CESifo WORKING PAPERS

6718
2017

October 2017

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CESifo

Impressum:

CESifo Working Papers
ISSN 2364-1428 (electronic version)
Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH
The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute
Poschingerstr. 5, 81679 Munich, Germany
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Editors: Clemens Fuest, Oliver Falck, Jasmin Gröschl
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CESifo *Working Paper No. 6718*
Category 8: Trade Policy

Brexit – Balancing Trade and Mobility?

Abstract

Control over borders and access to the common market are key issues in the Brexit negotiations. We explore a sequential model, where the UK can commit to mobility, and the EU may constrain trade to dissuade future secession, or to punish the UK. The model highlights the importance of whether the EU views trade and labor mobility as substitutes, in line with standard trade theory, or as complements, as suggested by EU statements about inseparable freedoms. In the former case, the UK can attain its preferred mobility with impunity. Mobility and trade restrictions are higher in the latter case. While the EU's bargaining position hinges on a willingness to constrain trade, the EU does not benefit from strengthen this, say by fueling resentment about Brexit. The sequence of moves is clearly important. Our model implies that the UK moving first is optimal for both parties. This sequence is also in line with the phased approach guiding the negotiations. With uncertainty about preferences, the EU benefits from claiming to have complements preferences, irrespective of its true preferences. Uncertainty harms the UK. Nevertheless, it is worse off moving second, despite the EU's preferences then being revealed. Also, if the EU has substitute preferences it could gain from committing to complement preference behavior. Finally, we discuss the scope for efficient bargaining taking the inefficient equilibrium points as points of departure. We note that contributions to the EU budget could potentially substitute for trade restrictions, thereby contributing to a more efficient outcome.

JEL-Codes: F150, F220, F550.

Keywords: Brexit, immigration, trade, sequential game.

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October 10, 2017
The authors are grateful for helpful comments by colleagues at a seminar at Stockholm University. The usual caveat applies.

1 Introduction

Brexit is arguably the greatest upheaval the European Union has faced and while some aspects of the exit negotiations, such as the time frame, are well structured it is in many ways a voyage over uncharted waters to an unknown destination. While recent studies offer some guidance on possible economic consequences of a divorce[1], the actual effects will depend on what kind Brexit we are heading for, which, as the negotiations now commence, is quite unclear.

The present paper attempts to shed light on how a few salient factors – labor mobility, freedom of trade and the risk of future exit – might shape the outcome, using a simple sequential non-cooperative game model, where the UK first determines labor mobility after which the EU decides on the access to the common market. The unilateral determination of mobility, by the UK, and trade, by the EU, reflects that the party with the most restrictive stance on mobility or trade could, in principle, implement this policy unilaterally.

An implication of the sequential perspective is that Britain's perception of how the EU is likely to respond becomes important for the outcome. We consider two scenarios. First, that the EU views freedom of trade and freedom of mobility as substitutes, in line with what standard trade theory would suggest, and second, that the EU views these freedoms as complements, in line with the rhetoric about inseparable freedoms touted by the EU. Not surprisingly, these lead to very different outcomes, with more mobility in the latter. The model also implies that with uncertainty about political preferences it is in the EU's interest to claim to view the freedoms as inseparable whether that is true or not. It may even wish to commit to act contrary to its preferences. While the model implies inefficient outcomes, one might expect a move toward efficiency over time. The initial outcome would then serve as a point of departure constraining the allocation of welfare between the parties. We briefly discuss this and the potential role of UK contributions to the EU budget for reducing inefficiencies.

The non-cooperative approach might appear questionable in view of negotiations being cooperative enterprises. However, an important part of the Brexit process is the interplay between the negotiating parties and their respective constituencies, and other stakeholders. The political mandates sought by the parties, and the political positions they announce, are unilateral, or non-cooperative, actions from the perspective of the Brexit negotiations, and will circumscribe the negotiations, at least in the short run. There has been plenty of political posturing leading up to Brexit and both the intensity of these activities and the positions that have been taken make

[1] See e.g., Baldwin [2016], Dhingra et al. [2016], Kierzenkowski et al. [2016], Bertelsmann Stiftung [2015] and Sampson [2017].

sense within the context of our model.

The sequential structure is important. That the UK moves first, and determines labor mobility, is motivated both by factual circumstances, and by internal consistency of the model. First, the sequential structure is in line with the "phased approach" set out in the guidelines for negotiations under Article 50 of the Treaty of the European Union by European Council [2017].[2] Moreover, the Brexit referendum affords the UK a degree of commitment regarding mobility, insofar that anything but a substantial reduction in EU immigration is a politically unacceptable outcome. The sequence of moves can also be examined in the model, and we show that both parties are better off with the UK moving first, in comparison with the EU moving first or the parties moving simultaneously.

The expressed political preferences of the parties, rather than economic efficiency, form the basis of our analysis. Neither the roots of the discontent leading up to Brexit, nor the EU's view on essence of the union and its inseparable freedoms can be reduced to simple economics. However, it seems likely that economic rationality carries some weight and moderates political positions that could otherwise economically shipwreck the negotiations.

We use stylized characterizations of the parties political preferences regarding labor mobility and freedom of trade. In particular, we abstract from the diversity of opinion within the EU.[3] Regarding mobility, we assume, in accordance with public statements in the wake of the Brexit referendum, that the UK wishes to reduce labor mobility. The EU is assumed to favor free mobility. Indeed, *free movement* is the EU policy that enjoys the most popular support among citizens in the member states, according to Eurobarometer 86 [2016].[4]

Both parties prefer trade to be free. However, the EU might nevertheless restrict access to the common market if the UK constrains mobility. First, the EU maintains that freedom of trade and free movement are insepara-

[2]The first phase seeks to ensure an orderly withdrawal from the EU and puts a strong emphasis on safeguarding the rights of EU and UK citizens after the withdrawal. The second phase, which deals with the future relationship between the union and the UK, especially with regard to trade, can only begin after sufficient progress has been made in the first phase.

[3]For a discussion of the different priorities of the member states in the EU see the contributions in Wyplosz [2016].

[4]At the same time, immigration tops the list of main concerns at the European level in the same survey. Apprehension about migration could have both cultural and economic roots. Mayda [2008] finds a marked difference between individuals working in traded as opposed to non-traded sectors. In a Ricardian political economy model Galiani and Torrens [2015] find that free trade and no labor mobility is a Nash equilibrium, and in a multi factor extension of the model there may be unaminous support for free trade while workers in the rich country oppose labor mobility. Wellisch and Walz [1998] argue that the effects of redistributive policies can explain why rich countries prefer free trade to free migration. From the immigrants perspective, Jackson et al. [2013] find that the type of benefits offered are more important than the size of the welfare state.

ble and, second, constraining trade may dissuade future secession from the union.[5] If the EU does view trade and labor mobility as strong complements, then the perceived utility cost of deterring secession falls with the severity of the mobility constraints imposed by the UK. We explore this scenario, as well as a case where the EU sees trade and mobility as substitutes, and for a given level of mobility prefers more trade to less.

That domestic concerns affect international affairs has long been recognized in political science and economics. See e.g., Rosenau et al. [1969] and later Putnam [1988], whose two level game metaphor has been very influential. The influence of domestic interest groups on trade and protectionism has been formalized by Grossman and Helpman in a series of papers.[6] In our paper, we do not model the domestic-international interplay but argue that it provides a basis for the political leadership to commit certain policy objectives in international negotiations. The potential advantages of committing in bargaining context was discussed early on by Schelling [1980]. Committing not to accept less than a certain share of the total surplus can improve a party's payoff, but simultaneous commitments may be incompatible can result in conflict.[7] In the Brexit context, the concept of a share of the total surplus is likely to be elusive and an unsuitable basis for political commitments. However, the parties can make commitments regarding policy variables they control, such as limitations of mobility and of the access to the common market in the Brexit case. Such commitments cannot be *per se* incompatible, but the outcome may nevertheless be poor.

While our paper takes the secession decision as given, the question why cessions occur is clearly important and ties in to the literature on the formation and success of states. Political and economic historians have related the success of states to the ability to raise taxes (Brewer [1989] and Tilly [1990]). Other factors, often stressed by economists, are institutions that facilitate international trade and markets in general (Acemoglu et al. [2005] and Besley and Persson [2009]). A related strand of literature considers the optimal size or scope of a state or economic union, and point to a trade-off between efficiency gains related to size and the cost of heterogeneity. A large union is more efficient since free trade is guaranteed inside the union and duplication of costs for institutions such as defense and law enforcement are avoided. A smaller country may on the other hand find it easier to respond to citizen preferences (Alesina and Spolaore [1997]). One source of heterogeneity between countries or regions, stressed by Bolton et al. [1996] and

[5]We do not address the issue of why limited market access for the UK would deter future exit. One reason might be that it reveals information about the EU's preferences, thus affecting beliefs about the cost of future exit.

[6]See Grossman and Helpman [1994], Grossman and Helpman [1995] and Grossman and Helpman [1995].

[7]Ellingsen and Miettinen [2008] examine this trade off in a two stage game with costly and imperfect commitments.

Bolton and Roland [1997], is different income distributions and corresponding differences in preferences for redistributive taxation. Here, migration mitigates the differences between regions. Gancia et al. [2016] allow for heterogeneity in cultural preferences and find a non-monotonic relationship between globalization and the size of states.

The paper proceeds as follows. Section 2 introduces the model and examines the outcome of the process in two different scenarios, namely when trade and mobility are substitutes, and complements, according to the EU's political preferences. The incentive for the EU to misrepresent its preference or to commit to behave as if it had other preferences is examined in the following section. Section 4 discusses efficient bargaining and concessions by the UK regarding contributions to the EU budget in exchange for better access to the common market. Some concluding comments are offered in section 5.

2 A Simple Model of Exit

The model has 2 periods. In the first period, the UK and the EU negotiate the terms of exit. In the second period, further countries may exit from the EU, the probability of which depends on the outcome of the Brexit negotiations. Payoffs are realized at the end of both periods.

The first period negotiations are modeled as sequential non-cooperative game where the UK first chooses mobility, anticipating EU's choice of trade.

In stating the parties' objectives, we aim to capture the qualitative difference in the *political motivation* between the negotiating parties, not to capture the economic effects of trade and mobility. We assume that both parties have a positive view of free trade, which does appear to be the case for the EU and the UK. Moreover, in accordance with the outcome of the British referendum, we assume that the the UK prefer less mobility than the EU.

Labor mobility, or freedom of movement, is measured by $m \in [0, 1]$. For simplicity, m is assumed to enter negatively in the UK's preferences and positively in the EU's preferences. Freedom of trade is measured by $1 - t$, where $t \in [0, 1]$ measures restraints of trade. Freedom of trade enters positively in both parties' preferences. Zero trade should be interpreted as the fallback position in the absence of an agreement, say the application of WTO rules. For labor mobility, the corresponding benchmark is the level of labor mobility most preferred by the UK.

In addition to trade and labor mobility, the EU is assumed to be concerned about the size of the union, n, and the risk of future exit. This presumably matters less for the UK and is, for simplicity, assumed to have no impact on the UK's utility in the model. If future exit were not a concern, then the EU's most preferred outcome is free trade coupled with free

mobility while the UK prefers free trade and zero mobility.

Throughout the model the political preferences of the UK is assumed to be given by the following Cobb-Douglas function,

$$U(t,m) = (1-t)^{\beta_1}(1-m)^{\beta_2}, \tag{1}$$

where β_1, $\beta_2 < 1$ measure the importance attached to free trade and reduced immigration respectively. Since future exit is not a concern for the UK these preferences remain the same over both periods.

The UK can anticipate the EU's response to its choice of labor mobility, $t(m)$, which will be discussed in more detail further below, and takes this into account when choosing m. The maximization problem facing the UK can then be expressed as

$$\max_{m\in[0,1]} U(t(m),m) + \rho U(t(m),m) = (1+\rho)U(t(m),m), \tag{2}$$

where ρ is a discount factor.

The sequential structure and the anticipated EU response, $t(m)$, are key features of the analysis here, and we will consider alternative assumptions about the EU's preferences. In the model, the EU's response to the UK's position on mobility, is determined by two factors: (i) The extent to which EU views freedom of trade and free movement as, so called, inseparable freedoms. (ii) The risk and cost of future exit from the union and the deterrent effect of trade barriers vis-à-vis the UK. The latter factor provides a stand alone benefit from imposing trade restriction for the EU. An alternative, or complementary, motivation for trade restrictions could be political resentment against the UK for leaving the union.

Below, we state the EU's preferences in quite general terms and set up the maximization problem. In the following subsections we explore the behavior of the EU under different assumptions about the complementarity of trade and mobility.

We assume that the EU's valuation of the size of the union, n, is given by the sub-utility function $g(n)$, which enters the EU's utility in an additively separable way. The probability of future exit, is assumed to depend negatively on the expected trade restrictions, t, following exit, and to be given by $p(t) = (1-t)F$. Hence, there is no risk of exit if it is expected to lead to a complete trade embargo. F is a cumulative probability distribution function depending on variables reflecting the political opinion regarding exit in the EU member states, which is here taken as given.[8]

The period utility for EU is

$$V(t,m,n) = v(t,m) + g(n), \tag{3}$$

[8]The value of belonging to, or standing outside, a union or free trade agreement may depend on the size of the union. Further cession could therefore increase the risk of setting of a chain reaction. See Baldwin [1995] and Baldwin and Jaimovich [2012].

where v is decreasing and concave in t (and strictly so for a sufficiently high t), increasing and concave in m (and strictly so for a sufficiently low m), and g is strictly increasing in n.

Since the game is sequential, we proceed by solving it backwards, starting with EU's choice of t for a given m. The EU chooses t in order to maximize its political objectives over two periods:

$$\begin{aligned} \max_{t\in[0,1]} W &= V(t,m,n) + \rho\left[(1-p(t))V(t,m,n) + p(t)V(t,m,n-1)\right] \\ &= (1+\rho)\left[V(t,m,n) - (1-t)K\right] \end{aligned} \tag{4}$$

where $K = \frac{\rho}{1+\rho}F\Delta g$, and $\Delta g = g(n) - g(n-1) = V(t,m,n) - V(t,m,n-1)$. The EU's first order condition for an interior solution is then

$$\frac{\partial V}{\partial t} + K = 0, \tag{5}$$

where the first term is negative and represent the marginal utility cost of imposing trade restrictions and the second term reflects the expected marginal gain from deterring future exit from the union.

In expression (5), only the first term depends on t and it is easy to verify that the second order condition is satisfied. Consequently, there is an interior solution with positive trade barriers if expression (5) is strictly positive at $t = 0$. We will focus on the arguably plausible case that the UK will not be granted unfettered access to the common market even if mobility would remain unconstrained, either because of a wish to deter further exit or to punish the UK for exiting. We therefore make the following assumption:

Assumption 1.

$$K > -\frac{\partial V(0,1,n)}{\partial t}. \tag{6}$$

The assumption implies that the EU's expected gain from preventing further exit is always sufficiently large to motivate at least some trade restrictions. In Appendix B we consider a case when this assumption does not hold.

In the subsections below, we consider alternative assumptions concerning whether trade and mobility are best viewed as complements or substitutes from the EU's perspective. This influences how the EU's can be expected to respond to different UK standpoints on labor mobility, which in turn determines the UK's position on labor mobility.

2.1 Trade and labor mobility as substitutes

> *"I am ambitious for what we can get for the UK in terms of our relationship with the EU because I also think that's going to be good for the EU."*

- Theresa May, *Speech, Lancaster House, 17 January 2017*

From an economic point of view it is natural to argue that more freedom of trade is better than less freedom of trade, non-withstanding the situation concerning labor mobility. Also, from a trade theory perspective labor mobility is arguably less important when there is free trade, since trade pushes factor prices toward equalization in standard neoclassical trade models.[9] From this vantage point, free trade and labor mobility could be seen as substitutes. If the UK, for political reasons, would like to limit labor mobility it would therefore still seem to be in the EU's interest to keep trade free.

Below, we explore the scenario that the EU views trade and mobility as perfect substitutes. Specifically, let the period utility for EU be

$$V(t, m, n) = (1 - t)^{\alpha_1} + m^{\alpha_2} + g(n), \tag{7}$$

where α_1, $\alpha_2 < 1$ measure the importance attached to free trade and free movement respectively.

The EU's choice of t is guided by expression (5). When trade and migration are substitutes, the marginal disutility of imposing trade barriers, V_t, is independent of m and depends solely on the perceived threat of future exit. Consequently, the EU's reaction function, expressed in terms of its preferred freedom of trade, is simply a constant, reflecting the optimal level of deterrence of future exit for a given K.

$$1 - t(m) = \left(\frac{\alpha_1}{K}\right)^{\frac{1}{1-\alpha_1}}. \tag{8}$$

Clearly, in this case the UK's choice of mobility is not in any way constrained by the anticipated response by the EU.

Consequently, if the EU views trade and mobility as perfect substitutes there is no strategic interaction between the parties and trade restrictions are determined solely with a view to the risk of future exit, and mobility solely according to the UK's preferences. In sum,

Proposition 1. The equilibrium outcome when the EU treats trade and mobility are perfect substitutes is $1 - t_s^* = \left(\frac{\alpha_1}{K}\right)^{\frac{1}{1-\alpha_1}}$ and $m^* = 0$.

Figure 1 illustrates the equilibrium outcome for the perfect substitutes case, where the EU's best response reflects the optimal level of deterrence of future exit, and is independent of m. The UK then chooses the point on the EU's best response that best satisfies it political preferences, as reflected by the indifference curves. This occurs at $m = 0$, where the UK's highest indifference curve intersects the EU's best response.

[9] Factor price equalization hinges on countries endowments not being to dissimilar, see e.g., Leamer [1987].

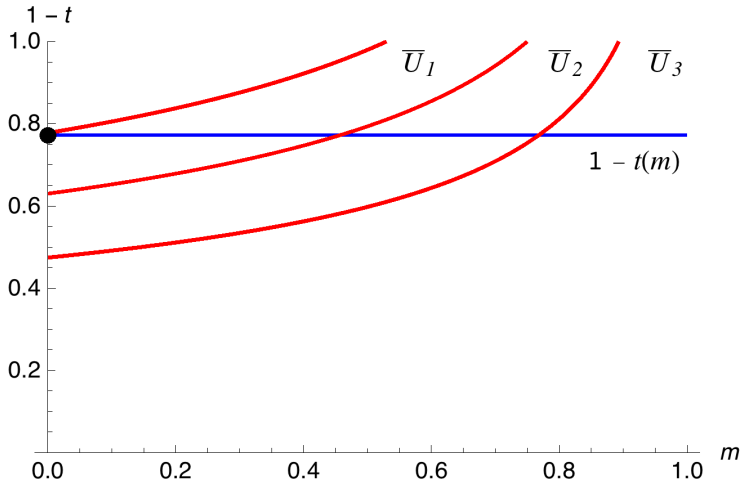

Figure 1: Trade and mobility when the EU view these as perfect substitutes.

Note that a higher perceived cost of future exit or a stronger wish to punish the UK, K, decreases equilibrium trade without any affect on the equilibrium migration. A higher K is therefore harmful for both the EU and the UK.

2.2 Trade and mobility as complements

> *"Fourth, the single market and its full freedoms, its four freedoms, are indivisible. Cherry picking is not an option."*
>
> - Michel Barnier, *Brussels, 6 December 2016*

The EU's stance, here expressed by the EU's chief Brexit negotiator, is that the four freedoms, freedom of movement of capital, labour, goods and services, are inseparable. According to this view, the EU regards the freedoms are complementary rather than being substitutes.

Below we consider the case where trade and mobility are imperfect complements in the political preferences of the EU. Specifically, we assume that the EU has Cobb-Douglas preferences, and that its period utility is

$$V(t, m, n) = (1 - t)^{\alpha_1} m^{\alpha_2} + g(n). \tag{9}$$

Expressions (5) and (6) then imply the following simple best response function for the EU, expressed in terms of its preferred freedom of trade, $1 - t$, for any given level of mobility $m \in [0, 1]$,[10]

[10]Strictly speaking, expression 5 does not determine a best response at $m = 0$. We define the best response at this point to equal the limit of expression (10) as m approaches 0 from above, i.e., equal to 0.

$$1 - t(m) = \left(\frac{\alpha_1}{K}\right)^{\frac{1}{1-\alpha_1}} m^{\frac{\alpha_2}{1-\alpha_1}}, \tag{10}$$

where the best response is linear in m if $\alpha_1 + \alpha_2 = 1$, as shown in Figure 2. As would be expected, the EU is more prone to restrict trade if the perceived cost of future exit is high, i.e., K is high. Its willingness to resort to trade restriction also increases in the importance attached to mobility, α_2. The effect of α_1 is somewhat less clear cut, but we can show the following.

LEMMA 1. For a given m, $1 - t(m)$ is quasi-concave in α_1 and strictly increasing (decreasing) in α_1 for $\alpha_1 < (>)\hat{\alpha}_1$, where $\hat{\alpha}_1 = \underset{\alpha_1}{\operatorname{argmax}}\, 1 - t(m)$. $\hat{\alpha}_1$ is strictly increasing in m and strictly decreasing in K.

Proof: In the Appendix.

Since the threshold $\hat{\alpha}_1$ depends on m, an increase in α_1 may have different effects on different segments of the reaction function. If $\alpha_1 < \hat{\alpha}_1$ for small m then an increase in α_1 has a general upward effect on the best response function, since $\hat{\alpha}_1$ is strictly increasing in m. However, if $\alpha_1 > \hat{\alpha}_1$, for small m, it may well be below $\hat{\alpha}_1$ for higher m. An increase in α_1 then pushes down the reaction function for low m while pushing it up for high m.

The UK's political preferences, taking the EU's response, in expression (10), into account, can be expressed as,

$$U(t(m), m) = \left(\frac{\alpha_1}{K}\right)^{\frac{\beta_1}{1-\alpha_1}} m^{\frac{\beta_1\alpha_2}{1-\alpha_1}} (1 - m)^{\beta_2} \tag{11}$$

where $\beta_1\alpha_2/(1-\alpha_1)$ measures the UK's weight on mobility induced freedom of trade. To simplify notation, let $\beta_m \equiv \beta_1\alpha_2/(1-\alpha_1)$. We will focus on the case where this indirect benefit of increasing mobility, via increased access to the common market, does not exhibit increasing returns. Therefore, we make the following assumption.[11]

ASSUMPTION 2. $\beta_m < 1$.

The UK maximizes expression (11) with respect to m. The first order condition is satisfied at $m = 0$ and at a unique interior point, m_c^*, where subscript c denotes the complements case. In Figure 2, the equilibrium mobility is where the UK's indifference curve is tangent to the EU's best response. It is easy to verify that the second order condition holds at m_c^*, but not at $m = 0$. Since m_c^* and its comparative static properties are straightforward they are stated without proof below.

PROPOSITION 2. The equilibrium mobility is $m_c^* = \beta_m/(\beta_m+\beta_2)$. It increases in β_m (i.e., in β_1, α_1 and α_2), decreases in β_2 and is independent of K.

[11] This assumption is also invoked in the proof of Proposition 5.

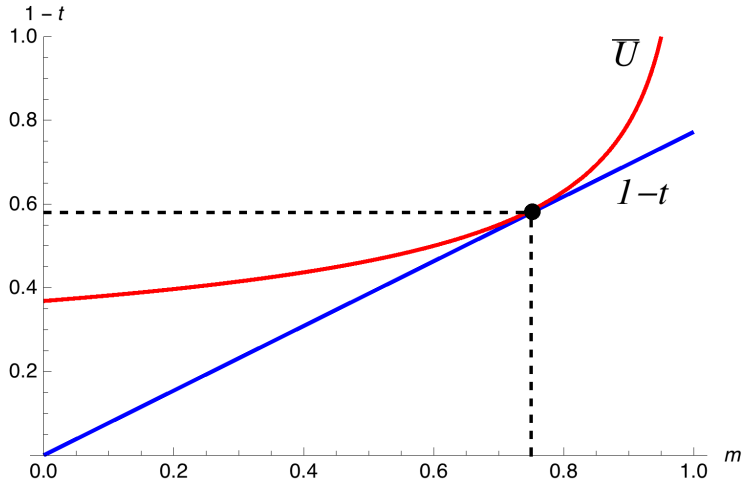

Figure 2: Equilibrium freedom of trade and mobility when $\alpha_1 + \alpha_2 = 1$ and $\beta_1 = 0.75$ and $\beta_1 = 0.25$.

Not surprisingly, equilibrium mobility increases in the weight the EU attaches to mobility and in the weight the UK attaches to free trade. It decreases in the UK's aversion to migration. The effect of a stronger emphasis on free trade by the EU is perhaps less obvious. If EU values trade more it is less willing to restrict market access at any level of mobility, i.e., its reaction function shifts up. However, the reaction function also becomes steeper, and more convex, thereby making constrained mobility more costly in terms of trade barriers, which explains why m_c^* increases in α_1. As in the previous case, K has no effect on equilibrium mobility.

Regarding freedom of trade, the equilibrium is simply obtained by substituting m_c^* into expression (10):

$$1 - t_c^* = \left(\frac{\alpha_1}{K}\right)^{\frac{1}{1-\alpha_1}} m_c^{*\frac{\alpha_2}{1-\alpha_1}} \tag{12}$$

Since the effects on freedom of trade of changes in the UK's political preferences (β_1 and β_2) are mediated only trough m_c^* they are qualitatively the same as in Proposition 2. Regarding the EU, we can only say something about the effect of a change in α_1 and K.

PROPOSITION 3. $1 - t_c^*$, increases in β_1, and decreases in β_2 and K. It increases in α_1 for $\alpha_1 < \hat{\alpha_1}$. The effect of α_2 cannot be signed.

Proof: The result concerning α_1 follows from that (i) EU's reaction function, $1-t(m)$, increases in α_1 for $\alpha_1 < \hat{\alpha_1}$ at m_c^* (Lemma 1), and (ii) m_c^* increases in α_1 (Proposition 2). Then $1 - t_c^*$ must also increase in α_1. □

In conclusion, a stronger emphasis on free trade, relative to less mobility, on the part of the UK increases both m_c^* and $1 - t_c^*$ and therefore unam-

biguously improves the situation for the EU. Likewise, if the EU places a stronger weight on trade this tends to increase both freedom of trade and mobility, at least in a situation where trade and mobility is high from the outset.

As in the case of substitute preferences, a higher perceived cost of future exit, K, results in less trade without any effect on mobility, which is a worse outcome for all parties. Consequently, if the EU leadership is in a position to fuel resentment abut Brexit and demands for retribution in terms of trade restrictions there are very good reasons for abstaining from this. At the same time, it is the EU's willingness to restrict the UK's access to the common market to at least some extent that provides it with any bargaining power to start with.

2.3 Does the UK moving first make sense?

In the introduction we argued that the UK could commit first, e.g., by making political commitments about EU migration in the wake of the referendum. However, it would only do so if it is beneficial. Also, the EU might try to leapfrog the UK in terms of commitments if that would serve the EU's interests. To clarify the parties interest in this matter we therefore examine the equilibrium outcomes under two alternate assumptions about the sequence of moves in the model, namely that the EU moves first and that the parties make simultaneous commitments.

First, consider the case when the EU first commits to a certain level of access to the common market post Brexit, and the UK subsequently sets the level of mobility. As before we proceed to solve the model using backward induction, now starting with the UK's choice of mobility in the second period. Clearly, for any *given* $1 - t$, the UK's best reply is to set $m = 0$. Anticipating this, the EU's willingness to grant the UK access to the common market is determined by its best response to $m = 0$. If the EU has substitute preferences this is $1 - t_s^*$, i.e., the equilibrium coincides with that in section 2.1. In the complements case, the EU's best response, given by expression (10), implies that $m = 0$ will be met by maximal trade restrictions. With complement preferences, the utility cost of imposing trade sanctions when $m = 0$ is zero. Thus, the unique equilibrium is $(0, 0)$, which is a much worse outcome for both parties than when the UK moved first.

Now, suppose the parties commit simultaneously. In a pure strategy Nash equilibrium both parties must play their best responses to the equilibrium. In the substitutes case, the logic is the same as above, since the UK's best response for any $1 - t$ is to set $m = 0$. Thus the equilibrium is again $(1 - t_s^*, 0)$. In the complements case the only point where the reaction functions intersect is $(0, 0)$. Thus, in both cases the equilibrium coincides with that when the EU moves first. We can therefore conclude the following:

Proposition 4. Both the EU and the UK are better off if the process

is structured so that the UK moves first, and the EU second, than if the sequence of moves is the opposite or simultaneous. This holds strictly if there is a strictly positive probability that the EU has complements preferences.

Thus, once the EU has decided on the UK's access to the common market there is nothing constraining the UK's choice of m. In the light of this, the phased approach set out in the guidelines by the European Council makes sense, both for the EU and the UK.

3 Preference misrepresentation and political positioning

As noted above the UK's perception of the EU's preferences plays an important role for its position regarding labor mobility, and ultimately, the outcome of the negotiation process. Below, we first consider the EU's incentive to misrepresent its preferences, when there is uncertainty about the EU's true preferences, and second, whether the EU would have an incentives to commit to behave *as if* it has other preferences than its true preferences.

3.1 Preference misrepresentation

So far the parties preferences has been assumed to be common knowledge, but if that is not the case the EU may have an incentive to misrepresent its preferences, since the UK adapts its stance on mobility to how it expects the EU to respond. (The EU can observe the UK's actions before moving and is thus not concerned with the UK's preferences).

We explore the incentive for preference misrepresentation by means of a simple example illustrating the relevant trade-off. Specifically, we assume that the EU's true political preferences are either of the substitute type, as in expression (7), or of the complement type, as in expression (9). The true state is observable to the EU but not for the UK, but it is common knowledge that the probability of these states are q and $1-q$ respectively. We assume that the parameter values are the same in both cases, and such that (i) the EU restrains trade to some extent regardless of m and (ii) that there is an interior solution in the complements case.

With uncertainty, the parties could wish to engage in pre-play communication, or cheap talk, to arrive at a better outcome. While we do not formally introduce a pre-play communication stage, the analysis below simply demonstrates that such communication would be uninformative, since the EU always has an incentive to claim to have complements preferences. Moreover, it is shown that uncertainty unambiguously harms the UK and aggravates inefficiency.

Suppose that the EU insists that trade and mobility are complements, regardless of its true preferences. (Later we show that the EU has an in-

centive to do so). The UK then only knows that the probability that the EU's reaction function is given by $1-t=\left(\frac{\alpha_1}{K}\right)^{\frac{1}{1-\alpha_1}}$ is q and that it is given by $1-t=\left(\frac{\alpha_1}{K}\right)^{\frac{1}{1-\alpha_1}} m^{\frac{\alpha_2}{1-\alpha_1}}$ is $1-q$. Consequently, the UK's maximization problem amounts to choosing the optimal m not knowing which reaction function that will guide the EU's choice of $1-t$.

$$\max_{m\in[0,1]} q\left[\left(\frac{\alpha_1}{K}\right)^{\frac{\beta_1}{1-\alpha_1}}(1-m)^{\beta_2}\right]+(1-q)\left[\left(\frac{\alpha_1}{K}\right)^{\frac{\beta_1}{1-\alpha_1}} m^{\beta_m}(1-m)^{\beta_2}\right]. \quad (13)$$

The first order condition for this choice can be expressed as:

$$\beta_2(1-m)^{\beta_2-1}\left(\frac{\alpha_1}{K}\right)^{\frac{\beta_1}{1-\alpha_1}}\left[-q+(1-q)\frac{\beta_m}{\beta_2}m^{\beta_m-1}\left(1-\frac{m}{m_c^*}\right)\right]\leq 0, \quad (14)$$

where we have used that $m_c^*=\beta_m/(\beta_m+\beta_2)$ to facilitate interpretation. Condition (14) identifies the optimal mobility m_u^* for the UK, where the subscript denotes uncertainty. This mobility choice is a compromise reflecting the probabilities of the two states.

PROPOSITION 5. There exists a unique $m_u^*>0$, which strictly decreases in q. $\lim_{q\to 0^-} m_u^*=m_c^*$ and $\lim_{q\to 1} m_u^*=0$.

Proof: In the appendix.

This result was derived assuming that the EU always claims to have complement preferences. It is easy to verify that this is indeed optimal for the EU. As the EU moves second, its ranking of equilibrium outcomes, given its preferences, simply corresponds to the mobility level set by the UK. If the EU claims to have substitute preferences, and is believed, then the UK sets $m=0$. Claiming to have complement preferences yields a strictly higher m, unless the UK knows this to be false, i.e., $q=1$, in which case m is the same. This is the case regardless of the EU's actual preferences, and therefore there is pooling in equilibrium.

The inability to observe the EU's preferences harms the UK. If preferences were observable, the UK would choose the optimal point on the relevant best response function, which is illustrated as points A and B in Figure 3. In expectation, it would then receive a probability weighted average of these payoffs. If preferences are not observable, the UK's choice of mobility, m_u^*, is maladapted for at least one of the preference states, and the UK's expected utility is therefore strictly lower. The equilibrium outcomes are obtained by inserting m^* into the respective reaction functions, and are illustrated as points C and D in Figure 3, where m_u^* is assumed to be 0.5.

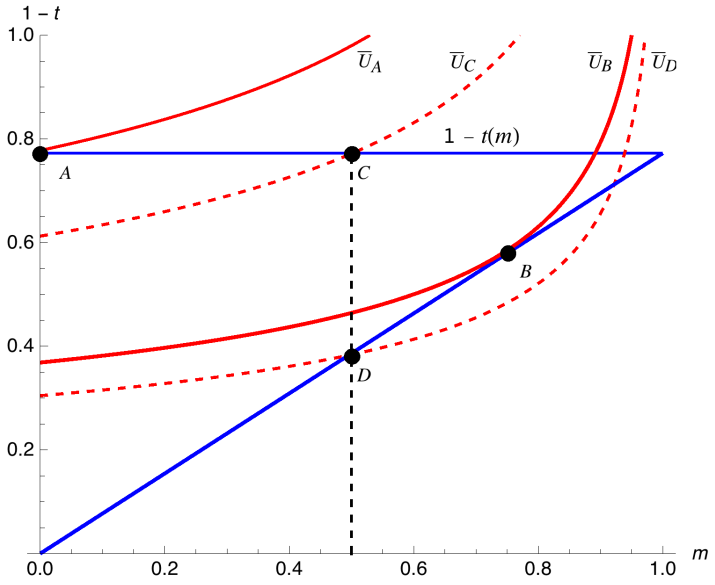

Figure 3: Uncertainty harms the UK since C is worse than A and D is worse than B.

(In the figure, C is strictly worse than A, and D is strictly worse than B for the UK). We can summarize our observations as follows.

PROPOSITION 6. If the EU's preferences are not observable, it is always better off claiming to have complements preferences. In expectation, the UK is strictly worse off when preferences are not observable for $q \in (0,1)$.

If the EU were to commit first its preference type would be revealed and the UK could tailor its choice of mobility accordingly. In view of this, one might ask whether the UK would be better off with an alternative sequence of moves. We therefore revisit the questions addressed in Proposition 4.

To do this we compare the UK's expected payoff when it moves first with the payoff it would receive under the alternative scenarios. The former is simply given by expression (13) evaluated at m_u^*, and the latter is a probability weighed average of the equilibrium payoffs under the alternative scenarios. Recall that the equilibria when the EU moves first, or the parties move simultaneously were $((\alpha_1/K)^{1/(1-\alpha_1)}, 0)$ under substitute preferences and $(0,0)$ with complement preferences. Hence, the UK's payoff is $q(\alpha_1/K)^{\beta_1/(1-\alpha_1)}$ in the former case and 0 in the latter. The UK is then better of moving first if,

$$q\left(\frac{\alpha_1}{K}\right)^{\frac{\beta_1}{1-\alpha_1}}(1-m_u^*)^{\beta_2} + (1-q)\left(\frac{\alpha_1}{K}\right)^{\frac{\beta_1}{1-\alpha_1}} m_u^{*\beta_m}(1-m_u^*)^{\beta_2} \geq q\left(\frac{\alpha_1}{K}\right)^{\frac{\beta_1}{1-\alpha_1}} \quad (15)$$

where m_u^* is a function of q. Proposition 5 implies that this inequality holds

strictly for $q = 0$ and with equality as q approaches 1. In the appendix we show that the derivative of the difference of the right hand side and the left hand side payoffs, with respect to q, is strictly negative for $q < 1$. Consequently, the inequality holds for all q, and we can conclude the following.

COROLLARY. Proposition 4 holds also if the UK only knows the probabilities that the EU has substitute or complement preferences.

Proof: In the appendix.

3.2 Political positioning

Above we noted that the EU has an incentive to make the UK believe that it views freedom of trade and mobility as complements. Below we consider whether the EU also might have an incentive to commit to act *as if* it has such preferences even if EU policy makers actually view these freedoms as substitutes. We leave aside the question of whether EU policy makers are able to commit and focus on the incentive to do so.[12] To simplify matters, we assume that a commitment by the EU is perfectly understood by the UK, so that there is no uncertainty about the EU's expected behavior.

The question is whether an EU with substitute preferences is better off with the complement preference equilibrium than the substitute preference equilibrium. Below, we consider this utility difference, which after some rearrangement of terms can be expressed as follows:

$$\Delta W = (1+\rho)\left[\left(\frac{\alpha_1}{K}\right)^{\frac{\alpha_1}{1-\alpha_1}}\left(m_c^{*\frac{\alpha_1\alpha_2}{1-\alpha_1}}-1\right)+m_c^{*\alpha_2}-K\left(\frac{\alpha_1}{K}\right)^{\frac{1}{1-\alpha_1}}\left(m_c^{*\frac{\alpha_1}{1-\alpha_1}}-1\right)\right]. \quad (16)$$

The first term within the brackets corresponds to the loss in trade, the second to the gain in mobility and the third to the value of stronger deterrence.

Below we seek to establish that committing to complement behavior makes sense for the EU if (i) the EU cares enough about mobility, relative to trade, to make a gain in mobility sufficiently valuable and (ii) the UK cares enough about trade, relative to mobility, to make a large enough concession in terms of mobility when facing an EU with complement preferences. The equilibrium mobility in the complements case, m_c^*, is crucial here. With a slight rearrangement it can be expressed as,

$$m_c^* = \frac{\alpha_2/(1-\alpha_1)}{\alpha_2/(1-\alpha_1)+\beta_2/\beta_1}.$$

[12] It seems likely that policy makers can at least raise the political cost of accommodation by public statements to the contrary or by commitments to important stakeholders, such as certain member states.

Thus, for given α_1 and α_2, m_c^* is a continuous function of the ratio β_2/β_1 with range $(0, 1]$. First, if m_c^* approaches 0 then $\Delta W < 0$, i.e., if the UK doesn't care about trade with the EU then it is counterproductive to commit to respond with trade restrictions. Second, if $m_c^* = 1$, the mobility gain is very large and $\Delta W > 0$. For intermediate cases the EU's relative valuation of mobility plays in and complicates the evaluation. However, assuming that $\alpha_1 \leq \alpha_2$ is sufficient, but not necessary, to establish the following.

PROPOSITION 7. For given α_1, α_2 and K, where $\alpha_1 \leq \alpha_2$, there exists a unique $\hat{m}_c^*$ such that $\Delta W = 0$, and $\Delta W > (<) 0$ for $m > (<) \hat{m}_c^*$.

Proof: In the appendix.

This confirms our intuition that if EU has substitute preferences it can gain from committing to behave *as if* it had complement preferences provided that it cares enough about mobility and that the UK cares enough about trade so that resulting gain in mobility is sufficiently large.

In this context, one might consider whether the UK has an incentive to commit first, to dissuade the EU to commit. For example, if the EU believes that the UK puts a very low weight on free trade with the EU then, falsely committing to complement preferences does not pay off for the EU, it just leads to unnecessarily restricted trade with little gain in mobility. In view of this, a "my way or the highway" attitude to the negotiations by the UK could pave the road for a more favorable deal for the UK, and perhaps Theresa May's often quoted "...no deal is better than a bad deal for the UK" can be understood in this way.[13]

However, success is contingent on the EU having substitute preferences and gambling on this could be a risky proposition in a sequential setting. If the EU actually views free trade and mobility as strong complements then a UK commitment to a hard line position on mobility leads to a worse outcome for everybody.

4 Inefficient outcomes and incentives to bargain

The point of departure for our analysis has been the conjecture that the Brexit process is not well captured by an efficient bargaining game since the parties seem to be interacting with their constituencies in ways that are likely to constrain their behavior and lead to inefficient outcomes.[14]

Below we discuss the scope for increased efficiency in the short and the long run. Regarding the short run perspective, the confinement of the analysis to two decision variables may exaggerate the inefficiencies. In the subsection below, we consider how UK contributions to the EU budget could

[13] See also the Manifesto by the Conservative and Unionist Party [2017], page 36.

[14] Efficiency only occurs in the substitutes case if Assumption 1 does not hold and $\{1 - t_s^*, m_s^*\} = \{1, 0\}$.

work as a side payment and potentially enhance efficiency. The ensuing subsection takes a long run perspective. Over time commitments fade and one might expect that inefficient agreements will eventually be renegotiated. We briefly discuss the scope for efficient bargaining using the equilibrium outcomes as points of departure.

4.1 Budget contributions as a deterrent to future exit

A contentious issue is whether the UK should continue to contribute to the EU budget for a period after the exit, and if so, to what extent? For example, it has been argued that the UK has a responsibility to contribute funding to programs it has initiated together with other member states. Here, we side step questions of responsibility and instead discuss whether concessions by the UK regarding budget contributions may work as a substitute for trade restrictions and deter future exit from the EU. The discussion below is informal in the sense that we do not include a budget contribution decision in our sequential model. We merely look at how such a substitution may affect the parties' payoffs.

We make a slight modification of the model to account for budget transfers. Specifically, we assume that the probability of future exit depends negatively on size of the budget contributions, b, the UK accepts as part of the Brexit deal in the following way:

$$p(t,b) = (1-t)F(x)h(b) \tag{17}$$

where $h(b) > 0$ is continuous in b, $h(0) = 1$ and $h'(b) < 0$. It follows that the rate of substitution between b and t, keeping the level of deterrence constant, is given by $r = (1-t)h'(b)/h(b)$. Whether budget contributions are better or worse than trade restrictions from the UK's perspective of course depends on its political preferences. Suppose that budget contributions enter the UK preferences in a similar multiplicative fashion, so that $U(t,m,b) = (1-t)^{\beta_1}(1-m)^{\beta_2}\hat{h}(b)$, where $\hat{h}(b) > 0$ is continuous in b, $\hat{h}(0) = 1$ and $\hat{h}'(b) < 0$. It follows that the rate of substitution for the UK is then $\hat{r} = (1-t)\hat{h}'(b)/\hat{h}(b)$, and that the UK is better of with budget contributions than trade restrictions if $|r| \geq |\hat{r}|$.

From the EU's perspective, substituting painful trade restrictions for welcome budget contributions by the UK, while keeping the level of deterrence constant, is unequivocally attractive. This indicates that even if the $|r| \geq |\hat{r}|$ condition is not met for the UK the parties could most likely find it mutually beneficial to substitute trade restrictions for budget contributions.

4.2 The scope for efficient bargaining

Below we briefly discuss the potential for efficient bargaining, using the equilibrium outcomes in section 2 as exogenous points of departure, i.e., we

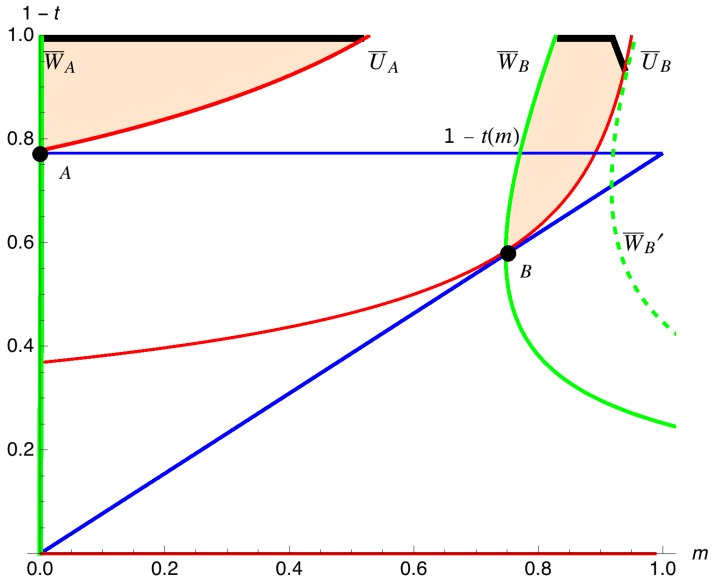

Figure 4: Scope for bargaining as illustrated for the case $\alpha_1 = \beta_1 = 0.75$ and $\alpha_2 = \beta_2 = 0.25$.

make no attempt to extend our model with an ensuing bargaining game. Furthermore, we only consider bargaining over trade and mobility here, and we assume that utility is non-transferable.

The main features of the bargaining scenarios under consideration are illustrated in Figure 4, where A and B are the equilibria in the substitute- and the complement-preference scenarios. The shaded areas show Pareto improvements from A and B and the solid thick lines indicate points where both parties cannot be made better off, i.e., the core. In the the example in the graph, efficient bargaining from A leads to unconstrained trade. Starting from B leads to either a point on the downward sloping segment of the core where $1 - t < 1$ where the parties relative valuation of freedom of trade and mobility coincide or to a situation where this is not the case but where freedom of trade has already reached its maximum and no further improvement can be made, as illustrated by the horizontal segment of the core.

More generally, we can make the observation that efficient bargaining must result in strictly higher trade and increased mobility. This follows from that the parties indifference curves are strictly upward sloping at an equilibrium point, which can easily be shown.

5 Concluding remarks

We model the Brexit negotiations as a simple sequential game over mobility and trade. The UK prefers full access to the common market while reducing mobility. It has jurisdiction over its future migration policy, but its choice of policy is affected by the expected reaction of the EU. The EU, in turn, prefers free mobility and free trade, but it may also wish to impose trade restrictions on the UK to dissuade further exit from the union, or to punish the UK for exiting.

That the UK moves first in our model, and determines labor mobility, is motivated both by factual circumstances, and by internal consistency of the model. We show that both parties are better off with the UK moving first, in comparison with the EU moving first or the parties moving simultaneously.

Our analysis has several implications for the ongoing Brexit negotiations. A key issue turns out to be to what extent the EU views trade and mobility as complements, as indicated by statements about these being inseparable freedoms. If the EU were to have more of a trade theory perspective, where trade and migration arguably is better viewed as substitutes, the UK would have its way regarding mobility without suffering reduced access to the common market. If the EU does view trade and migration as complements, the equilibrium outcome will be determined by relative preferences for trade and migration, and feature more mobility but less trade. The perceived cost of future exit is important in this case. Without the will to punish the UK the EU has no negotiating power, but an increased focus on this leads to an outcome with less trade but with little or no effect on migration, to the detriment of both parties.

We also examine a scenario where the EU's true preferences cannot be observed by the UK, and find that the EU then has an incentive to always claim to see trade and mobility as complements. Furthermore, this uncertainty is harmful for the UK. Nevertheless, it is still optimal for both parties that the UK moves first. We also find that if the EU has substitute preferences, it could still gain from committing to behave as if it had complements preferences.

Finally, the equilibria we analyze are inefficient. Consequently, there are incentives for the parties to move towards more efficient outcomes in a longer term perspective, implying increased trade and mobility. We also note that contributions to the EU budget could potentially substitute for trade restrictions, thereby contributing to a more efficient outcome.

Appendix A

Proof of Lemma 1. First, note that $\lim_{\alpha_1 \to 0} 1-t(m) = \lim_{\alpha_1 \to 1} 1-t(m) = 0$. Second,

$$\frac{\partial 1-t(m)}{\partial \alpha_1} = \frac{1-t(m)}{\alpha_1(1-\alpha_1)} \left[\ln \left(\frac{\alpha_1}{K} m^{\alpha_2} \right)^{\frac{\alpha_1}{1-\alpha_1}} + 1 \right]. \tag{A.1}$$

For $m \in (0,1]$ this is continuous in α_1, strictly positive for α_1 close to zero and negative for α_1 close to 1. Thus, there exists at least one critical point. The second derivative, evaluated at a critical point is:

$$\frac{\partial^2 1-t(m)}{\partial \alpha_1^2}\Big|_{\frac{\partial 1-t(m)}{\partial \alpha_1}=0} = \frac{1-t(m)}{\alpha_1^2(1-\alpha_1)} \left(\frac{\alpha_1}{1-\alpha_1} \underbrace{\left[\ln \left(\frac{\alpha_1}{K} m^{\alpha_2} \right)^{\frac{\alpha_1}{1-\alpha_1}} + 1 \right]}_{=0} - 1 \right) < 0.$$

Hence, the critical point, denoted $\hat{\alpha}_1$, is unique and $1-t(m)$ must strictly increase (decrease) in α_1 for $\alpha_1 < (>) \hat{\alpha}_1$. The effects of m and K on $\hat{\alpha}_1$ follow from implicit differentiation of the first order condition. □

Proof of Proposition 5. Since $\beta_2 < 1$ condition (14) can only be satisfied with equality if the bracketed factor, which we can denote $A(m)$, equals zero. Since $\beta_m < 1$ by assumption, A is continuous and strictly decreasing in m on $(0, m_c^*]$ and $\lim_{m \to 0} A = +\infty$ and $A(m_c^*) = -q$. Thus, there is a unique m_u^* such that $A(m_u^*) = 0$. The second order condition is satisfied at the critical point if

$$m^{\beta_m - 2} \left[(\beta_m - 1) \left(1 - \frac{m}{m_c^*} \right) - \frac{m}{m_c^*} \right] < 0,$$

which must hold when $\beta_m < 1$.

dm_u^*/dq is obtained by implicit differentiation of A

$$\frac{dm_u^*}{dq} = -\frac{-1 - \frac{\beta_m}{\beta_2} m^{\beta_m - 1} \left(1 - \frac{m}{m_c^*} \right)}{SOC} < 0 \qquad for\ m \in (0, m_c^*],$$

since the denominator is negative by the second order condition.

That $\lim_{q \to 0^-} m_u^* = m_c^*$ simply follows from insertion of $q = 0$ into expression (13). Finally, to see that $\lim_{q \to 1} m_u^* = 0$ we rearrange $A(m) = 0$ so that

$$\frac{q}{1-q} \frac{\beta_2}{\beta_m} = m^{\beta_m - 1} \left(1 - \frac{m}{m_c^*} \right).$$

The left hand side is strictly increasing in q and tends to infinity as q approaches 1. The right hand side is strictly decreasing in m and tends to infinity as m approaches 0 from above. □

Proof of the Corollary. First, simplify condition (13) and then let Φ denote the difference between the left and the right hand side:

$$\Phi \equiv (1 - m_u^*)^{\beta_2} \left[q + (1-q) {m_u^*}^{\beta_m} \right] - q \geq 0. \tag{A.2}$$

The derivative of Φ with respect to q is,

$$\begin{aligned} \tfrac{d\Phi}{dq} = \quad & \beta_2 (1 - m_u^*)^{\beta_2 - 1} \tfrac{dm_u^*}{dq} \left[q + (1-q) {m_u^*}^{\beta_m} \right] + \\ & (1 - m_u^*)^{\beta_2} \left[1 - {m_u^*}^{\beta_m} + (1-q) \beta_m {m_u^*}^{\beta_m - 1} \tfrac{dm_u^*}{dq} \right] - 1. \end{aligned} \tag{A.3}$$

Since $dm_u^*/dq < 0$ (Proposition 5) the first term is negative and the only positive element in the second term is 1. Since, $(1 - m_u^*)^{\beta_2} - 1 < 0$ for $q < 1$, this is also true for expression (A.3). □

Proof of Proposition 7.
A slight rearrangement of expression (16) yields

$$\Delta W = (1+\rho) \left(\frac{\alpha_1}{K} \right)^{\frac{\alpha_1}{1-\alpha_1}} \underbrace{\left[{m_c^*}^{\frac{\alpha_1 \alpha_2}{1-\alpha_1}} - \alpha_1 {m_c^*}^{\frac{\alpha_1}{1-\alpha_1}} - (1-\alpha_1) + \left(\frac{\alpha_1}{K} \right)^{\frac{\alpha_1}{1-\alpha_1}} {m_c^*}^{\alpha_2} \right]}_{\text{B}},$$

where ΔW only equals zero if $B = 0$. First, note that if $m_c^* = 0$ then $\Delta W = (1+\rho) (\frac{\alpha_1}{K})^{\frac{\alpha_1}{1-\alpha_1}} \left[-(1-\alpha_1) \right] < 0$ and that $\lim_{m_c^* \to 1} \Delta W = (1+\rho) > 0$. Since ΔW is continuous in m_c^* there at least one point where $\Delta W = 0$, which we denote $\hat{m}_c^*$. This point is unique if B is strictly increasing in m_c^*. Now,

$$\frac{dB}{dm_c^*} = \underbrace{\frac{\alpha_1 \alpha_2}{1-\alpha_1} {m_c^*}^{\frac{\alpha_1 \alpha_2}{1-\alpha_1} - 1} - \frac{{\alpha_1}^2}{1-\alpha_1} {m_c^*}^{\frac{\alpha_1}{1-\alpha_1} - 1}}_{\geq 0 \text{ if } \alpha_2 \geq \alpha_1} + \alpha_2 \left(\frac{\alpha_1}{K} \right)^{\frac{\alpha_1}{1-\alpha_1}} {m_c^*}^{\alpha_2 - 1}.$$

Hence, there is a unique $\hat{m}_c^*$ such that $\Delta W > (<) 0$ if $m_c^* > (<) \hat{m}_c^*$. □

Appendix B

B.1 Corner solutions

Assumption 1 ensures that the EU imposes to some trade restrictions to deter future exit, regardless of the UK's choice of mobility. If this assumption is relaxed corner solutions with $1 - t^* = 1$ can emerge in both the substitutes and the complements case. (In the former mobility is also at a corner and there is not much more to say).

Here, we briefly discuss the complements case, where the effect of a stronger preference for trade, α_1, has a different effect on mobility in the

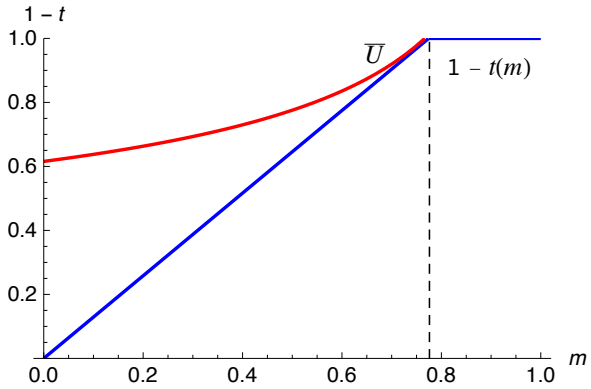

Figure B.1: Equilibrium trade and mobility when $\alpha_1 + \alpha_2 = 1$ and the UK's relative preference for mobility is $\beta_2/\beta_1 = 1/3$.

corner solution. The threshold mobility, $\hat{m}$, at which expression (10) equals 1 is given by $\hat{m} = (\frac{\alpha_1}{K})^{-1/\alpha_2}$. If $\hat{m}$ is sufficiently low we get a corner solution, as illustrated in Figure (B.1). The comparative static properties of $\hat{m}$ are:

PROPOSITION B1. $\hat{m}$ increases in K and α_2, but decreases in α_1.

Proof: The results follow from differentiation of $\hat{m}$, using that $\alpha_1/K > 1$. □

The reason why a higher α_1 decreases equilibrium mobility in a corner solution is that the EU's best response curve becomes more convex and increases at $\hat{m}$, which is easily seen if we evaluate expression (A.1) at $\hat{m}$. Incidentally, this is the same reason explaining why it can have the opposite effect in an interior equilibrium. (For example, suppose $\hat{m}$ is initially high and that we have an interior equilibrium. As α_1 increases, interior mobility also goes up while $\hat{m}$ decreases, up to the point where they coincide and we reach the corner solution).

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