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Impact of border barriers, returning migrants, and trade diversion in Brexit: Firm exit and loss of variety[☆]

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ABSTRACT

We investigate the impact of Brexit (the UK's planned withdrawal from the European Union) using computable general equilibrium models featuring conventional constant returns-to-scale (CRS) and increasing returns-to-scale (IRS) technology and firm heterogeneity, à la Melitz. We show that the imposition of the tariff and nontariff barriers associated with Brexit triggers the significant contraction of bilateral trade between the UK and the remaining 27 members of the European Union (EU27), exacerbated by firm exit from export markets. Given the imposition of these trade barriers, budget savings, migrants returning to the EU27 from the UK, and intra-EU27 integration and free trade agreements with the US and Japan, the IRS model predicts a total export loss of 5.1–5.8% of UK GDP and a total welfare loss of 1.1–1.5%. This is 60% greater than the CRS model predictions. However, the impact on output would vary between industries, whereby the UK chemical and automobile industries would contract, but its food and beverage sector and the business and information and communication technology service sectors would expand. In contrast, the EU27 would gain substantially from other integration programs, but lose very little from the stronger UK–EU27 border barriers. This suggests that the EU27 should have little interest in negotiations aimed at avoiding a "hard Brexit" (the surrendering by the UK of full access to the single market) and that it would be more productive for it to focus on integration programs with trade partners other than the UK.

1. Introduction

The internal market of the European Union (EU) has grown continuously by progressively accepting new member countries, with Croatia in 2013 being the 28th country to join. On June 23, 2016, the results of the referendum for the withdrawal of the United Kingdom (UK) from the EU known as Brexit shook the EU, which has managed to maintain regional cohesion, even following the recent European sovereign debt crisis. Nonetheless, Brexit creates many uncertainties regarding the future of Europe. These include the short- and long-run impacts of new tariff and nontariff barriers (NTBs) between the UK and the remaining 27 members of the EU (EU27), the effect on the common agricultural policy, changes in regulatory policy and standards, and the influence on foreign direct investment (FDI). The UK contributions to the EU budget are also significant and require consideration (HM Treasury, 2013; Núñez Ferrer and Rinaldi, 2016).

Immediately before the referendum, many economic studies quantitatively assessed the impact of Brexit employing structural general equilibrium models, especially computable general equilibrium (CGE) models and new quantitative trade models (NQTMs) to predict its possible consequences. For the most part, these analyses attempted to analyze the impact of Brexit using a theoretical framework because suitable empirical data was not available given Brexit has not yet taken place. Accordingly, given the wide range of future event scenarios, even when similar frameworks are used, the estimates of the macroeconomic effects on the UK differ. Overall, most studies estimate a moderate decline, "...in the low single-digit percentage range" in terms of UK GDP, as surveyed by Busch and Matthes (2016). For example, using a GTAP-based world trade dynamic CGE model, Booth et al. (2015) estimated a worst-case reduction in UK GDP of 2.2% by 2030, combining the losses associated with tariff imposition (0.9%), border costs (1.2%), and NTBs on goods (0.5%) and services (0.1%), but a saving to its EU budget contribution of 0.5%.[1]

Elsewhere, Boulanger and Philippidis (2015) used a world trade CGE model calibrated to the GTAP Database and estimated an income effect for 2020. They found that a 2% trade cost rise would almost

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[1] CGE studies prior to the Brexit referendum used the GTAP Database Version 8 with a reference year of 2007, which is one version older than the current Version 9.

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cancel out the benefit of the EU budget saving and that a 5% rise would lead to a 0.7% loss in terms of UK GDP.[2] PwC (2016), using a single-country dynamic CGE model, estimated a total loss of 1.2–5.5% of UK GDP, through anticipated losses via trade-related barriers (0.5–2.1%), short-run uncertainty in capital markets (0.9–2.6%), and migration (0.8–1.6%). Lastly, using an NQTM, Dhingra et al. (2017) estimated a total welfare loss of 1.3–2.7%, attributed to the loss from the UK's most favored nation (MFN) tariff imposition (0.1%), the UK–EU27 NTBs (0.5–1.3%), and intra-EU27 integration (0.9–1.6%). OECD (2016) predicted similar losses to UK GDP.

Unfortunately, most of these studies focused on just a few aggregate outcome variables such as the changes in GDP or net household expenditure, i.e., Hicksian equivalent variations (EVs), and thus did not analyze the possible sectoral output and trade changes in detail, even though their multisector models were well capable of such analysis. This was likely for convenience and the simplicity of presentation for Brexit voters. Moreover, few of the CGE studies, unlike the NQTMs, considered the heterogeneity of firms and increasing returns-to-scale with a love of variety à la Melitz (2003), recently recognized as a key driver of the explosion of trade in the globalized world economy.[3] For instance, Brexit should restore trade barriers and reduce trade between the UK and the EU27, thereby deteriorating national welfare, and possibly accentuated by UK firm exit from EU27 export markets. Firm exit would then lower firm productivity and harm consumers through the loss of varieties supplied by the trade partners in the internal market.

In this paper, we develop two world trade CGE models. One is a standard constant-returns-to-scale (CRS) model. The other is an increasing-returns-to-scale (IRS) model, featuring the Melitz (2003) structure with firm heterogeneity. We conduct Brexit experiments using both these models, thereby capturing the effect of firm exit and the loss of variety induced by the restoration of trade barriers between the UK and the EU27. In particular, we examine: (1) the impact of new trade barriers between the UK and the EU27, (2) the effect of EU budget savings and the reduction in labor supply with the return of EU27 migrants, and (3) the influence of additional economic integration programs by the EU27 within the internal market and with the US and Japan. Using our numerical simulations with the IRS model, we predict a significant export loss of 5.1–5.8% of UK GDP and a total welfare loss of 1–1.5%, which is 60% larger than the welfare prediction of the CRS model. The impact of output should vary across industries. For example, while new trade barriers would protect the food and beverage sector in the UK, many other industries would contract, especially chemicals and automobiles. Likewise, the UK service sector would gain from a side effect of the trade barriers, but be harmed by the return of EU27 immigrant workers. In contrast, the EU27 would gain substantially from its other integration programs, but lose very little from the rise in the UK–EU27 border barriers.

The remainder of the paper is as follows. Section 2 describes our CGE models with/without IRS technology and firm heterogeneity. Section 3 presents our Brexit simulation scenarios and their backgrounds. The simulation results are in Section 4, focusing on sectoral exports and value-added changes with household welfare impacts. Section 5 provides some concluding comments, followed by some qualifications, which suggest future research using a CGE model. The Appendix presents the sensitivity analysis of the simulation results in Section 4 along with details of the assumptions not presented in the main text.

[2] In their main scenario, they assumed a free trade agreement and thus no tariffs between the UK and the EU27 following Brexit.

[3] Jafari and Britz (2017) employed a Melitz-type CGE model, but did not compare its results with those of a conventional constant returns-to-scale CGE model. PwC (2016) incorporated imperfect competition with product differentiation between homogeneous firms, à la Dixit and Stiglitz (1977), in a single-country dynamic CGE model.

Table 1
Regional aggregation.

Regions
UK
EU 27
Benelux
France
Germany
Italy
Poland
Spain
Sweden
Other EU
Japan
US
Rest of the World

2. World trade CGE model with Melitz structure

Our world trade CGE models are static models with 12 regions, 22 sectors, and three primary factors (skilled and unskilled labor, and capital) (Tables 1–2). We assume the primary factors flexibly reallocate across sectors and equalize factor prices within each region. We develop two CGE model variants:

(1) Armington CGE model with CRS technology
(2) Melitz CGE model with IRS technology

They are explained in detail below.

2.1. Melitz structure in the CGE model

In the IRS CGE model, we assume that seven manufacturing sectors are equipped with features, à la Melitz (2003) (Table 2) (hereafter the Melitz structure). Based on the CRS CGE model, which is a standard model used in many CGE analyses (Hosoe et al., 2010), we incorporate firm heterogeneity, product differentiation, and monopolistic competition following Dixon et al. (2016). Starting from the bottom of Fig. 1, which describes the core part of the model structure, we assume that the domestic output of the i-th sector in the r-th region $Z_{i,r}$ is produced using primary factors, intermediate input, and a fixed setup cost $H_{i,r}^{MLZ}$. Of $Z_{i,r}$, $ZZ_{k,i,r,s}$ is used to produce the k-th variety shipped to the s-th region (including that shipped to domestic region r) $QT_{k,i,r,s}$ with a fixed variety production cost $F_{i,r,s}^{MLZ}$. The variety $QT_{k,i,r,s}$ is aggregated into a variety composite good $QT_{i,r,s}$ in the lower variety nest with a constant elasticity of substitution (CES) function and the elasticity of substitution σ_i^{MLZ}, à la Dixit and Stiglitz (1977).

The fixed costs $H_{i,r}^{MLZ}$ and $F_{i,r,s}^{MLZ}$ are measured in terms of domestic output $Z_{i,r}$ units, following Itakura and Oyamada (2015). Incidentally, while Melitz (2003) originally measured these fixed costs in terms of labor units, there have been alternative approaches in its CGE implementation. For example, Zhai (2008) assumed a combination of capital, labor, and intermediates for the fixed inputs, while Balistreri and Rutherford (2013) used a composite factor (i.e., a mix of capital and labor). A draw from a Pareto distribution determines a firm's productivity. In this setup, while all the operating firms ship their output to the domestic market, only very productive firms that can afford the fixed cost of export engage in exportation.[4]

The Armington (1969) composite good $Q_{i,r}$ is produced using the variety composite $QT_{i,s,r}$ supplied from all regions according to a CES aggregation function with an elasticity of substitution of σ_i^{ARM}. When we use the same elasticity value for σ_i^{ARM} and σ_i^{MLZ}, the two-stage nested CES functions reduce to a single stage, as originally employed by

[4] The model equation list is in the Annexure, available upon request.