lower the tax to attract firms. If country i is very large relative to j , $\frac{dt_i}{d\tau_{ij}}$ can be positive. An increase in τ_{ij} makes tax savings motives less relevant for the location choice of firms because these just want to have low-cost access to the huge market. In other words, the tax base of country i becomes less elastic in response to a rise in τ_{ij} . However, one should note that the taxes in i and j cannot increase simultaneously. That is, there will always be a country that has to lower its tax.

Having dealt with these comparative statics, in Corollary 1 in the Online Appendix we consider comparative statics of the (unweighted) average taxes with respect to trade costs. When bilateral trade costs between i and j increase, the average tax in these countries falls. The same holds for the average tax worldwide. A rise in τ_{ij} reduces economic activity worldwide, and attracting firms to improve domestic prices becomes more important. The effect on the average tax in country i and a third country k is ambiguous.

2.2 The Impact of Economic Disintegration on Tax Policies

In the following, we will consider several channels through which economic disintegration affects tax policy. First and foremost, the costs of bilateral trade between countries change (trade-cost effect). Moreover, economic disintegration alters the international mobility of firms via location fixed costs (de-harmonization effect and business-friction effect). Finally, we deal with the possible migration of households (migration effect).

2.2.1 Trade-Cost Effect

Suppose now that countries i and j are in an economic union. What happens to taxes when trade between country k and the economic union becomes more (or less) costly? As Proposition 1 shows, the answer depends on the relative sizes of the three markets. The proposition trivially follows from Lemma 1. Again, we relegate a more technical formulation of Proposition 1 to the Online Appendix.

Proposition 1 (trade-cost effect). *Consider the subgame-perfect equilibrium of economy \mathcal{E} and suppose that countries i and j form an economic union. Then, the disintegration of country k via a rise in bilateral trade costs with countries i and j*

(a) *reduces the leaving country's business tax, as long as it is not too large relative to the economic union, and*

(b) *reduces taxes in the remaining member countries, as long as the economic union is not too large relative to the leaving country. Under considerable asymmetries in population sizes, business taxes inside the economic union converge.*

(c) *Under symmetric population sizes of all three countries, the disintegration reduces taxes in all countries.*

When countries have the same population size ($n_i = n_j = n_k$), the tax in the leaving country declines. The same holds if it is not too large relative to the economic union. The market access argument described above drives this result.

If market sizes are equal, taxes in the remaining economic union decrease. In case that the leaving country is huge (small) relative to the economic union, taxes in the union decline (rise).

Notice that the reaction of taxes inside the economic union can be asymmetric depending on the relative size of the two markets. Let j be the largest of the three markets. Observe that the increase in trade costs with country k may help the smaller country i to tax more, whereas the larger country j needs to lower its tax. Country j still taxes more than i , but taxes converge as a reaction to the disintegration of k .

Proposition 1 is our first main result. It speaks to the hypothesis that, after Brexit, the UK lowers its tax, and this, in turn, puts pressure on the tax policies of countries inside the union. Taking the populations of the UK and France (which is very similar at 66 and 67 million) and Germany at 83 million, a UK departure from a union among these three countries would lead to lower taxes in all countries according to our admittedly simple model. The hypothetical exit of a somewhat smaller country like Spain (47 million) from a joint union with France and Germany, however, would lead to an increase in tax in France (whereas still lowering taxes in the other two countries).

2.2.2 De-Harmonization Effect and Business-Friction Effect

De-Harmonization Effect. So far, we have considered asymmetries which directly affected production choices by firms, that is, the intensive margin of firm decisions. Through pre-tax profit differentials, these asymmetries indirectly also change cutoff industries, which determine the relative number of firms. By contrast, we now consider the direct effects of economic disintegration on firm relocation. Recall that a firm in industry ij locates in country i only if $\pi_i^{ij}(\mu) - t_i \geq \pi_j^{ij}(\mu) - t_j - F^{ij}$. That is, the firm has to cover a location cost drawn from a cost distribution. This cost distribution may differ between country pairs. Note that these cost distributions influence relocation elasticities, which vary origin-destination-wise. Relocation within the union is cheaper than from the inside of the union to the outside. Thus, the relocation-cost differential is another dimension of economic integration. It describes the degree of harmonization or mutual acceptance of production standards and other business regulations a country pair has reached. One should note that, through this channel, economic integration tends to intensify tax competition, as it simplifies firm relocation and, hence, makes tax bases more elastic. Contributors to the tax competition

literature have extensively studied this mechanism. However, the existing literature is silent about what happens to taxes when one country leaves an economic union and, as a result, faces a less elastic tax base.

We operationalize this channel as follows. Recall that $F^{ij} \in [\underline{F}_{ij}, \overline{F}^{ij}]$ is drawn from a uniform distribution $G^{ij}(F^{ij}) = \frac{F^{ij} - \underline{F}_{ij}}{\overline{F}^{ij} - \underline{F}_{ij}}$. Suppose for now that both countries have the same level of business frictions ($\nu^i = \nu^j$) such that $-\underline{F}_{ij} = \overline{F}^{ij}$. Now we can directly interpret $\bar{\epsilon}^{ij}$ and, hence, $\overline{F}^{ij} = \bar{\epsilon}^{ij} + \bar{\epsilon}$ as the degree of harmonization of i and j . Therefore, economic disintegration induces a mean-preserving spread in the distribution of relative fixed costs. The higher $\bar{\epsilon}^{ij}$ (and, accordingly, $\overline{F}^{ij} = -\underline{F}_{ij}$), the more firms, and in this setting also industries, are attached to a particular country, and the less should business tax differentials matter for location decisions. When country k disintegrates from i and j , $\bar{\epsilon}^{jk}$ and $\bar{\epsilon}^{ki}$ rise in our model.

To dissect this effect, let us for now assume full country symmetry in all primitives of the model other than the distribution of fixed costs between any two countries. Then, we can derive each country's equilibrium tax as a function of $(\bar{\epsilon}^{ij})_{i,j \in \mathcal{X}}$. For a detailed exposition, we refer to the Online Appendix . We can now state Proposition 2.

Proposition 2 (de-harmonization effect). *Consider the subgame-perfect equilibrium of economy \mathcal{E} and suppose that trade costs and country sizes are identical. Let the degree of harmonization in business regulations across countries be sufficiently similar initially. Then, a rise in the degree of harmonization between two countries reduces all country's business taxes. Hence, the disintegration of country k via a de-harmonization between countries raises taxes everywhere.*

This result is not surprising in light of the literature. By construction of our model, a rise in $\bar{\epsilon}^{jk}$ makes tax bases in the countries j and k less elastic, which tends to increase taxes in these countries. In the Nash equilibrium, this spills over to the tax of the not directly affected country i . Due to the strategic complementarity of tax policies, t_i increases.

In most cases and in particular for similar initial conditions, the tax of a country goes up when the fixed cost distribution widens between that country and another one, that is, t_i increases in $\bar{\epsilon}^{ij}$. As we show in the Online Appendix, there may be cases in which the tax falls, $\frac{dt_i}{d\bar{\epsilon}^{ij}} < 0$. Most prominently, a negative sign may occur when \overline{F}^{ki} is very small, i.e. tax bases are very elastic

between countries i and k . Then, an increase in the elasticity of firm mobility between i and j makes country i tax more. Our intuition is that also the difference in tax base elasticities of a country plays a role. The more firm relocation to j differs from the one to k , the more elastic is country i 's tax base on average, leading to the described decrease in t_i .

With regard to economic disintegration, the proposition describes another potential effect of the disintegration of country k from i and j which we label as a de-harmonization effect. When $\bar{\epsilon}^{jk}$ and $\bar{\epsilon}^{ki}$ increase simultaneously, tax bases become less elastic between the economic union and the exiting country k . The lower mobility of firms causes taxes to rise everywhere.

Business-Friction Effect. So far, we have described origin-destination-specific asymmetries in the firm relocation costs and analyzed the impact of a drop in the mobility of firms between countries. Our second main result suggests that business taxes tend to increase everywhere when economic disintegration occurs in the form of more firm attachment to their countries. When interpreting the reduction in firm mobility as a feature of economic disintegration, two notes of caution are indicated, however.

First, the rise in $\bar{\epsilon}^{jk}$ and $\bar{\epsilon}^{ki}$ characterizes the economic disintegration of country k only in the short run as it regards those firms which already exist and decide to relocate after the disintegration of k . When firms anticipate the exit of country k from the economic union, the disintegration of a country may discourage prospective entrepreneurs from investing in a firm located in k . To summarize, in the long run, the mass of potential firms is endogenous to the degree of economic integration. Therefore, one of our extensions regards the effects of changing the ex-ante distribution of firms.

Second, we have assumed that economic disintegration triggers a mean-preserving spread in the relocation cost distribution. Therefore, a rise in $\bar{\epsilon}^{jk}$ affects countries j and k in the same way, which seems reasonable in the context of production standards and harmonization of regulations. However, regarding the effects of the disintegration of country k from j , it might be that production frictions in country k increase such that firm relocation from j to k becomes more costly than vice versa.

Therefore, we now consider the case where the disintegration of a country from an economic

union causes firm relocation cost distributions to shift. As before, $F^{ij} \in [\underline{F}_{ij}, \overline{F}^{ij}]$ is drawn from a uniform distribution $G^{ij}(F^{ij}) = \frac{F^{ij} - \underline{F}^{ij}}{\overline{F}^{ij} - \underline{F}^{ij}}$ where $\overline{F}^{ij} - \underline{F}^{ij} = \overline{F}^{jk} - \underline{F}^{jk} = \overline{F}^{ki} - \underline{F}^{ki}$. However, now the relocation cost distributions are allowed to have a different mean:

$$\nu^{ij} := \nu^j - \nu^i \gtrless \nu^{jk} := \nu^k - \nu^j \gtrless \nu^{ki} := \nu^i - \nu^k.$$

By considering comparative statics of taxes with respect to these means, we can study the effects of a shift in the relocation cost distributions. In particular, we are interested in the case where locating in the leaving country becomes more costly relative to setting up a business in the economic union. In Proposition 3, we show that the effects point in intuitive directions. We prove the statement in the Online Appendix.

Proposition 3 (business-friction effect). *Consider the subgame-perfect equilibrium of economy \mathcal{E} . An increase in the average cost of setting up a business in a country relative to another country induces lower taxes in the former country and increases taxes in the latter one. Hence, the disintegration of country k via a rise in business frictions lowers business taxes in the leaving country and increases taxes elsewhere.*

When ν^{ij} increases, the cost of locating in country j relative to country i goes up on average. As a consequence, country i gains market shares. Vice versa, country i loses industries after a rise in ν^{ki} . In the former case, country i 's ability to tax improves. In the latter case, country i has to lower its business tax. A change in ν^{jk} does not affect t_i because the reduction in t_k just offsets the rise in t_j .

Consider again the situation in which country k disintegrates from an economic union formed by i and j . When this disintegration makes it relatively more costly to set up a business in country k than inside the economic union, ν^{ki} decreases and ν^{jk} rises. By Proposition 3, country k has to lower its business tax. Members of the economic union tax more.

2.2.3 Migration Effect

So far, we have dealt with changes in parameters that directly affect the production side. However, economic disintegration affects local prices and, therefore, utility levels of households in a given country. When households are internationally mobile just like firms, they will migrate from one jurisdiction to another as long as the difference in utilities exceeds the migration cost. When the UK splits off, some EU citizens in the UK may return to their home countries or other countries in the union. In the following, we deal with the effects of exogenously driven migration on taxes. Unlike Lemma 1, we now assume that the world population stays constant and consider only population shifts between countries. Moreover, we return to the case where fixed cost distributions are the same $\bar{F}^{ij} = \bar{F} \forall i, j$. Proposition 4 follows from the comparative statics of Lemma 1. For a more detailed statement, we refer to the Online Appendix.

Proposition 4 (migration effect). *Consider the subgame-perfect equilibrium of economy \mathcal{E} and suppose that trade costs are sufficiently similar initially. Then, household migration from country i to j decreases country i 's tax and increases the tax in j . The reaction in country k 's tax is positive if and only if trade with country j is cheaper than with i ($\tau_{jk} < \tau_{ik}$). Hence, the migration into the union triggered by the disintegration of country k lowers the leaving country's business tax and increases taxes inside the union.*

The effects of migration (i.e., a change in the size of countries while holding $\sum_{l \in \mathcal{K}} n_l$ fixed) on taxes depend on the origin and the destination of migration flows. Migration from the leaving country into a member country reduces the leaving country's tax and allows the destination country to tax more. The tax in the other member country rises as well. The intuition is that the economic union grows as a whole such that member countries become more attractive to mobile firms irrespective of whereto migrants precisely move.

What is the average effect of a population shift from the leaving country towards a member country? One can see from Corollary (3) in the Online Appendix that the average tax of these two countries declines. In other words, the leaving country reduces its tax by more than the member country can raise its tax. The average tax of the world will increase. As described above, the population shift improves the other member country's ability to tax. In sum, taxes in the

economic union increase. This rise outweighs the reduction in the tax of the leaving country, such that the effect on the average tax of the world is positive.

Altogether, migration from outside to inside the union increases taxes inside the union and reduces the tax in the leaving country. This migration effect is the third central insight from our model.

2.3 The K -Country Model

Having seen the three-country model, extending our economy \mathcal{E} to an arbitrary number of K countries is straightforward and, at the same time worthwhile, because it allows us to analyze the effects of disintegration on third countries outside the economic union. Let $\mathcal{K}_{EU} \subseteq \mathcal{K}$ denote the set of countries forming an economic union and $K_{EU} := |\mathcal{K}_{EU}| \in \mathbb{Z}^+$ its cardinality. Note that $1 \leq K_{EU} \leq K$. For simplicity, let us consider the case where $\bar{F} = -\underline{F} > 0$. As we have seen, we can readily relax this assumption. However, in this section, we want to focus on two additional dimensions of economic disintegration, which the three-country model is unable to address. First, we show the effect of a rise in trade costs between a country leaving the economic union and the remaining member countries on the tax policy of third countries: countries that were already outside the union before the exit (like the US or China in the case of Brexit), which occurs when $K_{EU} < K$. Secondly, we impose some symmetry assumptions and derive the tax policy of each country as a function of K_{EU} . These assumptions allow us to model economic disintegration purely as a change in K_{EU} . For a detailed derivation of the K -country model, we refer to the Online Appendix.

2.3.1 Trade-Cost Effect

We now state Proposition 5, which is the K -country counterpart to Proposition 1.⁶ It is useful to define the average population of the union countries as $\bar{n}_{EU} = \frac{1}{K_{EU}} \sum_{m \in \mathcal{K}_{EU}} n_m$. We relegate the proof and a more technical statement of the Proposition to the Online Appendix.

⁶Observe that we only consider direct effects of economic disintegration, i.e. changes in the trade relations of the leaving country with the remaining economic union. In particular, we hold trade relations with third countries fixed which is plausible in the Brexit case since the UK remains part of the WTO. Moreover, it ignores the possibility that the UK might form new trade agreements, e.g. with the US.

Proposition 5 (trade-cost effect). *Consider the subgame-perfect equilibrium of economy \mathcal{E} and suppose that countries $m \in \mathcal{K}_{EU}$ form an economic union with common external trade costs. Suppose that country $l \in \mathcal{K} \setminus \mathcal{K}_{EU}$ disintegrates from the member countries. Then, the disintegration of country l via a rise in trade costs*

- (a) *decreases the leaving country's business tax unless it is not too large relative to \bar{n}_{EU} ,*
- (b) *has asymmetric effects on taxes in the remaining member countries, and*
- (c) *raises taxes in third countries outside the union.*

Trade disintegration between l and \mathcal{K}_{EU} makes third countries, which are not part of the economic union, relatively more attractive, which allows them to tax more (part (c)). As for the three-country case already described, the tax of country l will decrease in the aftermath of its disintegration from the economic union provided that it is not too large relative to the average member country.

The reaction of taxes inside the union is case-specific. It depends on the size of the leaving country, of the respective member country, as well as the size of the average member country. In general, the effect in a member country is positive, provided that the size of the average market in the union is large enough relative to the respective member country's market and the one of the leaving country.

After imposing cross-country symmetry in market size ($n := n_m = n_l$), the derivative in (b) reduces to

$$\frac{dt_m}{d\tau_{ml}} + \sum_{j \in \mathcal{K}_{EU} \setminus \{m\}} \frac{dt_m}{d\tau_{jl}} = 3n \frac{4K_{EU} - 2K - 1}{2K - 1} \frac{\alpha - w - \tau}{16\beta} \begin{cases} > 0 & \text{for } 4K_{EU} > 2K + 1 \\ < 0 & \text{for } 4K_{EU} < 2K + 1 \end{cases}. \quad (12)$$

As we can see, taxes inside the economic union rise when it has many member countries. In our setting, this corresponds to a particularly strong internal market, which covers most of the demand for tradeable goods and services. Furthermore, one can observe the effects of globalization. The more competing countries the economic union faces (K), the more sensitive react members' tax bases and, hence, taxes to the disintegration of a member country. Put differently, in a globalized world, the union is vulnerable to the fiscal consequences of economic disintegration.

In Corollary (5) of the Online Appendix, we consider the impact on world, EU, and non-EU average taxes. The disintegration of country l increases on average taxes of third countries, but reduces the average tax worldwide. This result is robust and does not depend on country sizes or the number of countries in the union. The effect on the average tax in the remaining economic union is ambiguous, however. When the leaving country is as large as the average country inside the union, the effect is negative (positive) for $2K_{EU} \leq K$ (for $2K_{EU} > K$). Thus, the average tax inside the union rises in reaction to the disintegration when the remaining economic union size is considerable. Vice versa, at a late stage of globalization, the number of rival markets (i.e., K) is significant, and member countries need to lower their taxes to stay competitive on the world market after the exit of a union member.

2.3.2 Union-Size Effect

Another way to examine the consequences of economic disintegration for tax policy is to impose some symmetry assumptions across countries and to directly differentiate taxes with respect to K_{EU} as if the number of countries was defined on a continuous domain.⁷ In particular, assume symmetry in country size as well as in internal and external trade costs as follows.

Assumption 1. *Let $n := n_i = n_j$ for all $i, j \in \mathcal{K}$. Moreover, let $\tau^* := \tau_{ij} = \tau_{ik}$ for all $i, j, k \in \mathcal{K}_{EU}$ with $j, k \neq i$ and $\tau := \tau_{lm} = \tau_{ln} > \tau^*$ for all $l \in \mathcal{K}$ and $m, n \in \mathcal{K} \setminus \mathcal{K}_{EU}$ with $m, n \neq l$. Let $K_{EU} > 1$.*

In the Online Appendix, we show that under Assumption 1 the tax of member countries, t_m , and the one of non-member countries, t_n , are functions of a reduced set of model primitives $\tilde{\Theta} := (\alpha, \beta, w, n, \tau^*, \tau, \bar{F}, K, K_{EU})$. In Proposition 6, we summarize the main implications.

Proposition 6 (union-size effect). *Consider the subgame-perfect Nash equilibrium of economy \mathcal{E} with $K > 2$ countries. Let Assumption 1 hold and suppose that $K, K_{EU} \in \mathbb{R}^+$. Then,*

(a) *business taxes inside the union are larger than outside,*

⁷This procedure is in its flavor similar to the literature on the effects of federalism and government decentralization on private investment (e.g., Kessing, Konrad, and Kotsogiannis (2006)).

(b) a rise the number of member countries (as well as a reduction in trade costs inside the union and a rise in trade costs outside the union) increases business taxes in member countries, and

(c) a rise the number of member countries (as well as a reduction in trade costs inside the union and a rise in trade costs outside the union) decreases business taxes in non-member countries.

Several aspects are worth mentioning. As shown in (a), under these assumptions, taxes inside the economic union are higher than outside. Being part of the economic union makes countries more attractive to firms, which lowers tax competition for these countries. Once asymmetries in trade costs are removed, all the advantages of the economic union have vanished such that $t_m = t_n$. To sum up, ceteris paribus the tax of the country that leaves the economic union will decline.

Secondly, comparative statics of taxes with respect to trade costs are intuitive. On the one hand, higher trade costs inside the economic union toughen tax competition inside the union and help non-member countries to tax more. As a result, taxes converge. On the other hand, a rise in external trade costs makes the economic union relatively more attractive and weakens the position of non-member countries. Then, taxes drift even further apart.

Third and most importantly, when the economic union loses member countries, the taxes inside the union will fall, and those outside the union will rise. The latter mirrors Proposition 5 (c). The former, however, will only be in line with Proposition 5 (b) if the economic union is small compared to the rest of the world. This conflicting finding is not surprising since the analysis conducted in this section is much more gritty compared to the one in Section 2.3.1.

Regarding the effects of globalization on taxes inside the economic union, one needs to differentiate t_m with respect to K . As shown in the Online Appendix, the sign of this derivative is ambiguous. Non-member countries gain relative attractiveness as globalization proceeds ($\frac{dt_n}{dK} > 0$). The reason is that the relative size of the economic union shrinks with K .

In this section, we have extended our model to any number of countries with an arbitrary institutional structure (K_{EU}). As we have seen, the results and intuitions formed in the three-country world remain valid.

2.4 Extensions

Tariffs. In this section, we describe three extensions to our baseline economy. Firstly, we incorporate tariffs into our model (see Section (4.1) in the Online Appendix). That is, aside from non-tariff trade barriers, we allow for the presence of import and export tariffs. Just as non-tariff trade barriers, trade taxes affect consumer surplus and revenues from taxing corporations. Besides, tariffs generate additional fiscal revenues. For non-negative import tariffs and export subsidies, the optimal business tax of a country is revised upwards. As business taxes in a country rise, firms move away from that country. As a result, the government generates extra tariff revenues and saves expenditures on export subsidies. Accordingly, the reaction of business taxes to a rise in non-tariff trade costs is downwards adjusted. The reason is that higher trade costs reduce trade volumes such that the extra gains in tariffs (expenditure savings) decline. Nonetheless, the key trade-offs, in particular concerning 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 setting for trade policy instruments that have revenue effects.

Accrual of Profits. Secondly, recall that, in our baseline economy, firm profits accrue to citizens in third countries or, at least, do not enter social welfare. This assumption is only reasonable for very wealthy investors and a government with a pronounced redistributive goal but not for smaller entrepreneurs or investors. Therefore, we now deal with the domestic accrual of profits (see Section (4.2) in the Online Appendix). We distinguish two polar cases of firm ownership. The first one considers internationally mobile entrepreneurs who only enter the social welfare of a country 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 social marginal welfare weight of firm ownership slightly modifies the optimal business tax. Moreover, in the former case, taxes are revised downwards by the accrual of domestic profits and, in the Nash equilibrium, of foreign profits, whereas, in the latter scenario, taxes account for the accrual of international profit differentials. This distinction is intuitive, as, 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 but not about the location of accrued profits.

Industry Size. Finally, we generalize our economy to an arbitrary number of immobile firms in each industry (see Section (4.3) in the Online Appendix). 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, more firms increase the degree of local competition such that the country becomes less attractive as a business location to mobile firms. In the Nash equilibrium, these two effects point in the same direction for the taxes of the other countries. Using this model specification, we can shed light on the anticipatory effects of economic disintegration. Suppose that some previously immobile firms anticipate a country's disintegration and move away from that country (towards the economic union). This firm relocation lowers (improves) the disintegrating country's (member countries') ability to tax. At the same time, firms face more competition inside the economic union, which lowers mark-ups there. Vice versa, in the leaving country, firms generate higher profits.

2.5 The Impact of Economic Disintegration on Trade Policies

In this section, we consider another dimension of economic disintegration: Trade policies around the world endogenously react to economic disintegration. Again, we consider economic disintegration as the departure of one country from an economic union (e.g., Brexit). As we show, there are global effects on trade policies in response to this disintegration. How do (non-tariff) trade policies inside the economic union change? How are regional trade agreements between the economic union and third countries affected? What are the effects on TAs between the leaving country and third countries?

Readjustment of Tariffs and Non-Tariff Trade Policies. To answer these questions, we develop in the following a novel approach of trade policies. In principle, this approach is free of specific assumptions on the structure of the underlying economic model and only relies on a small

set of assumptions on the welfare function. It allows us to remain agnostic about whether or not economic disintegration is desirable from the leaving country’s perspective. Moreover, we draw on the idea that cooperative trade policies result from efficient bargaining (see Grossman and Helpman (1995) and subsequent literature). Then, under the transferability of utilities, efficient cooperative trade policies maximize the respective sum of welfare, as described below.⁸ Our approach considers trade policies before (labeled as “old” optimum) and after the disintegration (“new” optimum). The strength of our approach is that it only relies on the following assumption.

Assumption 2. *A rise in bilateral trade costs between two countries raises welfare in third countries.*

In the Online Appendix we show that in our model, as described in Section 2.3, Assumption 2 is fulfilled given positive business taxes, small trade taxes, and sufficiently similar trade costs. This result has an intuitive appeal. It means that any protective measure (i.e., tariffs as well as non-tariff barriers) 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 a reduction in the business taxes of the two countries can compensate for this. Firms move to the third country, and prices decline there. This price effect raises welfare.

The assertion 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 a third countries’ welfare. It may result in bilateral opportunism (as in Bagwell and Staiger (2004)). We now present our approach.

Definition 2. Assume that each optimization problem is concave and solutions are interior. Moreover, suppose that trade policy changes are small. Then, we can describe our approach as a four-step procedure:

⁸At first glance, this may seem contradictory to the non-cooperative approach we have adopted in the context of tax policies. However, it fits well the situation of the EU, in which member countries have jointly introduced projects like the Common Market to facilitate trade and commerce in the union, whereas the setting of business tax policies has so far been independent. The Common Market project and the free flow of goods, factors, and services in the EU have taken precedence over tax policies and therefore justify our timing assumptions: Countries choose trade policies simultaneously before tax policies.

- (1) Approximate the respective objective function (welfare) in the new optimum around the old optimum.
- (2) Use the optimality of the old and new trade policy choices.
- (3) Impose the first-order conditions of the old optimum.
- (4) Relate the sign of the gradient of welfare to the change in trade policies.

What is the effect on trade policies when one country l (e.g., the UK) leaves an economic union formed by a set of countries \mathcal{K}_{EU} (e.g., Germany, France,...)? Our main observation is that the objective function of the economic union changes when one member country leaves. As a consequence, internal non-tariff, as well as external trade policies, are affected. External trade policies include, in particular, tariffs. These form within the framework of regional trade agreements with other markets as customary in the WTO or countries set them non-cooperatively. Moreover, one should note that the described economic disintegration means effectively, although not legally, the creation of a new trading partner for all countries worldwide, with whom they can form new TAs.

We summarize the insights from our approach in Proposition 7. For a more detailed exposition, we refer to the Online Appendix.

Proposition 7 (endogenous trade policy responses to disintegration from an economic union). *Suppose that, initially, countries l and \mathcal{K}_{EU} form an economic union (old optimum). In the new optimum, country l disintegrates from the economic union. Let Assumption 2 hold. Then, in the new optimum, the member countries integrate more with each other in terms of non-tariff trade costs. Suppose that country l also leaves the customs union. In that case,*

- (a) *the leaving country integrates more with countries with which it forms trade agreements and lowers tariffs toward the other countries, and,*
- (b) *the remaining union member countries integrate more with countries with which they form trade agreements and lower tariffs toward the other countries.*

In summary, the remaining member countries take efforts to lower their internal non-tariff barriers to trade. When the leaving country also exits the customs union, the union member countries lower cooperatively and non-cooperatively set trade barriers toward third countries. For

instance, the EU member countries and the US that are part of the WTO decrease their bilateral tariffs after Brexit. Moreover, the EU members implement lower tariffs toward non-WTO member countries, such as Iran. Similarly, trade barriers between the UK and the US decline after Brexit. The UK also lowers tariffs toward non-WTO members. Therefore, the departure of a country from an economic union leads *ceteris paribus* to a deeper integration of multilaterally formed institutions around the world and less protectionism.

Readjustment of Harmonization. Above, we have dealt with endogenously determined trade costs, which affect unit costs of international trade. As noted in the model developed above, another dimension of trade policy in an economic union is the harmonization of production standards and business regulations. For instance, discrepancies in company law, competition law, labor rights, and administrative practice make the relocation of firms from one country to another more difficult. As described, this dimension of economic integration directly affects the extensive margin of firm relocation. The degree of harmonization is, therefore, measured by a mean-preserving spread in the distribution of firm mobility costs.

Similar in spirit to above, one may endogenize the degree of harmonization inside the economic union. That is, member countries efficiently bargain over the harmonization of production standards and business regulations and, therefore, indirectly over firm mobility inside the union. Similar to Assumption 2, we state Assumption 3 regarding the degree of harmonization.

Assumption 3. *A reduction in the degree of harmonization in production standards and business regulations between two countries raises third countries' welfare.*

Intuitively, Assumption 3 means that a reduction in the degree of harmonization inside the economic union is beneficial to the leaving country. In our model, such a reduction occurs as a mean-preserving spread in country-pair specific relocation cost distributions of member countries. This spread makes tax bases inside the economic union less elastic. The resulting rise in taxes pushes firms to move to country l , which gains industry shares and experiences a rise in consumer surplus due to lower domestic prices. As a result, welfare in the leaving country increases. We verify Assumption 3 in our three-country economy with non-negative taxes and sufficiently similar relocation cost distributions (see Online Appendix).

Using our approach, one can observe that the remaining member countries harmonize more with each other in response to the leaving country's disintegration. In our model, firms become more mobile inside the economic union compared to the pre-disintegration policy. We summarize this finding in Proposition 8 and, again, relegate the proof to the Online Appendix.

Proposition 8 (endogenous harmonization responses to disintegration from an economic union). *Suppose that, initially, countries l and \mathcal{K}_{EU} form an economic union (old optimum). In the new optimum, country l disintegrates from the economic union. Let Assumption 3 hold. Then, in the new optimum, the member countries harmonize more with each other in terms of production standards and business regulations.*

Normative Implications. As a byproduct of our above analysis, one can note that the normative implications of economic disintegration are generally equivocal. The main reason for this insight is the fact that trade policies around the world change with the degree of economic integration between a subset of countries.

To give an example, consider the welfare in the leaving country. Several effects of trade policy changes add up. There are adverse effects since the remaining member countries in the economic union do not regard the leaving country's welfare when adjusting their cooperative and non-cooperative trade policies towards third countries as well as their internal degree of economic integration. On the contrary, after the disintegration, the leaving country is free to set its non-cooperative external tariffs solely to its advantage. The renegotiation of existing trade agreements may be beneficial or detrimental to the leaving country. One can show that the leaving country and the respective contractual partner improve their joint surplus after the disintegration. However, this does not mean that the leaving country is better off. It may well be the case that the presence of other countries in the trade agreement, here the member countries of the economic union, proves beneficial to the leaving country. As a consequence, the economic disintegration and the resulting absence of the member countries in the trade agreement are welfare-detrimental to the leaving country. By similar arguments, the normative effects on countries in the economic union and third countries are ambiguous.

These findings hold 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. Our central insight is to take existing inefficiencies in trade policies as given. Based on this, trade policies react worldwide to economic disintegration. Therefore, its normative implications may be far from obvious, even if one considers only first-order effects, which we address in our approach.

In this section, we have endogenized different dimensions of trade policy, namely tariffs, non-tariff trade costs, and the degree of harmonization in production standards and business regulations. Altogether, along these different dimensions of trade policy, the remaining countries in the union take further steps towards the economic integration of their internal market when being confronted with the disintegration of a former member. The leaving country, as well as the remaining economic union, intensify their trade relations with other countries. These further steps of economic integration do, of course, not necessarily mean that economic disintegration stabilizes multilateral institutions. It is possible that leaving an economic union is beneficial from a unilateral perspective, although it is multilaterally detrimental. Moreover, each loss of a member country jeopardizes the credibility of these institutions and increases the uncertainty of economic policy (e.g., Davis (2016)).

Also, note that these considerations assume a fixed set of trade agreements. It could be that, after disintegrating, country l negotiates TAs with countries that do not form TAs with member countries. Vice versa, the leaving country may fail to agree on TAs with third countries that form TAs with the economic union. Without imposing more structure on the underlying economy, it is a priori unclear whether countries breach (form) existing (new) TAs.

3 Conclusion

In this paper, we develop a novel approach for studying the effects of economic disintegration on trade policies. We have considered the departure of a country from an economic union. Our main contribution is to show the effects of disintegration by one country on trade policies worldwide. In reaction to the disintegration, the leaving and the remaining member countries deepen their trade agreements with other countries. Moreover, the remaining member countries take efforts to integrate further with each other. As a consequence, the welfare implications of economic disintegration are non-trivial. A limitation of our approach is that it can only address small policy changes. To consider large changes, one needs to know the sign and the size of the cross derivatives of welfare functions with respect to trade costs. This requirement would make it necessary to impose more structure on the underlying economy. Another restriction is that we hold trade agreements fixed and cannot address the formation of new trade agreements after the disintegration.

Moreover, we have built a multi-sector and multi-country general equilibrium trade model in which a continuum of internationally mobile firms generates fiscal competition over business taxes. Thereby, the elasticity of firm relocation is a sufficient statistic for the optimal tax in a given country. As we have seen, this elasticity crucially depends not only on the economic conditions in that country but also on those worldwide. This observation even holds when a minimum of mobility, here modeled as a bilateral location choice by one firm per industry, is introduced. As a result, the whole economic structure influences domestic policies in each country.

An important lesson is that the analysis of only two countries is potentially misleading when studying the effects of multilateral trade policy on local tax policy. Consider a change in bilateral trade costs. Firms alter their local prices and production quantities. In response, local governments adjust their taxes, which induces firms to move from one jurisdiction to another. Consequently, third countries modify their taxes as well, which, in turn, feeds back into local tax policy.

By considering an arbitrary number of countries, our stylized model takes such a broader perspective. We exploit the model to speak to the effects of economic disintegration on business taxation and trade policy. As we have seen, economic disintegration may have different forms of

appearance. An important dimension is that economic disintegration raises bilateral trade costs, which triggers a trade-cost effect on business taxes. When one country leaves an economic union, we predict taxes to decline in that country. The effects on taxes in the remaining members of the union are case-specific. We show that even under symmetric trade costs, the policies of these countries may react contrary to each other depending on the relative size of the respective local markets. Third countries, however, will enjoy a reduction in the downward pressure on taxes induced by local business tax differentials.

We have also dealt with the consequences of a lower degree of harmonization in regulations and production standards, which reduces the mobility of firms between the leaving country and the economic union. In line with the literature on tax competition, taxes increase as the costs of firm relocation rise (de-harmonization effect). However, this argument only holds in the short run as it regards those firms which are located in a country and decide to relocate after that country's disintegration. In particular, our analysis omits the anticipatory and dynamic effects of economic disintegration. Although we are able to shed light on these, a rigorous analysis is left for future research.

Besides, we identify a business-friction effect that adversely affects the leaving country's ability to tax and enables the other countries to tax more. From an institutional perspective, economic disintegration manifests as a reduction in the number of member countries in an economic union. The loss of a member country induces a convergence of taxes worldwide (union-size effect). As above, the tax of the leaving country declines.

Applying our model to Brexit, we predict the UK to become a tax haven after leaving the European Union. Larger countries in the EU might have to lower their taxes as well, whereas members with a small domestic market need not. Third countries gain attractiveness leading to higher taxes there. If, after Brexit, the UK forms additional trade agreements with third countries such as the US, it will at least partly regain attractiveness as an investment location and, thereby, mitigate the economic consequences of leaving the EU.

We note several limitations to our analysis. The simplicity of the supply side in our model, such as the two-country industry structure, which allowed us to obtain clear-cut policy predictions,

can also be considered a weakness. However, putting a more realistic structure into the economy is beyond the scope of this project. Moreover, labor is an internationally mobile factor, as in Caliendo, Dvorkin, and Parro (2019). This feature holds especially true in the long run. Our comparative statics show that, even in the absence of wage effects, the number of residents strongly affects tax policy and its connection to economic integration merely through the channel of market size. When the disintegration of a country pushes households to migrate from that country to the economic union, the business tax of the leaving country declines even further, while it improves the ability of member countries to tax firms (migration effect). Studying the interplay of tax and trade policies under the full mobility of firms, labor, and capital, we consider a promising area of future research.

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