Three Essays on Immigration and Institutions

Submitted by **Atisha Ghosh**
to the University of Exeter
as a thesis for the degree of
Doctor of Philosophy in Economics
In February 2018

I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature:

Abstract

This dissertation consists of three chapters.

Chapter 1 shows how an elite can turn an institution from being inclusive to extractive, in the context of the European Union's free movement of persons (FMP). In an international labor market, integrated by FMP across a number of member countries, we consider expansion of the market through the addition of new members. Each member government can control only immigration from non-members. The main result is that if new members are decreasing in total factor productivity, then expansion at first benefits but later hurts workers, while first hurting but later benefiting an economic elite, and benefiting a political elite throughout.

Chapter 2 shows how a government sets immigration policy in the presence of entrepreneurs who undertake investment. The government and the entrepreneurs negotiate to determine the quota of immigration and the amount of contribution to be paid to the government. We also show how a government may be willing to tie its hands to an institution that constrains the immigration policy it can set. We identify conditions such that by tying its hands to such an institution, the government can increase investment in the economy.

Chapter 3 analyses the effect of public good provision on the location choice of immigrants in the UK. In particular, we investigate the impact of a change in the number of schools on the location choice of immigrants by exploiting an exogenous shock provided by the Academies Act of 2010. We first employ a difference-in-difference strategy to analyse the effect of the Academies Act on immigration levels by comparing North West England and Wales, since the act was only applicable to England. In a separate analysis, we estimate a discrete choice model to examine the location choice of immigrants using a panel data of London boroughs. This model reports that a 1% increase in number of schools in a London borough increases the number of immigrants by 1.4%, on average.

Contents

Dedication 8

Acknowledgements 9

1 Turning an Institution from 'Inclusive' to 'Extractive' : The Case of the European Union's 'Free Movement of Persons' 11

1.1 Introduction 11

1.2 The Model 18

1.2.1 Immigration Quota and Government Welfare 20

1.3 Equilibrium in the Union under the Free Movement of Persons . . . 22

1.3.1 Stage 2: Labor Market Clearing under FMP 22

1.3.2 Stage 1: Setting the Quota to Maximize Government Welfare 24

1.4 Endogenous Union Formation 25

1.4.1 Symmetric countries 27

1.4.2 Asymmetric countries 29

1.4.3 Order of Entry of Countries into the Union 35

1.5 Conclusion 37

2 The Role of Institutions in Determining Immigration and Investment 39

2.1 Introduction 39

2.2 The Model 44

2.2.1 Benchmark Social Planners' Problem 47

2.2.2 Pure Democracy 48

2.2.3 Political Equilibrium 50

2.2.4 Comparing Government Welfare in Pure Democracy and Political Equilibrium 54

2.3 The Role of Institutions 57
2.4 Numerical Analysis 60
2.5 Conclusion 65

3 Public Goods and Immigration: England and Wales 66

3.1 Introduction 66
3.2 Schools in England and Wales 70
3.2.1 Academies Act 72
3.3 Impact of the Academies Act on Immigration: A difference-in-difference analysis 73
3.3.1 Data 74
3.3.2 Data Analysis 75
3.3.3 Difference-in-difference model 79
3.3.4 Results 81
3.4 An Empirical Model of Discrete Choice 85
3.4.1 Data 86
3.4.2 Model 89
3.4.3 Results 92
3.5 Conclusion 94

A Chapter 1 96

A.1 Derivation of the structural form of total employment for the ith country : Stage 3 96
A.2 Derivation of optimal immigration quota and total employment for country i : Stage 1 99
A.3 Floor with Symmetric countries : detailed calculations 101
A.4 Profits 103
A.5 Asymmetric countries : Mathematical Proof 104
A.6 Proof of Proposition 4 107

B Chapter 2 109

B.1 Derivation of the optimal contribution schedule 109

B.2 Derivation of optimal investment by entrepreneurs in first stage . . 112
B.3 Dependence of government's utility on its bargaining power and capital intensity 113
B.4 Derivation of political equilibrium under institutions and its relation with government's bargaining power : Proof of Proposition 5 115

C Chapter 3 **119**

C.1 Effect of Academies Act on Male Immigrants with Children 119
C.2 Effect of Academies Act on Male Immigrants with children, by occupation groups 120
C.3 Effect of Academies Act on Male Immigrants without Children . . . 121
C.4 Effect of Academies Act on Male Immigrants without children, by Occupation groups 122
C.5 Specification with dependent variable as share of male immigrants with/without children to total population in a region 123
C.5.1 Effect of Academies Act on share of male immigrants with children to total population, without occupation categories . 123
C.5.2 Effect of Academies Act on share of male immigrants with children to total population, with occupation categories . . . 124
C.5.3 Effect of Academies Act on share of male immigrants without children to total population, without occupation categories 125
C.5.4 Effect of Academies Act on share of male immigrants without children to total population, with occupation categories 126
C.6 Parallel Trends 127
Bibliography 128

List of Figures

1.1 Average Annual Wages in the UK at 2016 constant prices, pound sterling, 2000-2016 16
1.2 Effect on Wages 31
1.3 Effect on Profits 33
1.4 Effect on Government Welfare 36

2.1 Pure Democracy and Political Equilibrium 58
2.2 Institutions 59
2.3 Low responsiveness to contributions, s=0.2 61
2.4 Low responsiveness to contributions, s=0.5 62
2.5 Low responsiveness to contributions, s=0.8 63
2.6 High responsiveness to contributions, s=0.2 63
2.7 High responsiveness to contributions, s=0.5 64
2.8 High responsiveness to contributions, s=0.8 64

3.1 Immigrants to North West England and Wales, 2006-2016 77
3.2 Map of UK 80
3.3 Immigration in London vs Other Parts of England 86
3.4 Immigrants as a Percentage of Total Resident Population 86

List of Tables

3.1 Number of Free Schools and Average Population in Various regions of England. 73
3.2 Type and Number of Academies in North West England and Wales 74
3.3 Summary Statistics for U.K. from Annual Population Survey for 2006-2016 76
3.4 North West England and Wales 2006-2010 77
3.5 Average Population and Immigration in North West England and Wales 78
3.6 No. of male immigrants with/without children and change in population of male immigrants between 2010 (pre Academies Act) and 2015 (post Academies Act) 78
3.7 Average Employment of Males by Occupation in North West England and Wales, before 2010 (pre Academies Act) and after 2010 (post Academies Act) 79
3.8 Effect of Academies Act on Male Immigrants with Children 82
3.9 Effect of Academies Act on Male Immigrants with Children, by Occupation Group 83
3.10 Effect of Academies Act on Male Immigrants without Children . . . 84
3.11 Effect of Academies Act on Male Immigrants without Children, by Occupation Group 84
3.12 Number of Different types of Schools in London, 2005-2015 88
3.13 Summary Statistics of the Sample 89
3.14 Effect of Academies Act on Immigration to London borough 93

Dedication

To

Bhaiya

My Grandmother and my constant source of support and encouragement

and

My Parents

Acknowledgements

First and foremost, I would like to express my sincere gratitude to my primary supervisor, Prof.Ben Zissimos for his continuous support, patience, guidance and motivation during the course of my PhD. I am extremely grateful to him, not only for his tremendous academic support but also for enabling me to become a more mature individual. My sincere thanks to my second supervisor, Dr.Pradeep Kumar who helped me construct my final chapter and for his valuable suggestions and constructive criticisms. I would also like to thank the Department of Economics, University of Exeter Business School and Economic and Social Research Council for providing me with the opportunity to do this PhD. I would like to extend my heartfelt thanks to my Masters dissertation supervisor, Prof.Ira Gang at Rutgers University for his help in shaping my career.

I am indebted to my parents for their unwavering belief in me and for always being proud of me. I thank them for giving me the strength and the encouragement to chase my dreams. I would like to thank my younger sister, Areetra, for her love and support. I would also like to thank my parents-in-law, Didibhai, Chardibhai, my amazing brothers-in-law Harsh and Avik and my cousins Khushi and Arghya. My heartfelt thanks also go out to Babu, Pishimoni, Dadabhai and Sneha di. I am grateful to my little nieces and nephew for always bringing a smile to my face.

I would like to thank all my friends in Exeter especially Chumki di, without whose constant encouragement I would not have been able to complete this thesis. She has been like family to Kaustav and me, showering us with selfless love and amazing food. A very special thank you goes out to Brishti for being my little best friend in Exeter. I am extremely grateful to Siddhartha da for always giving

me constructive feedback on my work.

I would like to express my gratitude to my first Economics teacher in high school, Mrs. C Sen Chowdhury who motivated me to explore the subject. I am also grateful to Sriya and Abhishek da for their constant support and for being the best friends one could ask for. I would like to thank Sahana di for helping me get my first job in ICRIER and for providing me with constant inputs and suggestions on the way to go through the PhD process.

Finally, I would like to thank my husband Kaustav for being extremely understanding and patient with me. Without his love and support I would not have been able to complete this thesis. I am grateful to him for his amazing patience with me and helping me cope with the challenges of a PhD, both emotionally and academically.

Chapter 1

Turning an Institution from 'Inclusive' to 'Extractive' : The Case of the European Union's 'Free Movement of Persons'

1.1 Introduction

The economic development of a nation depends on its governing institutions. In his seminal paper, North (1991) defines institutions as 'humanly devised constraints that structure political, economic and social interactions'. These constraints could be formal rules, such as laws and structures that defend property rights, or they could be informal restrictions like traditions and customs. And they may be economic or political, constraining the actions of economic agents and politicians respectively. The idea that the prosperity of society depends on economic institutions such as property rights goes back at least as far as Adam Smith, and is prominent in the work of nineteenth century scholars such as John Stuart Mill (Jones 1981). At the same time, political institutions are also critical in supporting prosperity. It is well recognized that institutions such as elections and constitutional checks, that constrain the policies that politicians can set, play a

crucial role in minimizing the rents they can attain from office (Acemoglu, Johnson and Robinson 2005). Following North's definition, institutions have been further categorized into one of two types. The first type are referred to by Acemoglu and Robinson (2012) as 'inclusive', because they uphold the interests of society at large and are regarded as instrumental in creating an economic environment that enhances labor productivity.[1] The second type are referred to by Acemoglu, Johnson and Robinson (2001) as 'extractive', because they concentrate power in the hands of the elite and create an environment where labor productivity may be undermined.[2] An extensive literature traces development successes and failures to a prevalence of one or other type of institution: inclusive or extractive respectively (Knack and Keefer 1995, Hall and Jones 1999, Acemoglu, Johnson and Robinson 2001).

Going beyond the typology of institutions being inclusive or extractive, Acemoglu and Robinson (2012) discuss informally the idea that an elite may subvert an institution from initially being inclusive to eventually being extractive. As a result, although at the outset an institution might serve the interests of society, it ultimately serves only those of the elite. The purpose of this chapter is to provide a first formalization of this idea, focusing specifically on the European Union's (EU's) 'Free Movement of Persons' (FMP).[3] The FMP is open to interpretation as an economic institution, because it has created a single labor market within Europe. But it may also be interpreted as a political institution because it enables European citizens to 'vote with their feet' in moving freely from one European country to another. In the UK, migrants from the EU have voting rights in local elections and elections to the European Parliament. In effect, the FMP imposes a constraint on how politicians can set policy, in this case on immigration. Our analysis shows how a political elite may have driven expansion of the EU, at first because this coincided with an increase in the prosperity of society as a whole,

[1] Acemoglu, Johnson and Robinson (2001) use the alternative terminology 'institutions of private property' to refer to the same basic idea.

[2] In this chapter we assume elites could be of two types : the economic elite formed by entrepreneurs or owners of firms and the political elite which is the government.

[3] A fundamental principle of the EU is the free movement of persons. According to this clause, citizens of the EU can reside and work in any of the 28 EU member states, as well as the three non-EU countries in the European Economic Area and Switzerland.

but later because it served only their own interests and those of a narrow economic elite.

In the prior literature, political institutions are inclusive or extractive by definition. Therefore, the only way to go from inclusive to extractive is through a change in the form of government i.e. moving between dictatorship and democracy through a revolution or coup d'état. Our approach is different in that we interpret an institution as 'inclusive' or 'extractive' in terms of its effect on welfare outcomes to the respective groups in society. Inclusive institutions increase the welfare of society as a whole, while allowing for the possibility that at least one group may be adversely affected. Extractive institutions, on the other hand, enable an elite group, who are in a minority, to increase their welfare while that of the rest of society decreases. Within this framework, we can then show how a political elite can turn an institution from being inclusive to extractive without a wholesale change in the form of government.

In our model, the FMP has clear cut distributional implications for labor and capital. Therefore, we can be precise about the conditions under which an expansion of the EU under FMP will benefit or harm the respective groups in society. Using this framework, we will be able to show how a political elite can turn an institution from initially being inclusive under the early stages of expansion, to being extractive in the later stages of expansion.

The model that we develop is as follows. In a region of the world, a " Union" is a group of countries amongst which the movement of labor is free as a result of FMP. There is a number of countries outside of the Union, both in the region and in the 'rest of the world', from where labor can migrate to the Union. The FMP implies that Union governments cannot restrict migration between Union countries, but each member government can set a quota on immigration from countries outside of the Union.

The economic structure of a single representative country in the region is as follows. It has one sector of production producing a single homogeneous good, using two factors of production: capital and labor. Production takes place ac-

cording to a standard Cobb-Douglas technology, with decreasing returns to scale and full employment of both factors. Society is divided into three groups: entrepreneurs, the government, and workers. Entrepreneurs represent the economic elite, while the government represents the political elite, and workers represent the rest of society. Entrepreneurs are the sole owners of capital. Their welfare is derived from the returns to capital and profits. Their income is increasing in the amount of labor available because it is decreasing in wages. Workers derive all their income from labor and this determines their welfare. Domestic labor and immigrants are substitutes in production.[4] So an increase in immigration pushes down wages, which makes workers worse off. Under our utilitarian approach, the government's welfare is dependent on that of the other two groups, as well as rents that the government receive from the immigration quota. Wages are determined as an equilibrium of the local labor market. If the country is a member of the Union, wages are determined as an equilibrium of the Union labor market. The wage in the rest of the world outside the region is set exogenously below that of any wage in the region, reflecting an infinite potential supply of workers.

In this framework, we can model the process of Union expansion in terms of an increase in the number of countries that are included in the Union, and hence the pool of labor from which the government cannot prevent immigration. Taking Union membership as given, the decision-making process of the government of a particular member country is modelled as a two-stage game. In the first stage, the government maximizes its welfare to decide on the immigration quota from the non-member countries. This is done in anticipation of the fact that, in the second stage, wages are equalized between the countries in the Union due to the FMP.

To examine the implications of Union expansion, we first assume that all countries in the region have the same total factor productivity. We then consider an environment where all countries have differing levels of productivity. We grant one country in the region the power to invite others to form and join the Union, one

[4]The assumption of homogeneous labor implies that the median voter's wages get competed down by increased immigration. This simplifies the situation because high skilled native labor is complementary to immigrant labor, and hence may gain from increased migrant labor. However, Borjas (2015) argues that it is possible to extend such models of homogeneous labor to allow for more than one type of labor.

by one. We refer to this country as the 'agenda setter'. When TFP is symmetric across all countries, it makes no difference which the agenda setter is. When TFP varies across countries, it will make sense for the most productive country to be the agenda setter as we shall see.

To examine Union expansion, we look at how an increase in the number of Union countries affects the payoffs to the respective groups within a country. When countries in the region have the same TFP, as the number of countries in the Union increases, the government of each country in the Union (optimally) tightens its quota for immigrants from the rest of the world. Surprisingly, as the Union expands, the government of each country has an incentive to reduce the total number of workers in the country by reducing the number of immigrants from the rest of the world. This stems from the fact that, as the Union expands, a larger number of immigrants are able to enter the country from other member countries, without paying a quota rent. In the government's utilitarian national welfare function, which is standard, this tips the government's incentives away from raising quota rents and towards increasing domestic wages. This in turn motivates a tightening of the quota to the point where there are fewer workers in the economy overall. Consequently, total employment decreases while wages rise, matching patterns in the data over early EU expansion. Figure 1.1 is drawn from data obtained for the OECD and it shows the movement of annual wages in the UK over the period 2000-2016. We can see that till 2006, there was a rise in real wages. However, after that, particularly from 2007 onwards, there has been a downward trend in the wage schedule, though around 2008 there was a slight move upwards. This general downward trend in real wages seemed to occur soon after the major EU expansion to the East European countries. Though such a trend in wages could also be explained by alternate drivers such as the global financial crisis of 2008, we try to tease out the possibility of such a trend occurring because of increased immigration into the UK from other more populated European countries.

We find that the process of Union expansion increases the welfare of society

as a whole, specifically of the workers and the government, although the welfare of entrepreneurs declines over this range with the increase in wages. Since the quota tightens with Union expansion, ongoing expansion will eventually push the quota to a floor below which it cannot be reduced further. Surprisingly, we find that when productivity is the same across all union members, adding further countries once the floor has been reached does not lead to a fall (or rise) in wages. This is because, with all new entrants to the Union being identical, the increased demand for labor brought about by the introduction of new capital to the union is equal to the increase in supply of labor.

Figure 1.1: Average Annual Wages in the UK at 2016 constant prices, pound sterling, 2000-2016

Source: OECD

When TFP varies across countries, we identify conditions under which it is optimal for the agenda setter to invite other countries to join the Union in descending order of their productivity. Because each new member has signficantly lower productivity and hence wages, wages in the Union decline with expansion. Thus Union expansion under the institutional structure of the FMP, while initially working in favour of the interests of workers, turns against them once the floor is reached, while increasing the returns to capital for entrepreneurs, who represent the economic elite. However, the pay off to the government, representing the po-

litical elite, keeps on increasing even after the floor on immigration from the rest of the world is reached.

One might have expected the FMP to help the government act in the interests of entrepreneurs right from the outset of Union expansion. The government could apparently use Union expansion to commit to greater immigration through FMP, hence bringing down domestic wages. But, because FMP denies the government the ability to collect quota rent from immigrants from the Union, as the Union expands the government actually has an incentive at the margin to tighten the immigration quota on immigrants from outside the Union in order to raise domestic wages. This effect prevails until Union expansion pushes the quota to a floor. It is only after the floor is reached, and in an environment where productivity of successive entrants is declining, that further Union expansion serves the interests of the economic elite by leading to a decline in wages. This explains how the FMP could start out as an inclusive institution but eventually becomes an extractive one.

This chapter contributes to the recent strand of literature that describes how elites can manipulate political institutions. Acemoglu and Robinson (2001) examine how the elite can concede democracy to the poor in a bid to avoid a revolution. However, because democracy involves redistribution from the rich to the poor, the elite will try to mount a coup that restores dictatorship, potentially leading to an unstable cycle between forms of government. Acemoglu and Robinson (2008) show how the elite manipulate political institutions to keep the division of economic rents constant even through democratization. This explains how in practice, contrary to expectations, democratization may do nothing to improve the welfare of the rest of society. By contrast, we are examining a change in an economic institution while keeping a political institution constant, namely democracy, and showing how the elite nevertheless manipulate the outcome in their favour. Besley and Persson (2009) focus on the decision by a ruling elite not to install fiscal capacity as a deliberate step to prevent the possibility of their own assets being taxed, thus undermining the incentive of the rest of society to seize their

political power. The prior literature has looked at inclusive and extractive institutions separately. Our contribution is to examine how a political elite can turn a given institution from being inclusive to extractive.

This chapter also contributes to the literature that deals with the demand for immigrants (Benhabib 1996, Ortega 2005). In this respect this chapter also analyzes the formulation of immigration policy by the government of a destination country. However, we incorporate the role of an institution in the form of FMP in constraining immigration policy. The present chapter also builds on work by Borjas (2015) which studies the effect of movement of homogeneous workers between two regions on the host and destination countries. We also build on Facchini and Willmann (2005), who address the issue of a government formulating policies on labor movement into a country where the government captures rent from the quota on the incoming labor. Our current work follows the same approach in which a utilitarian social welfare maximizing government captures a certain portion of the immigrants' income as quota rents.

The chapter proceeds as follows. Section 1.2 describes the model and its implications. Section 1.3 discusses the various stages involved in the determination of the immigration quota in a country belonging to the Union. Section 1.4 describes endogenous union formation in cases of technologically symmetric and asymmetric countries respectively while section 1.5 concludes the chapter.

1.2 The Model

We model a region of the world in which there are M countries. We will refer to countries outside the region as the rest of the world (ROW). A subset, N $\in$ M, of the countries in the region form a Union.[5] We will assume that only one Union can form in the region. The key institutional feature of the Union is FMP, under which workers can move freely from one Union member country to another. The population of each country in the region is divided between entrepreneurs and workers.

[5]With some abuse of notation, we will use N to denote both the set, and the number, of countries in the Union.

Each entrepreneur owns a single firm that produces a homogeneous final good, and also owns the capital that is invested in their firm. The firms are competitive and they are price takers in the goods market. The mass of native borne workers in the economy is normalized to 1.[6] The population of entrepreneurs is normalized to s, and we assume that entrepreneurs form a minority of the population : ($s < 1$). Thus, the total mass of the native born population in the economy is $1+s$. Net immigration to country $i \in N$ from the other countries in the Union is given by $\tilde{I}_i$, which may be positive or negative. Wage in each prospective member country (belonging to the region M) is higher than the wage in the ROW. The government can control entry of immigrants from the ROW by an immigration quota, denoted I_i^I. Therefore, the total population of workers in country i is given by $L_i = 1 + \tilde{I}_i + I_i^I$. Note that entrepreneurs cannot migrate in our model. This assumption is made to focus attention on the affect of FMP on labor migration. Each country in M is endowed with a fixed quanitity of capital, K_i, also to sharpen the focus on labor migration.

The production function for the good of a representative country i is denoted by $Q_i = \phi_i K_i^{\alpha}\sqrt{L_i}$, where the total factor productivity (TFP) parameter, $\phi_i \in (0,1)$, is taken as given, and $\alpha + \frac{1}{2} < 1$. Thus, the production function exhibits decreasing returns to scale.[7]Assuming decreasing returns to scale ensures a unique profit maximizing plan for a firm. Because factor markets are competitive, labor and capital are paid their marginal products: $r_i = \alpha\phi_i K_i^{\alpha-1}\sqrt{L_i}$ and $w_i = \frac{1}{2}\phi_i \frac{K_i^{\alpha}}{\sqrt{L_i}}$.

Assuming the price of the final good to be 1 and entrepreneurs to be homogeneous, the profits of the entrepreneurs of country i are given by

[6]We assume that all countries in the region have the same population prior to immigration taking place.

[7]Since firms are competitive, the production function should exhibit non-increasing returns to scale. Assuming decreasing returns approximates an alternative set-up where the technology exhibits constant returns to scale in labor and capital, but where there is a specific factor that is in fixed supply, such as managerial expertise, that is distributed evenly among the entrepreneurs in the country, and the net returns after paying labor and capital accrues entirely to this specific factor.

$$
\begin{aligned}
\pi_i &= \phi_i K_i^{\alpha} \sqrt{L_i} - r_i K_i - w_i L_i \\
&= \phi_i K_i^{\alpha} \sqrt{L_i} - \alpha \phi_i K_i^{\alpha-1} \sqrt{L_i} K_i - \frac{1}{2} \phi_i \frac{K_i^{\alpha}}{\sqrt{L_i}} L_i \\
&= (\frac{1}{2} - \alpha) \phi_i K_i^{\alpha} \sqrt{L_i}
\end{aligned}
$$

We can see from this solution for profits how entry of more immigrant labor will push down domestic wages, and thus, hurt domestic workers.

On the other hand, lower wages increase profits of the entrepreneurs. The wage in ROW is given exogenously by w^*. We will assume that w^* is sufficiently low that everyone in ROW would like to migrate to the region. Thus, by assumption, $w^* < w_i$ for all $i \in 1, ..., M$. Under this assumption, the immigration quota $I_i^!$ binds in equilibrium.

1.2.1 Immigration Quota and Government Welfare

Although immigrants to country i earn the same wage as natives, w_i, they have to pay a 'quota rent' to the government when they enter the country. We will assume that the quota rent is only part of the surplus from immigration. Also, the rent is extracted only from immigrants coming into the country from outside the Union and not from intra Union migrants. Thus, after having paid the quota rent to the government, immigrants are left with the 'net wage' of $\eta = w^* + \gamma$. Here, w^* is the wage they would have earned had they remained in the source country and $\gamma > 0$ is the immigration surplus retained by a migrant.[8] This set-up implies that the government captures the quota rent per immigrant, $w_i - \eta$.[9] Under full surplus capture, the government would set η such that only immigrants from the rest of

[8] In case of the ROW, $w_j = w^*$.

[9] The fact that immigrants' earnings are effectively lower than natives can be explained by the visa costs and NHS surcharge payable by immigrants into UK from outside the EU. Health surcharge introduced on 6th April 2015 is £200 per year for temporary non EEA migrants and £150 per year for non EEA students. Revenue collected from NHS surcharge between 6th April 2015-14th March 2016 by the UK government is £175.6m. Also, Home Office income from visa and immigration has been £1086m and £1182m for the years 2015-16 and 2016-17 respectively. Similarly in France, non EEA migrants without work do not have access to benefits unlike those guaranteed to EU nationals without a job (since these are guaranteed by the EU in order to standardise social security systems in member countries). Also, income support for pensioners is available to non EEA nationals only if they have worked in France for ten years.

the world want to migrate to country i, and the government would capture all of the immigration surplus $w_i - w^*$ from them.[10]

The government sets the quota l_i^I to maximize its welfare, as captured by the following utilitarian national welfare function:

$$GW_i = s(\pi_i + r_i K_i) + w_i(1 + \tilde{l}_i) + (w_i - \eta) l_i^I \tag{1.1}$$

In setting l_i^I, the government balances the welfare of its citizens plus immigrants from the rest of the Union against its own utility via the quota rent. As we will show below, the terms π_i, r_i, and w_i can be expressed as functions of l_i^I. And as we shall see, when the government tightens (i.e. reduces) l_i^I, w_i will increase because this will reduce the overall labor supply in country i, all else equal. The return to entrepreneurs, $\pi_i + r_i K_i$, is increasing in the quota, whereas the return to domestic workers via the wage, w_i, is decreasing. With just these two terms in (1.1), GW_i is concave but monotonically increasing in l_i^I, leading the government to want to exclude non-Union immigrants all together. The role of the quota rent term, $(w_i - \eta)l_i^I$ is to ensure that GW_i is concave and eventually decreasing in l_i^I, and is necessary for the existence of a unique interior optimal solution. The reason for including $\tilde{l}_i$ is to obtain a closed form optimal solution for l_i^I. This is a reasonable assumption given that, under FMP, in many European countries Union immigrants are given some degree of political representation immediately.[11]

[10] In that case, for any immigrant from a country j in the region M, the immigration surplus retained by the immigrant $\gamma_j < 0$, which is why they would not want to migrate to country i.

[11] In the UK, EU migrants can vote in the local elections as well as election to the European Parliament. Under the political system in the UK, local elections have a direct impact at the national level since they comprise of the same political parties. Also, EU citizens with jobs in the UK have similar access to benefits s UK citizens. If an EU migrant is covered by the social security system, then they can claim child benefit and child tac credit for their dependent children who may not even be living in the UK. Non EEA citizens are not subject to public funds like jobseekers' allowance or tax credits.

1.3 Equilibrium in the Union under the Free Movement of Persons

In this section we will determine the equilibrium outcome in the Union. At this stage, we are taking Union membership as given. All countries in the region but outside the Union set their immigration quotas on a unilateral basis. The above model can be used to determine the behavior of each government outside the Union simply by assuming that they are in a 'singleton' of their own.

Events in a country i within the Union proceed in two stages. In Stage 1, the government of country i sets the immigration quota to maximize its welfare as given by (1.1). Let l^{I}_{-i} be the the sum total of all the immigration quotas set by the other governments in the Union. Then the best response immigration quota of country i is a function of the other countries' immigration quotas i.e. $\hat{l}^{I}_{i} = g(l^{I}_{-i})$. A Nash Equilibrium is a set of mutual best responses $\hat{l}^{I}_{i} = g(\hat{l^{I}_{-i}})$, for all $i \in N$. In Stage 2, the Union labor market clears: free movement between the countries in the Union leads to the equalization of wages between them. In our subsequent analysis, we assume country i chooses its quota l^{I}_{i} for given quotas l^{I}_{-i} of the other countries in the Union. The optimal immigration policy of country i is determined by working backwards from stage 2.

1.3.1 Stage 2: Labor Market Clearing under FMP

In Stage 2, wages are equalized between all the countries in the Union and this determines net movement of people between the countries. Thus we have a system of equations such that

$$\frac{1}{2}\phi_j \frac{K_j^{\alpha}}{\sqrt{1 + l_j^{I} + \tilde{l}_j}} = \frac{1}{2}\phi_i \frac{K_i^{\alpha}}{\sqrt{1 + l_i^{I} + \tilde{l}_i}}, \quad \forall j \neq i,\ i, j \in N.$$

In equilibrium,we have $\tilde{l_1} + \tilde{l_2} + ... + \tilde{l_N} = 0$. This enables us to obtain a structural

form for net migration into country i:

$$\tilde{l}_i = \frac{\phi_i{}^2 K_i^{2\alpha} \sum_{\substack{j=1 \\ i \neq j}}^{N} (1 + l_j^l) - \sum_{\substack{j=1 \\ i \neq j}}^{N} \phi_j{}^2 K_j^{2\alpha} (1 + l_i^l)}{\sum_{j=1}^{N} \phi_j{}^2 K_j^{2\alpha}} \tag{1.2}$$

From the above equation we can see that the higher is the immigration quota of country i, the lower will be the number of people who can enter the country under FMP and equalise wages among the countries in the Union. Also, the higher is the immigration quota set by the other countries, the larger is the number of people who will come into country i through FMP. Correspondingly total employment in country i, which is the sum of native workers, people coming to the country through the FMP, and immigrants from the ROW (capture by the immigration quota l_i^l) can be expressed as:[12]

$$1 + l_i^l + \tilde{l}_i = \frac{\phi_i^2 \sum_{j=1}^{N} (1 + l_j^l)}{\sum_{j=1}^{N} \phi_j{}^2 q_{ji}} = \frac{\phi_i^2 K_i^{2\alpha} \sum_{j=1}^{N} (1 + l_j^l)}{\sum_{j=1}^{N} \phi_j{}^2 K_j^{2\alpha}} \tag{1.3}$$

where $q_{ji} = K_j^{2\alpha}/K_i^{2\alpha}$.

The higher is the total labour force in the countries forming the Union (consisting of both natives as well as immigrants), the higher is total labour employment in country i. In other words, for given immigration quotas of other countries in the Union, the higher is the immigration quota of country i, the greater is the labour employment in country i. Using (1.3), we can obtain structural forms for wages, rental rate and entrepreneurial profits and they are expressed as :

$$\tilde{w}_i = \frac{1}{2} \sqrt{\left(\sum_{j=1}^{N} \phi_j{}^2 K_j^{2\alpha} \right) / \left(\sum_{j=1}^{N} (1 + l_j^l) \right)} \tag{1.4}$$

$$\tilde{r}_i = \phi_i{}^2 \alpha K_i^{2\alpha - 1} \sqrt{\left(\sum_{j=1}^{N} (1 + l_j^l) \right) / \left(\sum_{j=1}^{N} \phi_j{}^2 K_j^{2\alpha} \right)} \tag{1.5}$$

[12] Detailed derivations are in Appendix A.1

$$\tilde{\pi_i} = (\frac{1}{2} - \alpha)\phi_i{}^2 K_i^{2\alpha} \sqrt{\Big(\sum_{j=1}^{N}(1 + l_j')\Big) / \Big(\sum_{j=1}^{N} \phi_j{}^2 K_j^{2\alpha}\Big)} \tag{1.6}$$

The structural forms of the wage, rental rate and profits provide us with some insight on how the immigration quota of country i, can affect returns to agents in country i, for given employment in other countries in the Union. While rental rate and profits are directly proportional to the immigration quota, for given capital stock and quotas of the other countries, wages in country i are inversely proportional to the immigration quota. This implies that, with an increased number of people coming into the country through the quota, there is greater labor market competition which pushes down wages.

1.3.2 Stage 1: Setting the Quota to Maximize Government Welfare

In Stage 1, country i's government decides on l_i^l, anticipating $\tilde{l}_i$. Subsequently, we can prove the following proposition.

Proposition 1: *As the number of countries* N *in the Union increases, the immigration quota from the rest of the world of a country* $i \in N$ *decreases, for given immigration quotas of other countries in the Union. Total employment in country* i *decreases as well, and consequently the wage* w_i *increases.*

Proof.

For details of derivation refer to Appendix A.2

To understand the intuition behind the proposition, we use expressions for total labor employment (1.3), wages (1.4), rental rate (1.5) and profits (1.6), in (1.1), government welfare can be simplified to

$$GW(l_i^l) = (\frac{s+1}{2})\phi_i{}^2 K_i^{2\alpha} \sqrt{\Big(\sum_{j=1}^{N}(1 + l_j')\Big) / \Big(\sum_{j=1}^{N} \phi_j{}^2 K_j^{2\alpha}\Big)} - \eta l_i^l \tag{1.7}$$

Maximization of government welfare with respect to l_i^l gives the optimal immi-

gration quota for country i:

$$\hat{l}_i^I = \left[\frac{s+1}{4\eta}\right]^2 \frac{{\phi_i}^4 K_i^{4\alpha}}{\sum_{j=1}^{N} {\phi_j}^2 K_j^{2\alpha}} - N - \sum_{\substack{j=1 \\ i \neq j}}^{N} l_j^I \tag{1.8}$$

Consequently, total labor employment can be determined as

$$1 + \hat{l}_i^I + \tilde{l}_i = \left[\frac{s+1}{4\eta}\right]^2 \frac{{\phi_i}^6 K_i^{6\alpha}}{\left[\sum_{j=1}^{N} {\phi_j}^2 K_j^{2\alpha}\right]^2} \tag{1.9}$$

The immigration quota of country i from ROW is lower as the number of countries in the Union N increases, for given immigration quotas of the other countries in the Union. The quota $\hat{l}_i^I$ is directly proportional to the proportion of entrepreneurs in the economy. However, the higher is η, the lower will be $\hat{l}_i^I$. This is because a higher η implies lower quota rent from immigration to country i. Similarly, total employment $1 + \hat{l}_i^I + \tilde{l}_i$ as given by (1.9) is decreasing in N. We see this from the fact that the summation sign in the denominator depends on N.[13] Thus, the corresponding wages are higher when the country is in a Union than when it is a singleton. ■

The reason behind the above result is that as one more person enters from the Union through FMP, the wage decreases. At the original quota, this would reduce the quota rent per immigrant that the government could get. In order to compensate itself for this, the government has to increase wages by reducing the quota. Consequently we find that as N increases, wages increase initially while total employment decreases.

1.4 Endogenous Union Formation

We will now relax the assumption that Union membership is given and use the model set out above to look at the endogenous formation of Union membership. To do this, we will first assume in the next subsection that the countries in region

[13] Total labour employment for a standalone country is $\left[\frac{s+1}{4\eta}\right]^2 {\phi_i}^2 K_i^{2\alpha}$

M are symmetric in the sense that their TFP parameters are identical: $\phi_1 = \phi_2 = ... = \phi_M$. In the subsection after that, we will assume that countries are asymmetric in that their TFP parameters vary as follows: $\phi_1 > \phi_2 > ... > \phi_M$. In both cases, we will assume that country 1 is exogenously chosen to invite other countries to join it in the Union. Accordingly, we will say that country 1 is the 'agenda setter'. We will then find the effects on the returns to the government representing the political elite, the entrepreneurs who are the economic elite and the workers who form the rest of society.

We have already shown that as the number of countries in the Union increases, the optimal immigration quota of a particular country $\hat{I}_i^I$ decreases. We now want to focus the discussion on the Agenda Setter, country 1, and $\hat{I}_i^I$. This continues until the point where the number of countries in the Union is such that the immigration quota of country 1 reaches a lower bound, or 'floor', $\underline{I}_1^I$, below which the immigration quota cannot fall further. In our model, this floor will be reached at zero. In practice, there may be other considerations such as family ties that mean the floor will be attained at a positive level of immigration. Thus, when $\hat{I}_1^I$ is at the floor $\underline{I}_1^I$, even if country 1 invites an additional country to join the Union, it cannot decrease $\hat{I}_1^I$ further. Suppose θ is the value of N such that county 1 reaches its $\underline{I}_1^I$. In the following analysis, we investigate the consequences for the immigration quota and consequently wages, rental rate, profits and government welfare of the agenda setting country when the number of countries in the Union is increased to $N = \theta + 1$. We will do this for the cases of symmetric and asymmetric countries respectively. To simplify the dynamics, we will assume that at the end of each period all workers return home to their native countries. This simplifies the analysis in that there is no stock of immigrants to keep track of across periods. Also, the government decision over immigration policy in any given period is independent of the others, facilitating the comparison of outcomes across periods. This exercise will enable us to see how the welfare of the different groups are affected by Union expansion.

1.4.1 Symmetric countries

With N $\in$ M countries in the Union, $\hat{l}_1^l$ is given by

$$\hat{l}_1^l = \left[\frac{s+1}{4\eta}\right]^2 \frac{{\phi_1}^4 K_1^{4\alpha}}{\sum_{j=1}^{N} {\phi_j}^2 K_j^{2\alpha}} - N - \sum_{j=2}^{N} l_j^l \tag{1.10}$$

Also, with N $\in$ M, total employment in country 1 is given by

$$1 + \hat{l}_1^l + \tilde{l}_1 = \left[\frac{s+1}{4\eta}\right]^2 \frac{{\phi_1}^6 K_1^{6\alpha}}{\left[\sum_{j=1}^{N} {\phi_j}^2 K_j^{2\alpha}\right]^2} \tag{1.11}$$

From (1.11), we find that as the number of countries in the Union increases, total employment in country 1 decreases. Consequently, wages increase, rents decrease while government welfare increases with an increase in N. Equations (1.10) and (1.11), when evaluated at N = θ, represent the immigration quota and total labour employment in country 1 when the floor $\underline{l}_1^l$ is reached.

We now analyze the consequences of an additional country joining the Union such that the number of countries in the Union increases to N = (θ + 1) but immigration country of the agenda setter is at its floor ,$\underline{l}_1^l$. Recall that the new member country has the same TFP as the other countries in the Union.The result is summarised in the following proposition.

Proposition 2: *Assume countries are symmetrical in the sense* $\phi_1 = \phi_2 = ... = \phi_M$. *If the immigration quota from the rest of the world for Country 1 reaches a floor* $\underline{l}_1^l$ *when there are* N = θ *symmetric countries in the Union, then adding the* (θ + 1)*th country to the Union leads to employment and consequently wages remaining unchanged at the levels that had been achieved when the floor was reached. Profits and government welfare also stay at the same level.*

Proof.

Detailed proof is in Appendix A.3.

The intuition can be explained as follows. When the (θ + 1)th country enters

the Union, $\hat{l_1^l}$ stays at $\underline{l_1^l}$ as given by (1.10) (evaluated at N = θ). Consequently, in the presence of an additional country, and with an unchanged immigration quota, total labor employment in country 1 is now given by

$$1 + \hat{l_1^l} + \tilde{l_1} = \left[\frac{s+1}{4\eta}\right]^2 \frac{{\phi_1}^6 K_1^{6\alpha}}{\sum_{j=1}^{\theta} {\phi_j}^2 K_j^{2\alpha} \sum_{j=1}^{\theta+1} {\phi_j}^2 K_j^{2\alpha}} + \frac{{\phi_1}^2 K_1^{2\alpha}}{\sum_{j=1}^{\theta+1} {\phi_j}^2 K_j^{2\alpha}} (1 + l_{\theta+1}^l). \tag{1.12}$$

To understand the effect of the additional country on total employment in country 1, we compare between employment in country 1 when there are θ countries in the Union (1.11) and when there are (θ + 1) countries but $\hat{l_1^l} = \underline{l_1^l}$. Since all the countries are symmetric, with $K_1 = K_2 = ... = K_{\theta+1} = K$ and $\phi_1 = \phi_2 = ... = \phi_{\theta+1} = \phi$, (1.11) becomes

$$1 + \hat{l_1^l} + \tilde{l_1}\Big|_{\theta} = \left[\frac{s+1}{4\eta}\right]^2 \frac{\phi^2 K^{2\alpha}}{\theta^2} \tag{1.13}$$

while (1.12) becomes

$$1 + \hat{l_1^l} + \tilde{l_1}\Big|_{\theta+1} = \left[\frac{s+1}{4\eta}\right]^2 \frac{\phi^2 K^{2\alpha}}{\theta(\theta+1)} + \frac{1}{(\theta+1)} (1 + l_{\theta+1}^l). \tag{1.14}$$

We find that (1.13) and (1.14) are equal under our assumption that all countries in the Union have the same native population, normalized to 1, and the same immigration quotas $\hat{l_1^l} = l_2^l = ... = l_{\theta+1}^l$.This implies that when symmetric countries form a Union and $\hat{l_1^l}$ reaches the floor $\underline{l_1^l}$, total labor employment and consequently wages do not change as a further country is introduced to the Union. This is because, when countries are symmetric in all respects, there is no movement of people under the FMP and since the immigration quota also cannot fall below the floor, total employment does not change and consequently neither do wages. ■

The results stated in Proposition 2 enables us to conclude that in case of symmetric countries forming the Union, initially the political elite and rest of society gain from Union expansion in terms of higher welfare and wages respectively. At the same time, the economic elite loses. However once the quota reaches $\underline{l_1^l}$, the

gains to all groups do not change with further expansion of the Union.

1.4.2 Asymmetric countries

In this subsection we consider a situation when there are θ asymmetric countries in a Union such that $\phi_1 > \phi_2 > .... > \phi_\theta$. Similar to the analysis in the previous section, we will now show what happens to the total employment and hence wages in country 1 if the number of countries in the Union is increased to N = (θ + 1), after country 1 has already reached $\underline{l}_1^l$. The additional country has a lower TFP than the country which joined the Union prior to it. If there are N = θ countries in the Union, the immigration quota of country 1 from the ROW is given by (as explained in the last section)

$$\hat{l}_1^l = \left[\frac{s+1}{4\eta}\right]^2 \frac{{\phi_1}^4 K_1^{4\alpha}}{\sum_{j=1}^{\theta} {\phi_j}^2 K_j^{2\alpha}} - \theta - \sum_{j=2}^{\theta} l_j^l \tag{1.15}$$

Following this, total employment in country 1 when there are θ countries in the Union is

$$1 + \hat{l}_1^l + \tilde{l}_1\Big|_\theta = \left[\frac{s+1}{4\eta}\right]^2 \frac{{\phi_1}^6 K_1^{6\alpha}}{\left[\sum_{j=1}^{\theta} {\phi_j}^2 K_j^{2\alpha}\right]^2} = \frac{{\phi_1}^2 K_1^{2\alpha}}{\sum_{j=1}^{\theta} {\phi_j}^2 K_j^{2\alpha}} \left[(1 + \hat{l}_1^l) + \sum_{j=2}^{\theta}(1 + l_j^l)\right] \tag{1.16}$$

Suppose now N = θ + 1 i.e. the (θ + 1)th country is invited to join the Union. The government of country 1 cannot lower the immigration quota below $\underline{l}_1^l$. This would lead to total employment in country 1 being expressed as

$$1 + \hat{l}_1^l + \tilde{l}_1\Big|_{\theta+1} = \frac{{\phi_1}^2 K_1^{2\alpha}}{\sum_{j=1}^{\theta+1} {\phi_j}^2 K_j^{2\alpha}} \left[(1 + \hat{l}_1^l) + \sum_{j=2}^{\theta}(1 + l_j^l) + 1 + l_{\theta+1}^l\right] \tag{1.17}$$

The following proposition summarizes the effect of an additional country with a lower TFP joining the Union, on country 1's total employment, wages, profits and government welfare.

Proposition 3: *Assume countries are asymmetrical in the sense* $\phi_1 > \phi_2 > ... > \phi_M$*. If the immigration quota from the rest of the world for Country 1 reaches a floor* $\underline{I_1^I}$ *when there are* N = θ *symmetric countries in the Union, then adding the* $(\theta+1)$*th country to the Union leads to higher employment and consequently lower wages . Profits and government welfare increase.*

Proof.

Details of the proof can be found in Appendices A.4 and A.5.

To explain the above proposition, we first compare between total labor employment when there are θ countries (1.16) and when there are N = $(\theta + 1)$ countries but the floor $\underline{I_1^I}$ has been reached. We already know that the numerators of (1.16) and (1.17) are similar and

$$(1 + \hat{I}_1^I) + \sum_{j=2}^{\theta}(1 + I_j^I) + 1 + I_{\theta+1}^I > (1 + \hat{I}_1^I) + \sum_{j=2}^{\theta}(1 + I_j^I) \tag{1.18}$$

We thus need to focus on the denominators. The denominator of (1.17) can be written as

$$A = \phi_1^2 K_1^{2\alpha} + \phi_2^2 K_2^{2\alpha} + ... + \phi_{\theta+1}^2 K_{\theta+1}^{2\alpha} \tag{1.19}$$

while the denominator for (1.16) can be expressed as

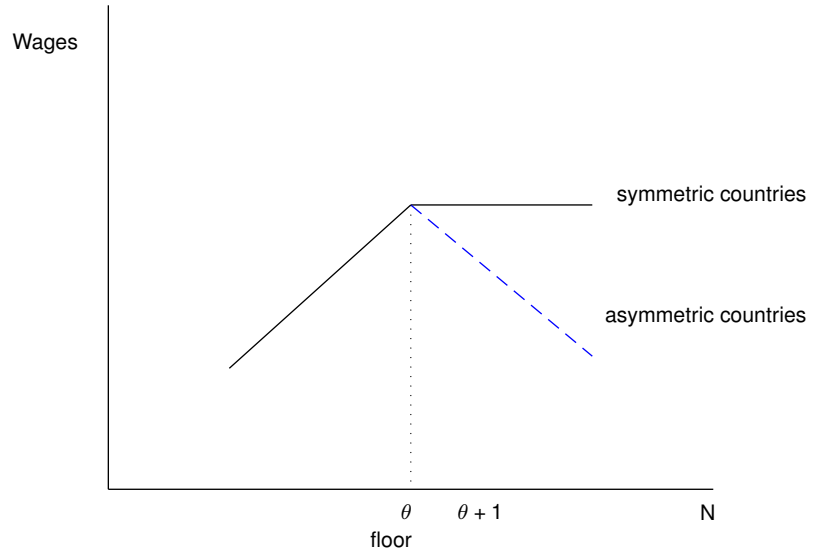
$$B = \phi_1^2 K_1^{2\alpha} + \phi_2^2 K_2^{2\alpha} + ... + \phi_{\theta}^2 K_{\theta}^{2\alpha} \tag{1.20}$$

When $\phi_{\theta+1}$ = 0, A = B. This implies for a given stock of capital, $1 + \hat{I_1^I} + \tilde{I_1}\Big|_{\theta+1} > 1 + \hat{I_1^I} + \tilde{I_1}\Big|_{\theta}$ at $\phi_{\theta+1}$ = 0. Since both A and B are continuous functions of ϕ, we can always find some $\bar{\phi_{\theta+1}} > 0$ such that $\forall \phi_{\theta+1} \in [0, \bar{\phi_{\theta+1}}]$, $1 + \hat{I_1^I} + \tilde{I_1}\Big|_{\theta+1} > 1 + \hat{I_1^I} + \tilde{I_1}\Big|_{\theta}$ holds. Thus, we find that if a technologically inferior country wants to join a Union where there are N countries which are more technologically advanced than itself and if the country which is technologically the most advanced (i.e. the agenda setter in our model) cannot lower its immigration quota below $\underline{I_1^I}$, then country 1

actually witnesses a rise in total employment and a consequent fall in wages.

The effect on wages and hence returns to the workers forming the rest of the society is depicted in Figure 1.2.

Figure 1.2: Effect on Wages



Next we compare between the profits of the entrepreneurs when there are N = θ countries in the Union and N = (θ + 1) countries but immigration quota is at $\underline{I}_1^I$. When there are θ countries in the Union, net profits of the entrepreneurs are given by

$$\pi_i(\hat{l}_1^I)\Big|_\theta = \frac{1}{2}\phi_i^2 K_i^{2\alpha} \sqrt{\frac{\left(\frac{s+1}{4\eta}\right)^2 \frac{\phi_i^4 K_i^{4\alpha}}{\sum_{j=1}^{\theta} \phi_j{}^2 K_j^{2\alpha}}}{\sum_{j=1}^{\theta} \phi_j{}^2 K_j^{2\alpha}}} \tag{1.21}$$

With the entry of the (θ + 1)th country in the Union, and if country 1 cannot lower its immigration quota below $\underline{I}_1^I$, the net profits of the entrepreneurs can be

represented as

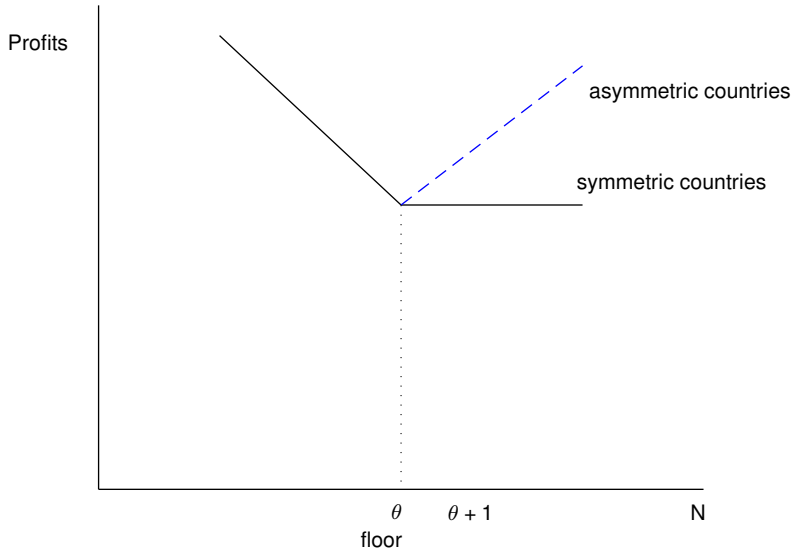
$$\pi_i(\hat{l}_1^l)\Big|_{\theta+1} = \frac{1}{2}\phi_i^2 K_i^{2\alpha} \sqrt{\frac{\left(\frac{s+1}{4\eta}\right)^2 \phi_1^4 K_1^{4\alpha} + \sum_{j=1}^{\theta} \phi_j^2 K_j^{2\alpha}(1 + l_{\theta+1}^l)}{\sum_{j=1}^{\theta+1} \phi_j^2 K_j^{2\alpha} \sum_{j=1}^{\theta} \phi_j^2 K_j^{2\alpha}}} \tag{1.22}$$

We need to compare between (1.21) and (1.22). By inspection, the numerator of (1.22) is greater than the numerator of (1.21) $\forall \phi_{\theta+1}$. We can also see that if $\phi_{\theta+1} = 0$, the denominator of (1.21) is equal to the denominator of (1.22). Thus under the assumption that $\phi_{\theta+1} = 0$, net profits are higher when there are N = (θ+1) countries in the Union with the immigration quota being fixed at $\underline{l}_1^l$ than when there are N = θ countries in the Union. Since profits are a continuous function of $\phi_{\theta+1}$, we can always find some $\bar{\phi_{\theta+1}} > 0$ such that $\forall \phi_{\theta+1} \in [0, \bar{\phi_{\theta+1}}]$ profits to entrepreneurs are higher when there are θ + 1 countries than when there are θ countries. This implies that if a technologically inferior country is allowed into the Union, and if country 1 cannot lower its immigration quota below a certain level, then once that level is reached, the induction of new countries actually lead to an increase in the profits of the entrepreneurs in country 1. The results of the effect of Union expansion on the economic elite is represented in the following diagram. Under asymmetric countries, the economic elite gains as membership of the Union expands beyond the point where the quota has reached a floor. This is shown in Figure 1.3.

Our final step is to compare the government welfare when there are N = θ countries in the Union and when there are N = (θ + 1) countries but immigration quota is at the floor $\underline{l}_1^l$. When there are N = (θ − 1) and N = θ countries in the Union, government welfare of country 1 can be expressed as respectively

$$GW(\hat{l}_1^l)\Big|_{\theta-1} = \left(\frac{s+1}{2}\right)\phi_1{}^2 K_1^{2\alpha} \sqrt{\left((1 + \hat{l}_1^l) + \sum_{j=2}^{\theta-1}(1 + l_j^l)\right) / \sum_{j=1}^{\theta-1} \phi_j{}^2 K_j^{2\alpha}} - \eta \hat{l}_1^l \tag{1.23}$$

Figure 1.3: Effect on Profits



$$GW(\hat{l}_1^{l})\Big|_{\theta} = \left(\frac{s+1}{2}\right)\phi_1{}^2 K_1^{2\alpha}\sqrt{\left((1+\hat{l}_1^{l}) + \sum_{j=2}^{\theta}(1+l_j^{l})\right) / \sum_{j=1}^{\theta}\phi_j{}^2 K_j^{2\alpha}} - \eta\hat{l}_1^{l} \qquad (1.24)$$

For notational simplicity we will say that the immigration quota of country i when there are θ countries in the Union is $l_i^{l'}$. Using the first order conditions for the government's welfare maximization for the two cases and the result that the immigration quota is lower when there are θ countries than when there are $(\theta - 1)$ countries, if the government welfare has to be greater when there are N = θ countries than when there are N = $(\theta - 1)$ countries in the Union for a given stock of capital

$$\eta\left[2 + 2(\hat{l}_1^{l'} - \hat{l}_1^{l}) + ... + 2(l_{\theta-1}^{l}{}' - l_{\theta-1}^{l}) + 2l_{\theta}^{l'} + \hat{l}_1^{l} - \hat{l}_1^{l'}\right] > 0 \qquad (1.25)$$

Since $\eta > 0$, it implies

$$(1 + l_{\theta}^{l'}) > \frac{\hat{l}_1^{l} - \hat{l}_1^{l'}}{2} + \sum_{j=2}^{\theta-1}(l_j^{l} - l_j^{l'}) \qquad (1.26)$$

For given immigration quota of the other countries, this above condition can be written as

$$2(1 + l_{\theta}^{l'}) > \hat{l}_1^{l} - \hat{l}_1^{\hat{l}'} \tag{1.27}$$

Using the expressions for the optimal immigration quota for country i when there are θ and $\theta+1$ countries in the Union, the condition can be further simplified to

$$1 + l_{\theta}^{l'} > \left[\frac{s+1}{4\eta}\right]^2 \left(\frac{\phi_1^4 K_1^{4\alpha}}{\sum_{j=1}^{\theta-1} \phi_j^2 K_j^{2\alpha}}\right)\left(\frac{\phi_\theta^2 K_\theta^{2\alpha}}{\sum_{j=1}^{\theta} \phi_j^2 K_j^{2\alpha}}\right) \tag{1.28}$$

The above condition implies that assuming N $<$ θ, for given other parameters, the larger is the proportion of entrepreneurs in the countries of the Union, the less likely that government welfare will rise as the number of countries in the Union increases. Similarly, for given values of other parameters, if the return to immigrants (η) decreases, the it is also again less likely that government welfare will rise as the number of countries increase. This is because if the net wage (η) is lower, then quota rent per immigrant rises. Thus, as the number of countries in the Union increases, the immigration quota of country i decreases and hence the loss of quota rent is higher for lower values of η. This implies that for government welfare to keep on increasing before a floor on the quota is reached, the proportion of entrepreneurs in the population should be sufficiently small or the return to migrants must be sufficiently high. We can always set underlying parameters such that η will be sufficiently high.[14]

We now proceed to show that as the number of countries in the Union increase from N = θ to N = (θ + 1), but the immigration quota of country 1 remains unchanged at $\underline{l_1^l}$, government welfare will still increase. This would imply that throughout the expansion of the Union, irrespective of whether the floor is reached or otherwise, the political elite will always gain. When there are N = θ + 1

[14] Detailed Proof in Appendix A.5

countries, government welfare is

$$GW(\hat{l}_1^l)\Big|_{\theta+1} = \left(\frac{s+1}{2}\right)\phi_1{}^2 K_1^{2\alpha}\sqrt{\left((1+\hat{l}_1^l)+\sum_{j=2}^{\theta+1}(1+l_j^l)\right)/\sum_{j=1}^{\theta+1}\phi_j{}^2 K_j^{2\alpha}} - \eta\hat{l}_1^l \quad (1.29)$$

But we know that the immigration quota under such a situation is fixed at the θ country level $\underline{l}_1^l$. Thus, we just need to compare between the first terms of (1.24) and (1.29). We know by inspection that the numerator of (1.29) is greater than the numerator of (1.24). We an also see that if $\phi_{\theta+1} = 0$, the denominator of (1.29) is equal to the denominator of (1.24). Thus under $\phi_{\theta+1} = 0$, government welfare is higher when there are N = (θ+1) countries in the Union with the immigration quota fixed at $\underline{l}_1^l$ than when there are N = θ countries in the Union. Since government welfare is also a continuous function of $\phi_{\theta+1}$, we can always find some $\bar{\phi}_{\theta+1} > 0$ such that $\forall\phi_{\theta+1} \in [0, \bar{\phi}_{\theta+1}]$ government welfare is higher when there are N = ($\theta+1$) countries than when there are N = θ countries. This implies that if a technologically inferior country is invited into the Union, and if country 1 cannot lower its immigration quota beyond a certain level, then once that level is reached, the induction of new countries still leads to an increase in the welfare of the government in country 1. ■

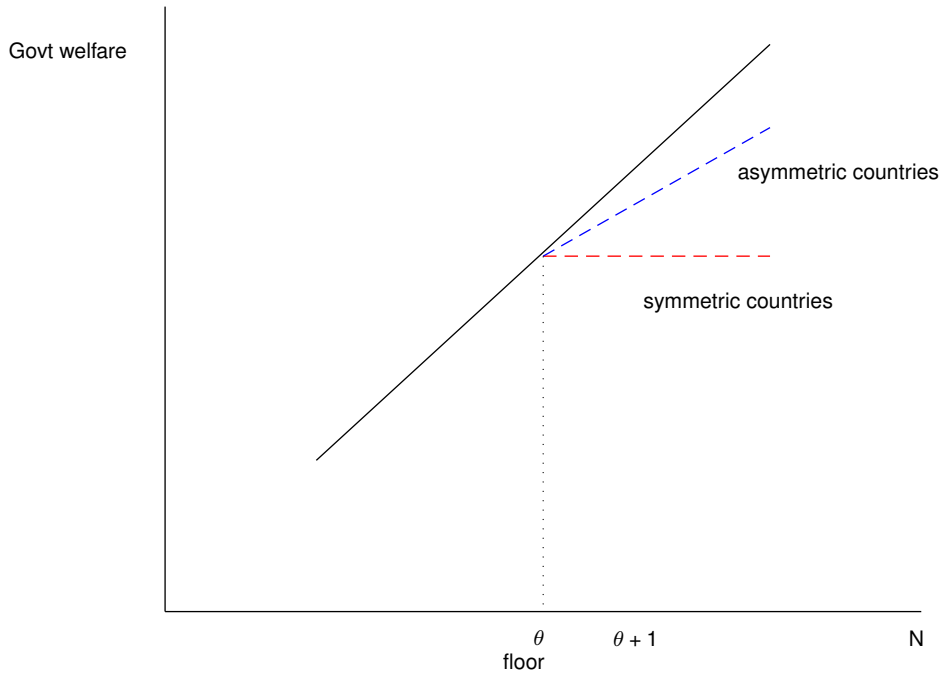
Figure 1.4 summarizes the results of government welfare for symmetric and asymmetric countries.

1.4.3 Order of Entry of Countries into the Union

We have assumed country 1 to be the agency setter such that it decides upon which countries from the region would be invited to form the Union. We establish that countries will be allowed to join the Union in a decreasing order of their TFPs. Thus, country 1(with TFP ϕ_1) would first induct country 2 (with TFP ϕ_2) into the Union and not country 3 (with TFP ϕ_3 where $\phi_3 < \phi_2$). This is described in the following proposition.

Proposition 4: *Consider a particular* $\phi_2 > 0$*. There exists a* $\phi_3^* \in (0, \phi_2)$ *such that*

Figure 1.4: Effect on Government Welfare



if $\phi_3 < \phi_3^*$*, country* 1 *will prefer to induct country* 2 *over country 3 into the union.*

Proof.

The formal proof of this proposition is relegated to appendix A.6. Here we discuss the intuition behind the result. Suppose the TFP in country 3 is low enough such that the wage in the country is close to the rest of the world wage rate. This implies that if country 1 first invites country 3 to join the Union, wage equalisation would drive down the wage in country 1 close to the world wage rate. However, this outcome could have been achieved by country 1 when it was a standalone country (by allowing more immigration). But, we know by solving the optimisation problem of a standalone country, that it chooses an immigration quota from the rest of the world such that wages in the country remains higher than the world wage rate. This implies that the welfare of country 1 is higher when it is a standalone country than when it is joined by country 3 in the Union, when country 3's TFP is below a certain threshold. At the same time, we know that the welfare

of country 1 goes up when country 2 joins the Union, where country 2's wage is lower than country 1's but higher than the world wage rate (implying higher than country 3's wages). Hence, we can infer that for a TFP of country 3 lower than a certain threshold (and hence wages are very close to the world wage rate), country 1 prefers to induct country 2 over country 3 into the Union. ■

1.5 Conclusion

In the case of symmetric countries forming a Union, the addition of more countries leads to a fall in total employment in the country, rise in wages, fall in entrepreneurial profits and a rise in government welfare. However, once a floor on the immigration quota is reached, total employment, wages , profits as well as government welfare no longer changes with the addition of further countries to the Union. In the case of asymmetric countries forming the Union, addition of a country which has lower TFP into the Union leads to a fall in wages and a rise in profits and government welfare. Thus, at first, Union expansion benefits the government and workers, but not entrepreneurs. However we have seen that, after N = θ is reached, further Union expansion benefits the government and the entrepreneurs, while workers are made worse off. This is the sense in which we see that initial Union expansion benefits the rest of society, but later switches to benefiting the economic elite. It is the fact that the political elite benefits throughout that motivates expansion throughout.This is the sense in which we conclude that expansion of the Union transforms the FMP from being an inclusive into an extractive institution.

The model and results obtained in this chapter could be used to throw light on euroscepticism which seem to be gaining ground in various countries in the European Union. The recent Brexit vote in the UK is one such instance where natives felt threatened by the influx of East European immigrants and the consequent downward pressure on wages. Similarly, there have been massive anti EU protests in Rome. Italy was once considered to be one of the most pro EU coun-

tries. However, people took to the streets to protest the ineffectiveness of the EU in helping Italy deal with the large flow of immigrants into the country. Thus, over time there has been a constant rise in anti EU sentiments which poses a threat to the existence of an Union like the EU.

Chapter 2

The Role of Institutions in Determining Immigration and Investment

2.1 Introduction

Immigration policy is determined by the interaction between the different groups in society. On the one hand, under conditions of full employment and perfect substitutability between native and migrant labor, increased immigration leads to lower welfare of domestic labor through increased competition for jobs and hence, lower wages. On the other hand, allowing immigration increases profits of capital owners and in the process, increases investment in the economy. This implies that in a democracy without institutions that tie a government's hand, if the median voter is from the working class, immigration would be minimal. Alternatively, in a world where lobbying is possible, it is always tempting for the government to move away from the median voter's preferred outcome in response to pressure from lobby groups, when taking into account its own political considerations.

This chapter shows that in a setting where entrepreneurs can lobby the government for a higher immigration quota and production is capital intensive, the government's welfare is inversely related to its bargaining power vis-a-vìs the

lobby. Consequently, the levels of immigration and investment are determined according to the strength of the bargaining power between the government and the entrepreneurs. The greater is the bargaining power of the government, the larger is the contribution it can induce from the lobby in order to relax immigration policy and consequently, the lower will be the level of investment by the entrepreneurs all else equal. We show how a government can potentially solve this underinvestment problem by tying its hands to an institution, whereby it would be able to guarantee that immigration will be above a certain minimum level in the presence of lobbying activities. With a minimum level of immigration guaranteed by the institution, incentives to invest increase and counteract the underinvestment problem. This chapter presents a new framework within which the competing forces determining immigration and investment interact through the institution to determine both the level of immigration and capital formation.

We use a standard one sector model with two factors of production: labor and capital. Production technology exhibits decreasing returns to scale and there is full employment of both the inputs. Society is divided into three groups: labor, entrepreneurs and government. Workers earn their marginal product and increased immigration lowers their wages. The entrepreneurs are firm as well as capital owners. This means they earn profits as well as rental returns on capital. They decide how much capital to invest in production and benefit from having more immigrant labor, as higher labor supply lowers the cost of production through lower wages. The government chooses an immigration policy in terms of an immigration quota, after taking into account the interests of all groups in the society including its own. The government welfare function is a weighted average of the total welfare of the inhabitants and the contributions it receives from the lobbies. This feature of the model is adopted from the framework of Grossman and Helpman (1994). In order to influence the government's decision making process, the entrepreneurs form a lobby. The lobby's contribution to the government is conditional on the openness of the immigration policy. This contribution is determined through the process of bargaining between the government and the lobby. Immi-

gration policy is endogenously determined as a result of the conflicting choices between the government and entrepreneurs.

Following Maggi and Rodríguez-Clare (1998), we model the policy formation process as a two-stage game between the government and the lobby. In the first stage, the entrepreneurs maximize their profits to determine the amount of capital they want to invest in the production process. They do so anticipating the level of immigration and contributions that will be decided by the bargaining process in the second stage. In the second stage, the government and the lobby engage in Nash bargaining whereby their joint surplus is maximized to determine the level of immigration into the economy. Following that, the surplus that arises from lobbying is shared between the government and the lobby according to their given bargaining powers. This consequently leads to the determination of the optimal contribution schedule for the lobbyists. From this, the level of immigration, capital stock and contributions are determined.

The characterization of the political equilibrium and hence the behavior of the various agents is central to the contribution of this chapter. The government has to formulate immigration policy in such a way that it is able to balance the interests of the various agents in the society against its own. We set up a benchmark in which the government is not allowed to take contributions from the lobby. As a result, we can think of the outcome as 'pure democracy' because the government is responding only to the interests of the voters. We will first show that the outcome corresponds to the planner's solution. We then compare, with this benchmark, the outcome when the government is able to accept contributions by the lobby. This leads to a political equilibrium where the government's utility is always higher than under pure democracy due not only to the contributions that the government receives from the lobby, but also because the investment level is higher. Native labor tends to suffer a welfare loss in such an equilibrium as compared to pure democracy because wages are pushed down due to greater immigration. This comparison reveals the tensions between the different groups.

Once in a political equilibrium, if production technology is relatively capital in-

tensive, the government's utility is a decreasing function of its bargaining power. This is because a change in the bargaining power of the government has two opposing effects on its utility. On the one hand, for a given stock of capital, an increase in the bargaining power directly increases the amount of contributions from the lobby to the government and hence increases utility to the government. On the other hand, increased bargaining power translates into lower capital investment and consequently the immigration level and hence contributions decrease, reducing the government's utility. This latter effect is greater the more capital intensive the production process is. Thus, if production is sufficiently capital intensive, the second effect outweighs the first and as the bargaining power of the government increases, the government actually suffers a loss in its welfare.

The final part of the chapter argues that if the government is sufficiently strong vis-a-vís the lobby, it would prefer to tie its hands by an institution which guarantees a minimum level of immigration. This would enable a strong government to neutralise the problem of underinvestment. Such an institution could be the European Union (EU). In order to become a part of such an institution, a country has to satisfy certain conditions encompassing the rule of law, stable democracy and free market economy (Copenhagen Criteria). Becoming a part of such an institution involves certain costs. Thus, negotiations also take place regarding the financial arrangements i.e. how much a country needs to pay to become a part of the Union and how much they receive from the EU's budget.[1]. However, once a country becomes a part of the EU, it is subject to the Free Movement of Persons clause and hence entrepreneurs of that country can avail of workers from whom the government cannot extract a quota rent and those who do not require a visa sponsorship. This implies that the entrepreneurs now has access to a larger labour force without incurring any specific cost. The theoretical model in the final part of the chapter is a stylised way of capturing this feature.

This chapter contributes to the strand of literature that deals with the demand for immigrants which can be traced back to Benhabib (1996). He shows that in an economy under majority voting, the median voter tends to choose immigrants

[1] In 2014, UK paid £11.34 billion euros to the EU budget

whose skills are complimentary to those of the natives. Hence, this imposes certain capital and skill requirements on potential migrants. Ortega (2005) extends Benhabib's work to a dynamic framework whereby children of immigrants' are allowed voting rights. Consequently, skill complementary immigration policy results in a shift in political power. Thus, there exists a trade off between current and future immigration policy. Following Benhabib and Ortega, this chapter also analyses the formulation of immigration policy by the government of a destination country. However, we incorporate the role of an interest group and institutions in constraining immigration policy.

Two papers to which the present work is closely related are the ones by Facchini and Willman (2005) and Maggi and Rodríguez-Clare (1998). Facchini and Willman address the issue of the role of interest groups in formulating government policies on factor movements. The organized sector lobby the government for increased protection by offering contributions. They use a two stage game between the lobby and the government in the form of a menu auction. They find that protection granted is not only higher for a lobbying than a non-lobbying factor, but also higher for a factor that is abundant in the domestic country. They also show that a factor has incentives to lobby against the protection of its complement. This is because allowing greater imports of its complement will enhance the lobbying factor's marginal product. Maggi and Rodríguez-Clare, in the context of international trade, investigate whether the presence of lobbies induce a government to tie its hands to a free trade agreement. In a small two country two sector model, they use a two stage game involving the government and the lobby to establish the conditions under which the government is worse off in a political equilibrium than under a free trade agreement. In our present work, we develop a model that studies a government's policy formation on international factor movements in line with Facchini and Willman, combined with the bargaining framework of Maggi and Rodríguez-Clare. We show how immigration policy can determine the investment level in an economy. That is, we show that policy on an internationally mobile factor (which is labor in our case) can influence the formation

of the complementary factor (capital) which is not internationally mobile. In that case, lack of commitment on the government's part can lead to the problem of under-investment. We then identify a type of institution to which the government can tie its hands to solve this under-investment problem and the conditions under which a government would rather tie its hand to such an institution than formulate policy in the absence of such an institution.

The chapter is organized in the following way. The next section, section 2.2 sets out the analytical framework, outlining the benchmark social planner's problem, and the government's welfare function under the cases of a pure democracy and political equilibrium. Section 2.3 discusses the role of institutions and establishes conditions under which a government would prefer to tie its hands to an institution in the presence of pressure groups. Section 2.4 provides a preliminary numerical analysis of the results, while Section 2.5 which concludes the chapter provides a brief discussion of the main findings of the chapter and directions for future research.

2.2 The Model

The economy consists of one sector with two factors of production, labor (L) and capital (K).[2] We consider a production function of the form $Q = K^{\alpha}\sqrt{L}$ such that $\alpha + \frac{1}{2} < 1$.[3] Thus, the production function exhibits decreasing returns to scale. The economy consists of a fixed number of domestic workers and entrepreneurs (entrepreneurs). The entrepreneurs are firm owners as well as capital owners. These firms are competitive and they are price takers in the goods and factor market.[4] The mass of the domestic labor force is normalized to 1 while that of the entrepreneurs is normalized to s ($s < 1$). Thus, total mass of the population

[2]We assume that this economy is a small country in the world economy

[3]The main results of the model will still hold for a more general production function of the form $Q = K^{\alpha}L^{\beta}$ where $\alpha + \beta < 1$.

[4]Since firms are competitive, the production function should exhibit non-increasing returns to scale. Assuming decreasing returns is without loss of generality as it is similar to assuming a constant returns to scale production function with labor, capital and another fixed factor which is distributed evenly among the entrepreneurs in the country and the net returns after paying labor and capital accrues entirely to this fixed factor.

in the economy is (1 + s). We also assume that both workers and entrepreneurs (as owners of capital) earn their marginal products. This implies that the factor markets are competitive. Thus, r = $\alpha K^{\alpha-1}\sqrt{L}$ and w = $\frac{1}{2}\frac{K^{\alpha}}{\sqrt{L}}$ where, L = 1 + l_l. l_l is the domestic quota of immigrant labor into the economy and this is the main policy variable of the government.

The entrepreneurs not only own the capital, but they also form a group which lobbies for more immigrant labor. More labor is beneficial for firm owners since it translates into lower wages and higher profits for them. Assuming the price of the final good to be 1 and entrepreneurs to be homogeneous, gross profits of the entrepreneurs are given by

$$\begin{aligned}\pi &= K^{\alpha}\sqrt{L} - rK - wL \\ &= K^{\alpha}\sqrt{L} - \alpha K^{\alpha-1}\sqrt{L}K - \frac{1}{2}\frac{K^{\alpha}}{\sqrt{L}}L \\ &= (\frac{1}{2} - \alpha)K^{\alpha}\sqrt{L}\end{aligned} \tag{2.1}$$

Assuming unit cost of installing capital (e.g. equipment), the net income of entrepreneurs, is given by

$$\Pi(l_l) = \pi(l_l) + r(l_l)K - K \tag{2.2}$$

It is assumed that domestic workers and immigrants are perfect substitutes for each other. Entry of more immigrant labor will tend to push down domestic wages, and thus hurt domestic workers. On the other hand, lower wages increase profits of the entrepreneurs. Entrepreneurs can lobby the government for more immigration by making a financial contribution. On the one hand, the government needs to balance between the conflicting interests of its citizens i.e, the workers and the entrepreneurs, but on the other, it values the financial contribution made by the entrepreneurs. We assume that the world wage rate is fixed at w^*. Immigration will take place into the country as long as immigrants get a higher wage than the world wage. The model is set up in such a way that the quota of immigration

is always binding in equilibrium. The government captures only part of the surplus from immigration while a fixed amount γ is retained by the immigrant. Thus, government acquires ($w(l_l) - w^* - \gamma$) as quota rent per immigrant.[5]

The national welfare from the perspective of a benevolent social planner is written as

$$SW(l_l) = s\Big(\pi(l_l) + r(l_l)K - K\Big) + w(l_l)1 + (w(l_l) - w^* - \gamma)l_l \tag{2.3}$$

From the above expression, we can see that the social planner's welfare is a weighted sum of entrepreneurs' and labor's income. The weights are according to the population share of each group in the economy. We assume that this is a planner for the home country, and does not take into account the welfare of people in the rest of the world. The social planner chooses l_l and capital investment simultaneously to maximise the social welfare of the economy.

The government welfare function (or, the government's objective function) is a weighted average of the total welfare of the inhabitants and the contributions it receives from the lobbies. It can be written as

$$\begin{aligned} GW &= s\Big(\pi(l_l) + r(l_l)K - K\Big) + w(l_l)1 + (w(l_l) - w^* - \gamma)l_l + ac(l_l)l_l \\ &= SW(l_l) + ac(l_l)l_l \end{aligned} \tag{2.4}$$

The government places a constant weight $a > 0$ on the contributions it receives from the lobby. We assume that under pure democracy, the government is not allowed to receive any contributions from the lobby by an institutional constraint and hence c = 0 while under a political equilibrium it is allowed to receive

[5]The fact that immigrants' earnings are effectively lower than natives can be explained by the visa costs and NHS surcharge payable by immigrants into UK from outside the EU. Health surcharge introduced on 6th April 2015 is £200 per year for temporary non EEA migrants and £150 per year for non EEA students. Revenue collected from NHS surcharge between 6th April 2015-14th March 2016 by the UK government is £175.6m. Also, Home Office income from visa and immigration has been £1086m and £1182m for the years 2015-16 and 2016-17 respectively. Similarly in France, non EEA migrants without work do not have access to benefits unlike those guaranteed to EU national without a job (since these are guaranteed by the EU in order to standardise social security systems in member countries). Also, income support for pensioners is available to non EEA nationals only is they have worked in France for ten years.

contributions.

We set up a two stage game. In the first stage, the entrepreneurs decide how much capital to invest in the production process. In the second stage, the government and the lobby engage in bargaining to determine the level of immigration to be allowed into the economy and contributions. Following Maggi and Rodríguez-Clare (1998), negotiation takes place in the form of Nash bargaining where the government and the lobby have σ and $1-\sigma$ bargaining powers respectively.

2.2.1 Benchmark Social Planners' Problem

The benchmark case is the optimization decision of the social planner. The planner chooses the immigration quota and stock of capital simultaneously by maximising his welfare function. From the expression of the social welfare function described above, the first order condition is

$$\left(\frac{1+s}{2}\right) K^{\alpha}\sqrt{1+l_l} - (w^* + \gamma) l_l = 0 \tag{2.5}$$

We will denote the solutions to the social planner's problem with superscript 'SP' for the corresponding variables. The maximization problem yields $L=1+l_l^{SP} = \left(\frac{1+s}{4}\right)^2 \frac{K^{2\alpha}}{(w^*+\gamma)^2}$ as the optimal labor requirement for the economy. Thus, the level of immigration in the benchmark case is given by

$$l_l^{SP} = \left(\frac{1+s}{4}\right)^2 \frac{K^{2\alpha}}{(w^*+\gamma)^2} - 1 \tag{2.6}$$

We find that the larger is the mass of entrepreneurs in the total population (s), the higher will be the immigration quota from the rest of the world (l_l^{SP}). However, the higher is the world wage rate, the lower will be the immigration into the economy since the difference between the domestic and world wages will decrease, leading to a lower incentive for foreign workers to migrate. Also, the higher is the amount immigrants can earn (γ) in the country, lower will be l_l^{SP}. Consequently, at

this level of immigration, wages will be

$$w^{SP} = \frac{2(w^* + \gamma)}{1 + s} \tag{2.7}$$

For $\gamma > 0$ and s < 1, this wage rate is higher than the prevailing world wage rate. Since the social planner chooses the level of investment simultaneously with the quota, maximization of the social welfare function ((2.3)) yields investment in the economy to be

$$K^{SP} = \left[\frac{\alpha(1 + s)^2}{8s(w^* + \gamma)}\right]^{\frac{1}{1-2\alpha}} \tag{2.8}$$

We find that capital investment is directly proportional to the share of capital in the production process and the mass of entrepreneurs in the economy. However the higher is the world wage rate and the return to the immigrant, the lower will be the investment in the economy.

2.2.2 Pure Democracy

We proceed to consider the situation when the government sets policy on immigration. Under pure democracy the government is constrained such that it is not allowed to accept financial contributions from entrepreneurs. Using superscript 'D' to denote variables under pure democracy, the government's welfare function in such a situation can be written as -

$$GW^D(l_l) = s\Big(\pi(l_l) + r(l_l)K - K\Big) + w(l_l)1 + (w(l_l) - w^* - \gamma)l_l \tag{2.9}$$

Combined with observations from the previous section, we find the following result

Proposition 1: *In a pure democracy, immigration quota and investment levels are lower than that of the social planner.*

Proof.

Using the structural expressions for entrepreneurs' profits, rental rate and do-

mestic wages to maximise the government's welfare function with respect to the quota l_l, we obtain the expression for the immigration quota under pure democracy and it is given by

$$l_l^D = \left(\frac{1+s}{4}\right)^2 \frac{K^{2\alpha}}{(w^*+\gamma)^2} - 1 \tag{2.10}$$

Thus, for a given stock of capital investment, the higher is the weight the government puts on entrepreneurs' income, the higher is the immigration quota from the rest of the world. However, a net wage to immigrants ($w^* + \gamma$) leads to lower immigration quota. The wages under democracy is

$$w^D = \frac{2(w^*+\gamma)}{1+s} \tag{2.11}$$

The higher the weight on the entrepreneur's income, the lower are the wages in pure democracy. The total income of entrepreneurs under pure democracy is given by

$$\Pi(l_l^D) = \pi(l_l^D) + r(l_l^D)K - K \tag{2.12}$$

Anticipating the government's choice of the level of immigration, the entrepreneurs maximise their total income in the first stage by deciding the level of capital they would want to invest:

$$K^D = \left[\frac{\alpha(1+s)}{4(w^*+\gamma)}\right]^{\frac{1}{1-2\alpha}} \tag{2.13}$$

The higher is the weight on entrepreneur's income, the greater is capital investment in the first stage, while a higher world wage rate and quota rent has a negative impact on such investment. However, the higher the intensity of capital in the production process, captured by α, the greater is the investment by entrepreneurs.

We now compare the capital investment and quota under pure democracy to the ones derived under the social planner's problem. Since $s < 1$, direct computation enables us to conclude that investment under the planner given by 2.8 is

larger than investment in a pure democracy shown by 2.13. Given this result and values of all other parameters, immigration quota under a planner shown by 2.6 is greater than the quota in pure democracy (2.10). ■

The social planner chooses an immigration quota and capital investment simultaneously by maximizing its welfare. This implies that there are no entrepreneurs who make investment decisions. However, in a pure democracy, the government chooses I_I^D after entrepreneurs have decided upon a level of investment. This may lead to underinvestment in pure democracy as entrepreneurs solely care about their total income, unlike a social planner.

2.2.3 Political Equilibrium

In our analysis of Political Equilibrium, we relax the assumption that the government cannot accept financial contributions. The entrepreneurs lobby the government to increase the quota of immigrant labor since more workers will push down wages in the economy, increasing profits. Under political equilibrium, the government has to strike a balance between the demands of its citizens and the utility it receives from the contributions by the lobby. The government weighs the returns to the domestic laborers and entrepreneurs as under pure democracy, but now also places a weight on the contributions it receives. Thus, in the first stage, the entrepreneurs choose the amount of capital to invest while in the second stage, the lobby and the government share the surplus generated from moving to a political equilibrium according to their bargaining powers. This consequently leads to the determination of the immigration quota and contributions. We use the method of backward induction to solve for the political equilibrium. In the second stage, the government and the lobby bargain on the level of immigration to be allowed and the contributions. We will use the superscript 'PE' to denote solutions for corresponding variables in political equilibrium. The results from this stage is summarised in the following proposition.

Proposition 2: *In the second stage of a political equilibrium, for a given stock of*

capital, the immigration quota in an economy depends positively on the degree of responsiveness of the government to pressure from the lobby and also on the level of capital investment. The contribution from the lobby to the government is larger, the higher is the capital investment. Also, the greater is the bargaining power of the government, the larger contributions it will be able to extract from the lobby.

Proof. Detailed derivation is shown in Appendix B.1

The steps and intuition behind the proposition is as follows. The immigration quota l_I^{PE} maximizes the joint surplus of the government and the lobby, represented as

$$\begin{aligned} JS &= GW(l_I) + a\Big[s\big(\pi(l_I) + r(l_I)K - K\big) - c(l_I)l_I\Big] \\ &= s\Big(\pi(l_I) + r(l_I)K - K\Big) + w(l_I)1 + (w(l_I) - w^* - \gamma)l_I + as\Big(\pi(l_I) + r(l_I)K - K\Big) \\ &= \frac{s}{2}K^{\alpha}\sqrt{1+l_I} + \frac{1}{2}K^{\alpha}\sqrt{1+l_I} - (w^* + \gamma)l_I + \frac{as}{2}K^{\alpha}\sqrt{1+l_I} - s(1+a)K \\ &= \frac{s(1+a)}{2}K^{\alpha}\sqrt{1+l_I} + \frac{1}{2}K^{\alpha}\sqrt{1+l_I} - (w^* + \gamma)l_I - s(1+a)K \end{aligned} \tag{2.14}$$

In political equilibrium, the optimal level of immigration that maximizes the joint surplus function is

$$l_I^{PE} = \frac{K^{2\alpha}}{16(w^* + \gamma)^2}\Big[1 + k(1+a)\Big]^2 - 1 \tag{2.15}$$

From inspection we see that as the world wage rate w^* increases, the level of immigration into the country decreases. Similarly, if immigrants can earn more in the country, the quota for immigrants falls. Also, the higher is the responsiveness of the government to political pressures, the higher is the immigration quota that maximizes JS. Comparing l_I^{PE} and l_I^{D} using (2.15) and (2.10), we find that the quota under a political equilibrium is higher than under pure democracy, for a given stock of capital investment. This is because entrepreneurs can now influence the policy making process to increase the quota by making contributions to

the government.

The utility of the government under pure democracy is the social welfare under democracy denoted by $GW^D(I_I^D) = SW^D(I_I^D)$. Under the political equilibrium, the government's payoff becomes $GW^{PE} = SW^{PE}(I_I^{PE}) + ac(I_I^{PE})I_I^{PE}$. Similarly under pure democracy, the lobby's payoff can be represented as $(\pi(I_I^D) + r(I_I^D)K)$ while in a political equilibrium the lobby's pay off becomes $(\pi(I_I^{PE}) + r(I_I^{PE})K - c(I_I^{PE})I_I^{PE})$. Under Nash Bargaining, the government and the lobby share the surplus obtained from the increased immigration according to their bargaining powers. The weighted product of the surplus that arises from a political equilibrium to the government and entrepreneurs, with the bargaining powers as corresponding weights, is denoted by B. Contributions are chosen such that B is maximized.

$$B = \left(SW^D(I_I) - SW^{PE}(I_I^{PE}) - ac(I_I^{PE})I_I^{PE}\right)^{\sigma} \left(\pi(I_I^{PE}) + r(I_I^{PE})K - K - c(I_I^{PE})I_I^{PE} - \pi(I_I^D) - r(I_I^D)K + K\right)^{1-\sigma} \tag{2.16}$$

This yields a total contribution schedule

$$c(I_I^{PE})I_I^{PE} = \frac{(1-\sigma)(SW^D(I_I^D) - SW^{PE}(I_I^{PE}))}{a} + \sigma\left(\pi(I_I^{PE}) + r(I_I^{PE})K - \pi(I_I^D) - r(I_I^D)K\right) \tag{2.17}$$

When the government is very strong, depicted by a bargaining power σ = 1, the contributions that the entrepreneurs will have to pay is exactly equal to the difference in their surplus as the economy moves from pure democracy to a political equilibrium. Thus, the government will be able to extract all the surplus of the lobbyists as the latter lobby for more immigrant labor. On the other hand, if the government is very weak i.e. σ = 0 and all the bargaining power is with the lobby, the amount of contributions that the government can get will just be enough to compensate it for the difference in social welfare between a political equilibrium

and pure democracy. We get the expression for optimal total contributions as

$$c(I_I^{PE})I_I^{PE} = \frac{sK^{2\alpha}}{16(w^* + \gamma)}\Big[2a\sigma + as(1-\sigma)\Big] \tag{2.18}$$

The stronger is the government portrayed by a higher σ, the greater is the contribution it can extract from the lobby. Also, the greater the responsiveness of the government to political pressures, the greater is the amount of the contributions that the lobby will be willing to provide the government to influence the latter's immigration policy. ■

In the first stage, anticipating the levels of immigration and contributions that will be decided through bargaining between the government and the lobby, the entrepreneurs decide on the level of capital they want to invest in the production process. The result that we obtain is as follows.

Proposition 3: *The higher is the bargaining power of the government, the lower will be the capital investment by entrepreneurs in the first stage as the government will be able to extract relatively large contributions from the lobby.*

Proof. Detailed derivation is in appendix B.2.

Entrepreneurs choose the level of capital stock, anticipating the level of immigration and contributions. The net income of the entrepreneurs under political equilibrium is given by

$$\Pi(I_I^{PE}) = \pi(I_I^{PE}) + r(I_I^{PE})K - c(I_I^{PE})I_I^{PE} - K \tag{2.19}$$

The difference in the net income from the pure democracy case is that now the entrepreneurs also have to account for the contributions that they pay to the government. Maximizing the profit function by choosing capital stock, after substituting the values of optimal immigration level and contributions under political

equilibrium yields optimal investment

$$K^{PE} = \left[\frac{\alpha}{8(w^* + \gamma)}\left[2(1 + s(1 + a)) - s[2a\sigma + as(1 - \sigma)]\right]\right]^{\frac{1}{1-2\alpha}} \tag{2.20}$$

We can conclude that capital investment is inversely related to the bargaining power of the government, that is, the stronger is the government, the lower will be the investment by entrepreneurs. ■

This can be interpreted in terms of a commitment problem on behalf of the government. The lobby and the government enter into a negotiation that yields both of them a higher return than that under pure democracy. However, the lobby knows that once it has made an investment, it has to share the gross returns from such investment with the government. Consequently, since bargaining powers are known to each group, if the government has a higher bargaining power, entrepreneurs will deliberately invest less since they know that a greater portion of their returns post negotiation will accrue to the government. However, the greater is the responsiveness of the government to political pressure from the lobby, the greater is the level of capital investment in the first stage.

2.2.4 Comparing Government Welfare in Pure Democracy and Political Equilibrium

We are now in a position to compare between government's welfare (utility) under pure democracy and political equilibrium and shed light on the government's decision to commit to an institution. Using results from the previous sections enables us to establish the following result.

Proposition 4: *The government's own welfare is lower in pure democracy compared to a political equilibrium. However, higher level of welfare for the government in political equilibrium decreases with the increase in its bargaining power, when production is relatively capital intensive. Entrepreneurs' welfare also in-*

creases in a political equilibrium. However, welfare of workers is higher under pure democracy compared to a political equilibrium.

Proof.

Details of the derivation can be found in Appendix B.3.

To gain further insight, the government's welfare function is the same as the social welfare function under pure democracy and is given by

$$GW^D = \left(\frac{1+s}{2}\right)K^\alpha\sqrt{1+I_I^D} - (w^*+\gamma)I_I^D - sK \tag{2.21}$$

Given the expressions for immigration level (2.10) and stock of capital investment ((2.13)), we can rewrite the government's welfare function as

$$\begin{aligned} GW^D &= \left(\frac{1+s}{2}\right)K^\alpha\left(\frac{1+s}{4}\right)\frac{K^\alpha}{(w^*+\gamma)} - (w^*+\gamma)\left[\left(\frac{1+s}{4}\right)^2\frac{K^{2\alpha}}{(w^*+\gamma)^2} - 1\right] - sK \\ &= \left[\frac{\alpha(1+s)}{4(w^*+\gamma)}\right]^{\frac{2\alpha}{1-2\alpha}}\frac{1}{(w^*+\gamma)}\left(\frac{1+s}{4}\right)^2 + w^* + \gamma \end{aligned} \tag{2.22}$$

Similarly, under political equilibrium, government welfare function can be represented as,

$$\begin{aligned} GW^{PE} &= s(\pi(I_I^{PE}) + r(I_I^{PE})K + w(I_I^{PE}) + (w(I_I^{PE}) - w^* - \gamma)I_I^{PE} + ac(I_I^{PE})I_I^{PE} \\ &= \left(\frac{1+s}{2}\right)K^\alpha\sqrt{1+I_I^{PE}} - (w^*+\gamma)I_I^{PE} + ac(I_I^{PE})I_I^{PE} \end{aligned} \tag{2.23}$$

Given the value of optimal immigration level ((2.15)), capital investment ((2.20)) and contributions, the government welfare function under political equilibrium can

rewritten as

$$
\begin{aligned}
GW^{PE} &= \frac{K^{2\alpha}}{(w^* + \gamma)}\left[\frac{(1+s)(1+s(1+a))}{8} - \frac{(1+s(1+a))^2}{16} + \frac{a^2 s[2\sigma + s(1-\sigma)]}{16}\right] + (w^* + \gamma) \\
&= \frac{K^{2\alpha}}{16(w^* + \gamma)}\Big[(s+1)^2 + a^2 s\sigma(2-s)\Big] + (w^* + \gamma) \\
&= \left[\frac{\alpha}{8(w^* + \gamma)}\Big[2(1+s(1+a)) - s(2a\sigma + as(1-\sigma)\Big]\right]^{\frac{2\alpha}{1-2\alpha}}\left[\frac{(1+s)^2 + a^2 s\sigma(2-s)}{16(w^* + \gamma)}\right]
\end{aligned}
\tag{2.24}
$$

Subsequent analysis of the government welfare functions under pure democracy (2.22) and political equilibrium (2.24) reveals that welfare of domestic workers will always be higher in pure democracy than under a political equilibrium. The intuition behind this is as follows. In the political equilibrium, the government extracts rent from the lobby through contributions. Thus, compared to the situation of pure democracy, the government has an additional tool to extract rents. This explains the result.[6]

However, government's utility in political equilibrium will always be greater than government's utility under pure democracy. However, for a certain range of capital intensity, α, the government's utility under political equilibrium will be a decreasing function of σ. In other words, if capital is very important in the production process, i.e.

$$
\frac{2a(1+k) + 2a^2k(1-\sigma) - a^2k^2(1-\sigma)}{2\Big[(1+k)^2 + 2a(1+k) + a^2k(2-k)\Big]} < \alpha < \frac{1}{2} \tag{2.25}
$$

the greater (lower) the bargaining power of the government, the less (more) will be the utility it will derive from committing to a political equilibrium.

This outcome comprises of two effects. On the one hand, as σ decreases (in-

[6]This conclusion generally to hold in models adopting the framework of Grossman and Helpman (1994). They develop a model where a special interest group in order to incumbent government's choice of trade policy, make political contributions. Government's objective is defined over these contributions and voter's welfare. Subsequent empirical analysis by Goldberg and Maggi (1999) finds that government does have campaign contributions in its objective function. Gawande, Krishna and Olarreaga (2012) also empirically validate the predictions of the Grossman-Helpman model.

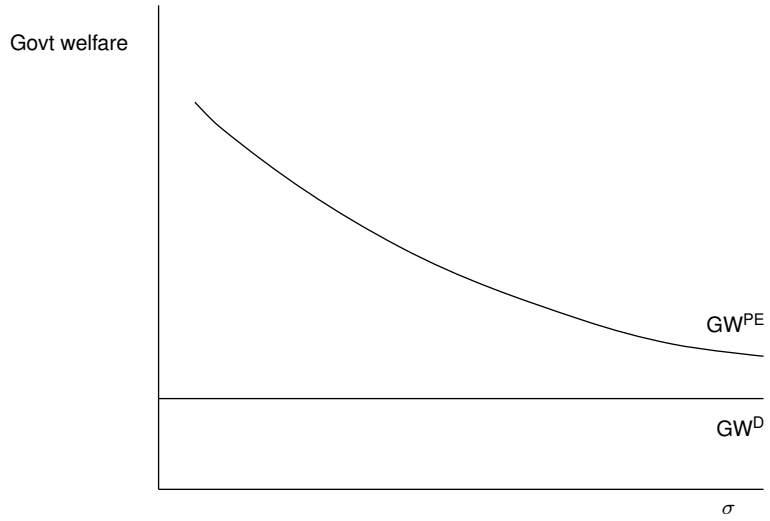
creases), for a given stock of capital, contributions decrease (increase). This has a downward (upward) effect on the government's utility. On the other hand, as σ decreases(increases), capital investment increases(decreases) and through this change in capital investment, rental rate, wage rate, immigration level as well as contribution increases (decreases). This again leads to a rise (fall) in the government's utility. However, the second effect, due to σ, depends on the intensity of capital in the production process, α. If capital is very important in the production process, the increase (decrease) in the government's welfare due to a decrease (increase) in its bargaining power outweighs the loss (gain) in its welfare due to a fall (rise) in contributions and hence government welfare shows an overall increase (decrease). Subsequently, if capital intensity is low, the government's utility increases with an increase in its bargaining power. Under a political equilibrium the welfare of entrepreneurs in terms of their total income will be higher than in pure democracy. ■

Figure 2.1 represents the welfare differences. Thus, given a production process where capital is of a very high intensity but the government has a higher bargaining power, investors will be held up leading to underinvestment.

2.3 The Role of Institutions

This far we have demonstrated that a relatively strong government experiences a reduction in welfare in a political equilibrium due to underinvestment by entrepreneurs. Hence, a natural question to ask is whether the government is able to solve this underinvestment problem by adhering to an institution. Here we will focus on an institution whereby the government can pre-commit to a certain minimum level of immigration. We identify the kind of institutions a government could commit to. To formally address this issue we now introduce a stage 0 to our above described model, where the government can commit to a particular level of immigration.

Figure 2.1: Pure Democracy and Political Equilibrium



In the original political equilibrium, the threat point was that under pure democracy. In the new set-up, we assume that the threat point is above democracy, i.e. in stage 0, the government commits to allow more people to come in than under pure democracy, without taking any contributions from the lobby. In other words, the level of immigration now allowed is such that the total labor employment is $\beta^2 L^D$ where $\beta \geq 1$, that is, the new threat point is a scaled up version of the level under pure democracy. Also, by assumption the government has to incur a certain cost for tying its hands to an institution and that cost is proportional to the scaling up factor β (this is similar to assuming that the cost is a proportion of the capital stock in the economy since the higher is the β, the higher will be the capital investment). The game is again solved by backward induction. We will now show that if the government can commit to a floor i.e. a level of immigration higher than that assured under pure democracy, then it will do so only if it's bargaining power is greater than a certain threshold. In other words, a government will prefer to tie its hands by an institution when it is relatively strong vis-a-vìs the lobby.

As outlined in the previous section, GW^{PE} is the welfare from the political equilibrium in the situation when the government does not tie its hands to any insti-

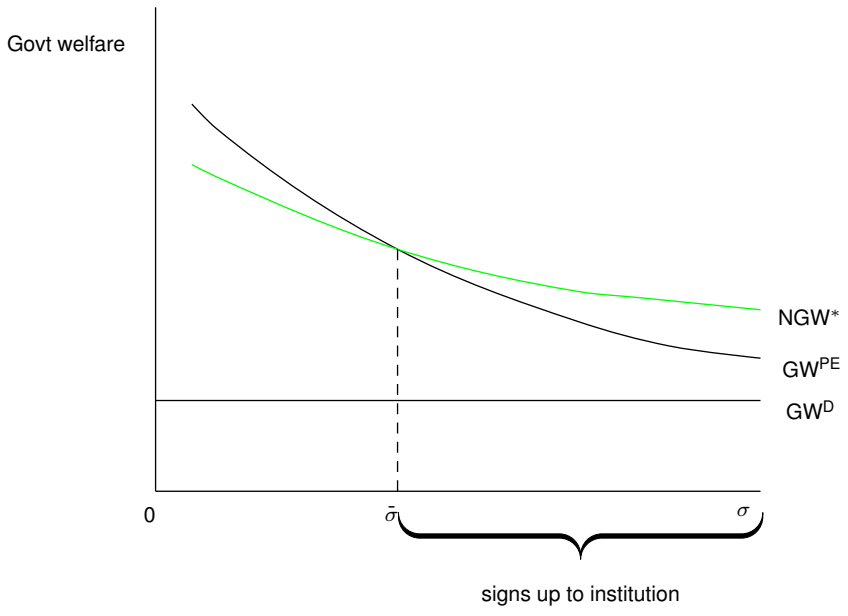
tution. Let GW^{PE_i} be the welfare to the government from the political equilibrium under the situation when in stage 0 the government ties its hands to an institution by choosing a certain β. The cost of tying hands is $\beta^2 Q$ where $Q > 0$. Thus NGW^{PE_i} is the net welfare to the government if it prefers to tie its hands to the institution. We now define

$$NGW^* = \max_{\beta} NGW^{PE_i} = \max_{\beta}[GW^{PE_i} - \beta^2 Q]$$

The results obtained from our analysis is summarized in the following proposition:.

Proposition 5: *If a government is strong vis-a-vìs the lobby such that its bargaining power is above a certain threshold, then it will prefer to tie its hands to an institution. Commitment to such an institution will increase the welfare of the government and it would be able to counteract the underinvestment problem that would arise in the absence of such an institution.*

Figure 2.2: Institutions



Proof.

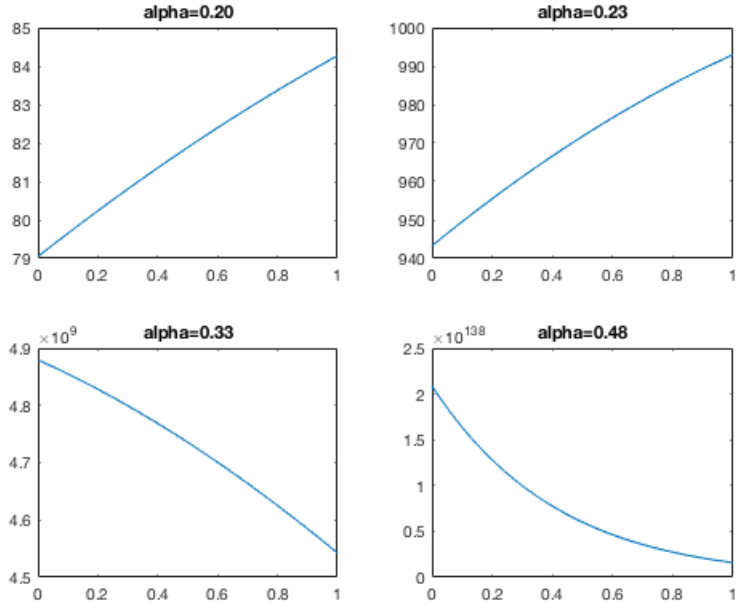
The detailed mathematical proof can be found in Appendix B.4 while Figure 2.2 depict the values of σ for which the government will be willing to sign up to an institution. Here we discuss the intuition behind the proof. We find that when the government is very weak relative to the lobby i.e. $\sigma = 0$, its welfare from a political equilibrium after committing to an institution is strictly lower than its welfare under a political equilibrium without an institution. We find that the reverse happens when the government is very strong vis-a-vìs the lobby i.e. $\sigma = 1$. Since the government welfare functions are continuous in the government's bargaining strength, we can conclude that for a government whose relative strength vis-a-vìs the lobby is above a certain threshold ($\bar{\sigma}$), the government would actually like to tie its hands to the institution rather than stay in a political equilibrium without such institutions. In the absence of such an institution, a government with a high bargaining power would extract a lot of contribution from the lobby which would deter entrepreneurs from undertaking investment, leading to underinvestment in the economy. However once a strong government signs up to such an institution, it is able to counteract such underinvestment problem without lowering its contributions. This is because such an institution assures a higher level of immigration into the economy without lobbying activities. The government's commitment to a larger immigration quota encourages the entrepreneurs to increase investment and hence, makes the government better off in a political equilibrium arising out of tying its hands to such an institution.

■

2.4 Numerical Analysis

In this section, we undertake a numerical exercise to further understand the relationship between the government's bargaining power σ and its welfare for different different levels of capital intensity. We also explore these effects when the mass of entrepreneurs (s) in the economy changes and when the degree of responsiveness of the government to contributions from the lobby (a). We have already

Figure 2.3: Low responsiveness to contributions, s=0.2



proved in subsection (2.4) that in a political equilibrium, if capital is very important int he production process, then the government's welfare actually decreases with an increase in its bargaining power. This is primarily because, at higher values of σ, the increase in welfare due to contributions is outweighed by the loss in welfare due to fall in investment, rental and wage rates, quota and the indirect effect on contributions. The numerical analysis confirms this relationship.

Figure 2.3 shows how government's welfare changes with σ for various values of α. In this exercise, we fix the mass of entrepreneurs (s) and government's responsiveness to contributions from the lobby (a) at 0.2 and 0.8 respectively.[7]. We observe that as the value of α varies from 0.20 (low) to 0.48 (very high), the slope of the government welfare function changes from being positive to negative.

Following this, we investigate how across this range of α government welfare responds to changes in s and a. In Figure 2.4 and 2.5, we increase the mass of entrepreneurs in the economy to 0.5 and 0.8 respectively, while keeping the government responsiveness to contributions constant at a lower value of 0.8 as in Figure 2.3. We find that, as s increases, the slope of the welfare function becomes

[7]Following Grossman and Helpman (1994), Goldberg and Maggi (1999), McCalman (2004),and Lai and Yan (2012) among others, the estimated weight that the Government of the United States places on campaign contributions is between 0.000315 and 1.33.

negative at a lower value of α. This implies that, with a remaining constant, an increase in s exacerbates the underinvestment problem in the economy due to which government welfare becomes negatively related to σ at a lower α. This is reflected in the second diagrams across Figure 2.3, 2.4 and 2.5. According to our model, this implies that the fall in welfare due to decreased investment, wages, rents, quota and contributions brought about by an increase in σ outweighs the rise in welfare due to increased contributions.

In the next three figures, we analyse the effect on government welfare for the same range of α but now we assume that the government's responsive to contributions from the lobby is very high (1.3). We find that as s increases from 0.2 to 0.5 and then 0.8 as shown in Figures 2.6, 2.7 and 2.8 respectively, the value of α at which the government's welfare becomes negatively related to σ is higher. This is because the increase in welfare brought about by an increase in contributions outweighs the decrease in welfare brought about by an increase in σ for a larger range of α. The government derives increasing welfare from valuing contributions more. In these three figures we find that welfare becomes negatively sloped for α=0.33 while when a was constant at a lower value of 0.8, government welfare starts decreasing with σ when α=0.23.

Figure 2.4: Low responsiveness to contributions, s=0.5

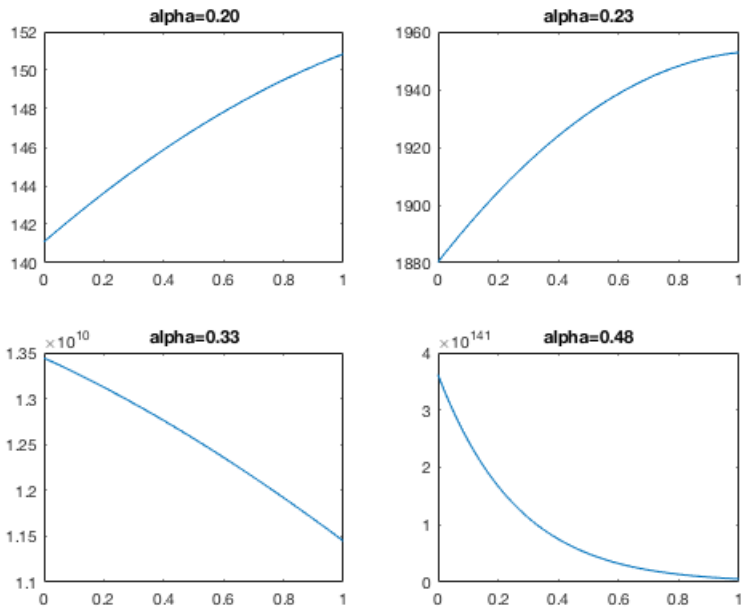


Figure 2.5: Low responsiveness to contributions, s=0.8

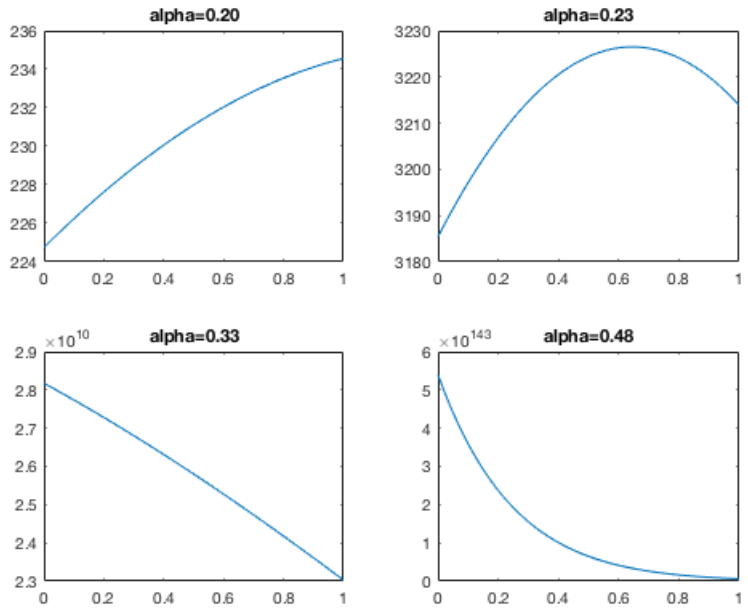


Figure 2.6: High responsiveness to contributions, s=0.2

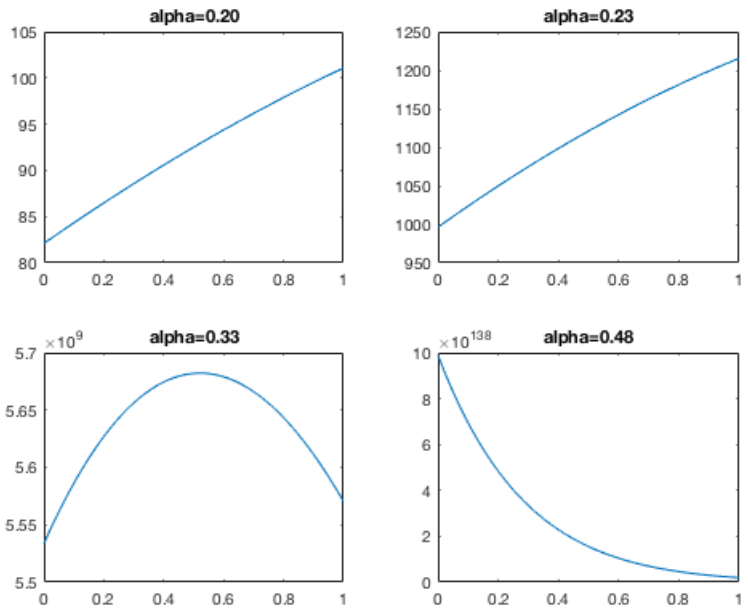


Figure 2.7: High responsiveness to contributions, s=0.5

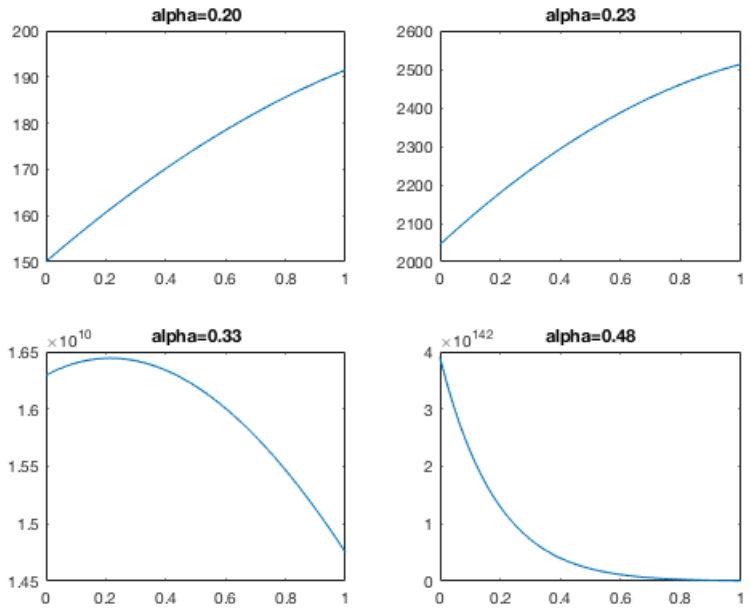
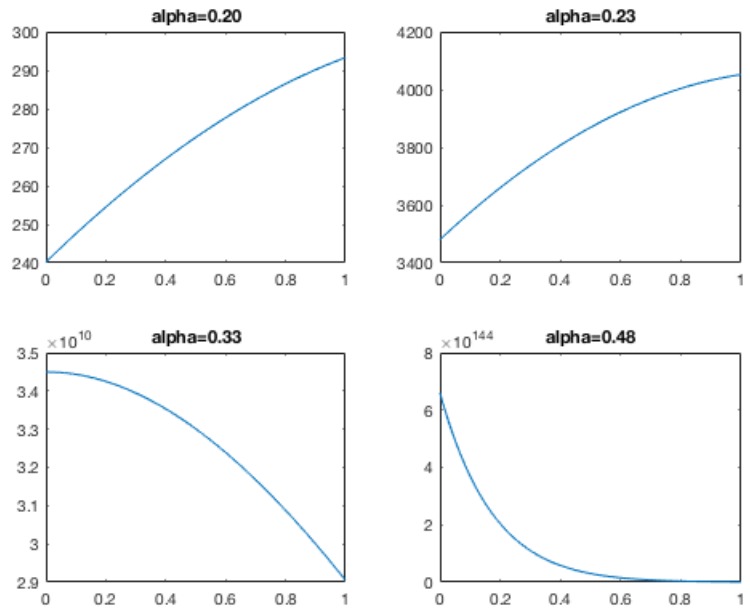


Figure 2.8: High responsiveness to contributions, s=0.8



2.5 Conclusion

This chapter explains how immigration policy is endogenously determined in a set up where the government is concerned not only about its citizens but also about contributions it can get from the lobby. The lobby formed by the entrepreneurs invest capital in the production process depending on the immigration quota decided upon by the government. The interaction between the government and the lobby is modelled as a two stage game involving Nash bargaining where the surplus arising from increased immigration is shared between the government and the lobby according to their respective bargaining powers. We find that a government, when considering its own welfare, is always better off in a political equilibrium than in a pure democracy. However, if the government is very strong relative to the lobby, the resulting underinvestment problem may become particularly acute. Such a problem can be overcome by the government tying its hands to an institution that guarantees a certain level of immigration into the economy. In this chapter we are able to prove the existence of a threshold level of bargaining power of the government such that for any bargaining power higher than that level, the government will prefer to tie its hands to such an institution than stay away from it. One possible direction of future research could be to analyse the formation of immigration policy in the presence of multiple skill levels of the workers.

Chapter 3

Public Goods and Immigration: England and Wales

3.1 Introduction

The way immigrants distribute themselves within a country can have important implications for policy design and welfare. There are various factors which can drive the location choice of an immigrant, such as job opportunities, political and religious freedom, education opportunities, medical facilities and crime levels. Although it is often reported that immigrants chose to cluster themselves with existing immigrants of the same community due to social ties, it is however important to understand the role and magnitude of other factors impacting this decision. Specifically, we analyse the role of public good provision in influencing the locational choice of an immigrant.[1]

In this paper, we investigate whether an increase in the number as well as quality of schools had an effect on the location choice of immigrants. We exploit the exogenous variation provided by the Academies Act which was introduced in England in 2010. The introduction of this Act led to an increase in the number

[1] A public good is one which is non-excludable implying that individuals cannot be excluded from using it and which is non rival meaning that use by one individual does not reduce availability to others. Education is a public good that has positive externalities. It is non rival up to a point since extra students do not reduce the space available to others. It is also semi non-excludable as fees may be such that non-paying consumers cannot use it. Technology borne education such as online courses and MOOCs are also non rival and non-excludable.

of schools in the country (free schools) as well as a betterment in the quality of schools who opted for academy status as academies enjoyed greater autonomy in their functioning. We undertake two distinct approaches on different datasets in this paper to answer the aforementioned question.

First, we explore the role of the Academies Act in the location decision of immigrants by comparing the stock of migrants to the North West region of England (where the Act came into effect) and Wales (where the Act was not introduced) before and after the Act. The reason for choosing these two regions is due to their geographical proximity, comparability in immigration procedures and similarity in key demographics. We estimate a difference-in-difference model for two separate sample groups, households with children and for households without children. If the number of schools actually does affect the location choice, it should be reflected in the magnitude of the number of immigrants with children relative to the number of immigrants with no children, *ceteris paribus*. Also, we do the same analysis by dividing the immigrants into occupation categories. The regression model accounts for any variation in the immigration levels in the two regions due to differences in crime, religion, house prices, industry sector and economic activity.

In the second part of the paper, we study the relationship between the number of schools and immigrants' location choice within the London boroughs. We employ a discrete choice model where a migrant's utility depends on number of schools in a borough, borough demographics such as crime rate, unemployment rate, number of active enterprises and religious distribution. Unobserved variables such as social ties in a borough can also be one of the drivers for the opening up of new free schools after the Academies Act was passed. To mitigate this endogeneity bias, we use instrumental variables such as the timing of the Academies Act and lagged number of schools. The intuition for the instrumental variables is that the timing of the Academies Act will be correlated to the change in number of schools but is not correlated to the social ties in a borough.

We conducted both the analyses for two main reasons. First, London is

unique in terms of its immigration patterns from rest of the UK.[2] It can be due to London being an economic hub as well as due to social ties among immigrants. Hence, studying immigration patterns in both areas adds robustness to our findings. Second, the two approaches employ distinct econometric methods, difference-in-difference for the first approach while a discrete choice logit model for the second one. Each econometric approach relies on specific identifying restriction. While the difference-in-difference method relies primarily on a parallel trends assumptions, the discrete choice model for location choice assumes IIA (independence of irrelevant alternatives) among London boroughs and the exclusion restriction of the instrumental variable. Although we test for these identifying assumptions where possible, a similar finding across both methods can further support our results.

The theory that people are attracted towards the place where they are provided with more public goods can be traced to Tiebout (1956). The paper shows that if there are a number of alternative communities in which a consumer can locate in and these communities differ in their provision of public goods, then each consumer will choose that place which offers the public goods closest to his ideals. This will subsequently lead to an optimal size of a community where optimal size is defined as the number of residents for whom the decided set of public goods can be produced at the lowest cost. Banzhaf and Walsh (2008) and Cebula (2009) provide further validation of the Tiebout hypothesis. Banzhaf and Walsh (2008), using data on California, find that population density increased in those areas which witnesses an exogenous increase in public goods while the Cebula (2009) using state level data from the US between 2000-2005 finds that consumers prefer states with lower income tax burdens and those states which have spent more on primary and secondary education. Borjas (1999), using the 1980-90 Public Use Microdata Sample (PUMS) of the US Census, demonstrates how locational choices of welfare benefit receiving immigrants to the US are influenced by interstate dispersion of welfare benefits. He found that in the case

[2] In 2015, London had 37% of the foreign born population in the U.K., followed by the South East region which had only 13%.

of self selected migrants, if the marginal cost of choosing to live in one US state over another one is small, once the decision to emigrate from their country has been made, then such immigrants tend to move to those states which give them the highest benefits.

Giorgi and Pellizzari (2009) estimate how locational decisions of migrants in the EU15 countries are affected by the welfare generosity of these countries. [3] They find a small but significant impact of welfare policies on the location choices of migrants. Verdugo (2015) shows how a 1970s reform in France that allowed immigrants with children to have access to public housing influenced the initial location choices of migrants. Using a difference-in-difference approach to compare changes in the choice of location for immigrants with and without children after the introduction of the reform, the paper finds that cities that had more public housing supplies had a larger influx of immigrants with children. There is also a considerable literature that highlights the fact that migrants tend to concentrate in those locations which have relevant ethnic clustering (Bartel 1989, Pohl 2007).

Using the difference-in-difference method, we find that after the implementation of the Act, there has been a significant increase in the number of immigrants with children to the North West England as compared to the Wales, however there is no significant difference in the number of immigrants without children between the control and treatment group. Also, when we estimate the model by dividing the immigrants into occupation categories, our findings are similar. In the discrete choice model, the estimated parameters show that there has been a significant increase in the immigration in London boroughs due to an increase in the number of schools. We find that a 1% increase in the number of schools in a borough increased the number of immigrants by 1.4% on an average.

The rest of the paper is organized as follows. Section 3.2 gives a description of the kinds of schools in England and Wales and discusses the Academies Act. Section 3.3 describes the difference-in-difference model. Section 3.4 discusses the discrete choice model of immigrant location decisions within London boroughs

[3] The EU15 countries are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom

while Section 3.5 concludes the paper.

3.2 Schools in England and Wales

There are broadly four different types of schools in England - (1) Maintained schools, (2) Academies, (3) Independent schools and (4) Grammar schools. Further, Maintained Schools can be of four kinds. First, community Schools are run and controlled by the local authority who also employs the staff, decides on admission requirements and owns the land and buildings. Second, foundation and trust schools are run by the governing body who also decides on the admission criteria and employs the staff. The land is owned by the governing body or by a charity in case of trust schools. Third, voluntary Aided Schools are mostly faith schools where a religious foundation or trust provides a small portion of the capital costs for the school and they also form a majority on the school's governing body. This religious body owns the land and buildings while the governing body employs staff and sets admission criteria. Lastly, Voluntary Controlled Schools are like the Voluntary Aided Schools but are run by the local authority who are entrusted with the responsibility of employing staff and deciding admission requirements. The foundation or the trust owns the land and buildings and normally forms a quarter of the governing body.

Academies can be of three types. First, traditional Academies are normally under performing schools which are allocated to an academic sponsor to take over. Such academic sponsors could be universities, FE colleges, education charities or business sponsors. These academies are independent, free of local authority control and are accountable to the Government through a funding agreement. The funding agreement enlists the duties of the Academy Trust, the rules of running the school and recruitment of teachers, details of funding for the school and all other aspects involved in the maintenance and upkeep of the school. They are usually set up with the Department of Education brokering between the academy providers and under performing schools. Second, converter

Academies are already existing high performing schools who opt for academy status to gain independence and move out of the jurisdiction of the local authority. Like the Traditional ones, they also have a funding agreement with the government. Finally, Free Schools are new state schools including independent schools becoming state schools for the first time. They operate in law like academies. These schools can be set up by teachers, parents, existing schools, educational charities, universities or community groups after they have submitted an application demonstrating the requirement of that form of school by parents in that particular area. In order to set up the schools, the group applying to set it up has to form a guaranteed limited company, appointing members and directors who can run it. These schools are independent, free from the control of the local authority and like other academies, accountable to the government through a funding agreement.

The Academies, with increased autonomy in running schools, recruiting teachers and pupil admissions, were expected to perform better than maintained schools. The National Foundation for Educational Research (NFER) found that pupils in secondary sponsored academies were 2.7% more likely to achieve better GCSE grades (5 or more A^* to C grades) as compared to their contemporaries in the local authority maintained schools.

Apart from the maintained schools and academies, there also exist grammar schools and independent schools. Grammar schools are state funded schools that select their students on the basis of their academic ability. Independent schools are those that are set up and governed by the school itself i.e. by an independent body of governors. They charge a fee to attend and can also make profits. They could be set up by companies and charities. In Wales, the types of schools are same as those in England except that there are no academies or free schools.

3.2.1 Academies Act

Academies were first introduced by the Labor government in 2002-03 whereby only secondary schools were eligible to become academies once they were able to find a sponsor. Later, the Academies Act of 2010 made it possible for all publicly funded schools in England to become academies, still publicly funded but with an increased degree of autonomy in issues such as setting teachers' wages and diverging from the national curriculum. With the introduction of this Act, even primary schools were allowed to become academies. Requirement of a sponsor was no longer necessary and most importantly, it led to the creation of free schools. Prior to 2010, the main aim of the Labor government in introducing the Academies was to improve schools that were under-performing. However, the Academies Act introduced in the 55th UK Parliament by the Conservative–Liberal Democrat coalition government called for greater autonomy and injected more competition into the state school sector. Thus, post 2010, though traditional sponsored academies continued to open, there were more converter academies which started to come into existence. Eyles et al (2015) conduct a study to highlight the differences between the academies before and after the implementation of the policy and the possible implications on the quality of pupil enrolment.

Before 2010, there were 203 Academies in England. By January 2011, a total of 407 primary and secondary schools with academy status existed, with the 371 secondary academies representing 11% of the total number of secondary schools. By the end of August 2016, there were 5,825 academies. The Academies Act also authorized the creation of free schools. A free school, as described in the preceding section, is a type of academy, a non-profit making, independent, State-funded school which is free to attend but is not controlled by any local authority. In September 2011, the first 24 free schools opened and the number rapidly increased to 425 in September 2016. These schools normally opened at the beginning of the academic year. The number of free schools which started in the academic year 2012-13 was almost double than the first wave in 2011-12. A Briefing (No. 7033, 2nd December 2016) from the House of Commons Library

states that London had the largest number of free schools at 130 and North East England with the fewest at 12 till December 2016. It is more likely that the free schools were located in deprived areas and it was found that non-white population in primary free schools was 55% which was well above the national rate of 25%. Table 3.1 shows the number of free schools which have opened in various parts of England between 2011 and 2016 after the introduction of the Act. Table 3.2 lists the number and type of academies in North West England and London which have opened up from the year 2005 onwards. Converter Academies came into being from 2010 only.

Table 3.1: Number of Free Schools and Average Population in Various regions of England.

Year	London	North West	West Midlands	South West
2011	9	2	2	1
2012	18	6	7	2
2013	33	14	10	11
2014	33	11	7	7
2015	20	7	13	8
2016	20	9	4	5
Avg Population	8,424,706	7,038,817	5,629,217	5,306,961

Source: Data for Free Schools is obtained from Department of Education, U.K. Government. Population Data is from the Annual Population Survey

3.3 Impact of the Academies Act on Immigration: A difference-in-difference analysis

In this section, we will use a difference-in-difference regression model to analyse the impact of the Academies Act (2010) on the location choices of immigrants. First, we will discuss the various data sources, the methods employed to clean the data and some key descriptive statistics. Subsequently, we discuss the difference-in-difference model and estimation results.

Table 3.2: Type and Number of Academies in North West England and Wales

	North West			London		
Year	Sponsor	Converter	Total	Sponsor	Converter	Total
2005	1	0	1	4	0	4
2006	1	0	2	9	0	13
2007	4	0	6	10	0	23
2008	7	0	13	8	0	31
2009	9	0	22	8	0	39
2010	9	7	38	6	14	59
2011	4	80	122	5	128	192
2012	14	57	193	13	72	277
2013	18	48	259	34	51	362
2014	26	36	321	37	37	436
2015	30	43	394	21	36	493
2016	16	51	461	24	63	580

Source: Department of Education, U.K. Government

3.3.1 Data

Immigration data

We use data on the stock of immigrants to U.K. from the Annual Population Survey (APS) between 2006-2016. The APS uses data from the Labor Force Survey (LFS) and is a household level survey covering the U.K. with an approximate sample size of 320,000 respondents. It was first published in 2004 and is available for every calendar quarter. The LFS interviews are conducted in five waves, one wave pertaining to one quarter. This means that each cohort is interviewed five times after which it drops out from the sample. The APS combines waves one and five from four successive quarters of the LFS. This ensures that the APS does not have the same responding households. In addition to this, the APS is augmented with three annual boost samples. In these boosts, the respondents are also interviewed for four waves but at yearly intervals, with one quarter of the sample being replaced each year. These sample boosts are called English Local labor Force Survey, Welsh Local labor Force Survey and Scottish Local labor Force Survey.

In our analysis, we use a dataset spanning 10 years. To prevent a respondent from being counted more than once, we only use the first wave of the main LFS

as well as the boost surveys. We define immigrants as those people whose country of birth is not England, Wales, Scotland or Northern Ireland. The difference between nationality and country of birth is that nationality may change over time but country of birth does not and hence gives more accurate estimates of any changes over time. This definition of an immigrant in line with most of the prior literature in this area. For our econometric analysis, we restrict our sample to adult male married and unmarried immigrants with children. We do this to prevent double counting a family in the sample. Consequently, we have a dataset comprising adult male immigrants with children for every year between 2006-2016.

Demographic Data

We obtain data for crime for the different regions of England and Wales from the database used for the National Statistics bulletin Crime in England and Wales, published by the Office of National Statistics (ONS).In our case, crime is measured by the number of offenses committed. House prices are simple average house prices obtained from ONS and are calculated in pounds. Unemployment rates and Economic activity rates are also obtained from the ONS. Economic Activity rate is the percentage of total economically active individuals in the population over 16 years of age in the region. Unemployment rate is measured as a percentage of the total number of economically active individuals in the region. It is the total number of unemployed people divided by the total number of economically active people in the region. Age is in number of years while the proportion of people belonging to a religion is the number of people in the religion divided by the total population of the region. Table 3.3 depicts the summary statistics of the above mentioned demographic variables.

3.3.2 Data Analysis

Table 3.4 depicts the similarities between the North West of England and Wales in terms of the regions' demographic factors between 2006 and 2016. We find that unemployment rate is approximately 7% in both the regions and they also

Table 3.3: Summary Statistics for U.K. from Annual Population Survey for 2006-2016

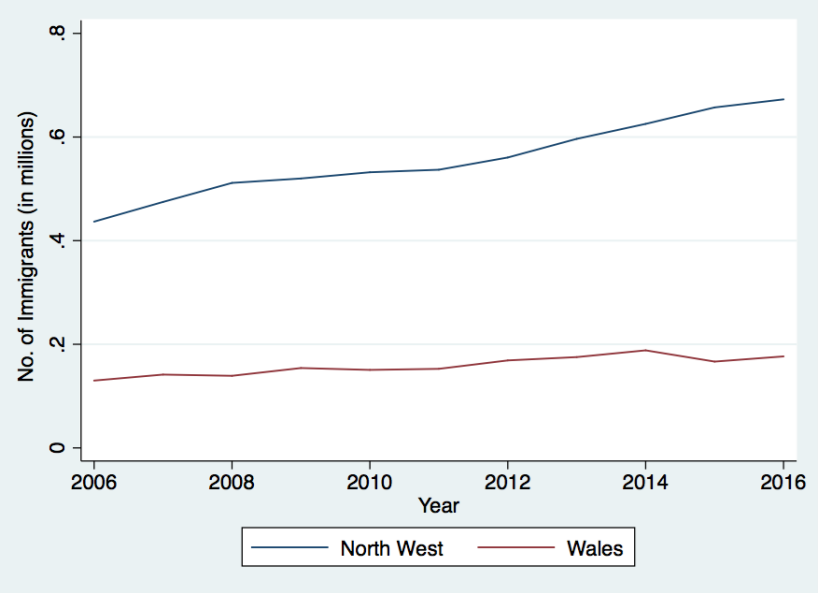
	Mean	Std Dev	Minimum	Maximum
Age (years)	40.72	13.64	16	79
Unemployment rate (%)	6.57	1.72	3.6	10.8
Crime (No. of offences)	443,651	190,291	139,920	992,557
Eco Activity Rate (%)	63.49	2.09	58.9	68.8
Mean Net Pay (£)	3154.18	1887.52	286.37	9043.95
Average House Price (£)	240,533	83,596	141,126	534,272
Mean Net Pay (£)	3,093.38	1,883.49	286.37	8,978.79
Prop. of Christians	0.56	0.22	-	-
Prop. of Muslims	0.04	0.04	-	-
Prop. of Hindu	0.01	0.01	-	-

Notes: The above table is compiled from the Annual Population Survey. It consists of data from all regions of England (North East, North West, Yorkshire and Humber, East Midlands, West Midlands, Eastern, London, South East and South West) as well as Wales, Scotland and Northern Ireland from 2006-2016.. In the table, mean net pay is calculated monthly.

exhibit very similar house prices. This implies that an immigrant when choosing whether to locate in the North West of England or Wales should be indifferent when considering these factors. In addition, the distributions of the major religions were also very similar. Thus, an immigrant's choice of locating in one region over the other due to ethnic clustering or social ties can be assumed to be similar.

Figure 3.1 shows the number of immigrants (defined as those who were not born in the U.K.) over the period 2005-2015. We can see that before 2010, the immigration pattern was similar in the North West and Wales. However, post 2010 there has been an influx of people into the North West of England while such a trend cannot be seen in Wales.

Figure 3.1: Immigrants to North West England and Wales, 2006-2016



Source: Annual Population Survey

Table 3.4: North West England and Wales 2006-2010

	North West	Wales
Unemployment Rate (%)	6.8	6.7
Eco Activity Rate (%)	61.8	59.6
House Prices (£)	172,068	166,916
Prop. of Christians	0.776	0.709
Prop. of Muslims	0.048	0.007
Prop. of Hindus	0.005	0.002

Source: Annual Population Survey, 2006-2010

Table 3.5 shows the average total population and immigrant population in the two regions in the years before and after the introduction of the Act. This table shows that not only has total population increased in both the regions, immigrant population has also increased. However, the immigrant to population ratio has risen more in the North West (0.014) than in Wales (0.008). This may be considered as a preliminary evidence of the impact of the Academies Act on the immigration levels.

Table 3.6 depicts the changes in the population of male immigrants in the two regions after the implementation of the Act. Since the Act was introduced

Table 3.5: Average Population and Immigration in North West England and Wales

	North West		Wales	
	2006-2010	2011-2016	2006-2010	2011-2016
Population	6,876,500	7,038,817	2,987,517	3,051,958
Immigrant Population	494,976	608,169	143,086	171,394
Immigrants to Total Population	0.072	0.086	0.048	0.056

Source: Annual Population Survey, 2006-2016.

in 2010, we allow for the fact that immigrants may take some time to make a decision on where to locate i.e. it takes time for them to decide on where to stay, what kind of property to stay in (rented or bought) and often it may take time for the employment contract to be finalized. Given these factors, we calculate the percentage change in immigrant male population in the two regions between 2010 and 2015. We find that both the regions witnessed an increase in the population of immigrant males with children as well as without children. In the North West, since the introduction of the Act, married and unmarried males with children increased by 99% from 2010 to 2015 while those without children increased by only 38%. On the other hand, though Wales also witnessed an increase in both immigrant males with and without children, the increase is higher for males without children as compared to male immigrants with children.

Table 3.6: No. of male immigrants with/without children and change in population of male immigrants between 2010 (pre Academies Act) and 2015 (post Academies Act)

	Males with children			Males without children		
Region	2010	2015	% chng 2010-15	2010	2015	% chng 2010-15
North West	59,205	118,121	99%	113,270	156,184	38%
Wales	18,818	24,695	31%	30,812	44,306	44%

Source: Annual Population Survey

Table 3.7 enlists the average employment of immigrant males before and after 2010 in North West and Wales in our sample. The North West saw a greater increase in immigrant employment in the professional as well as elementary occupation sectors as compared to Wales. This could be due to the fact that North West has more industries as opposed to Wales. At the same time, knowing Welsh

provides extra advantage to people choosing to locate in Wales, whereas immigrants are mostly not adept in that language. It is important to study immigration patterns by different occupation categories as particular vocations may have preferences in choosing North West England or Wales due to unobserved demand or supply side shocks.

Table 3.7: Average Employment of Males by Occupation in North West England and Wales, before 2010 (pre Academies Act) and after 2010 (post Academies Act)

	North West		Wales	
	Before 2010	After 2010	Before 2010	After 2010
Manager and Senior Officials	17,598	20,680	4,774	4,724
Professional Occupations	20,472	38,169	5,525	10,369
Associate Professional and Technical	12,470	15,395	3,433	4,636
Administrative and Secretarial	5,537	8,198	1,289	1,860
Skilled Trade Occupations	18,693	30,958	4,532	7,286
Personal Service Occupations	4,966	9,584	1,257	2,285
Sales and Customer Service	8,916	13,626	1,360	2,608
Process Plant and Machine Operations	23,701	36,269	4,322	6,772
Elementary Occupations	25,324	40,034	5,796	7,803

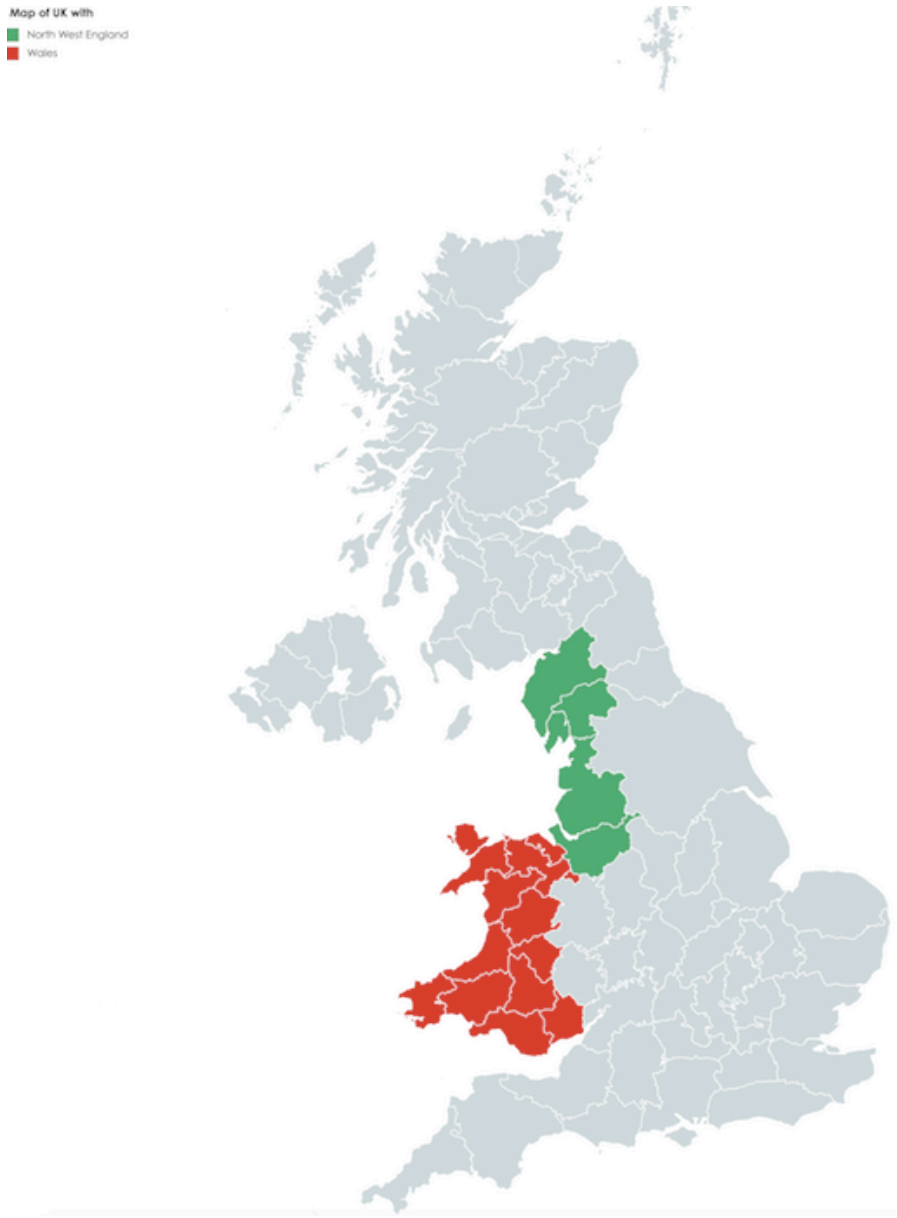
Source: Annual Population Survey

3.3.3 Difference-in-difference model

We use a standard difference-in-difference model to analyse differences in immigration stocks between the treatment (North West) and control (Wales) groups, before and after the policy change i.e. introduction of the Academies Act in 2010. Figure 3.2 shows the geographical proximity of North West England and Wales. Figure 3.1 shows the number of immigrants (defined as those who were not born in the UK) over the period 2005-2015. We can see that before 2010, the immigration pattern was similar in the North West and Wales. However, post 2010 there has been an influx of people into the North West of England while such a trend cannot be seen in Wales. Also, both England and Wales have very similar immigration procedures.[4]

[4]All applications for the visit and stay in both England and Wales are handled by a common organization, U.K. Visas and Immigration division.

Figure 3.2: Map of UK



We study the effect of the Act on the locational choice of married and unmarried immigrant males with children. This is because people with children are more likely to respond to or let their decision to locate in a certain region be influenced by changes in policies pertaining to education. We compare the estimation results from the aforementioned group to married and unmarried males who do not

have children and, ideally, they should react similarly to all other factors as the previous group except to changes in education policy. We estimate the following regression model,

$$Immig_{st} = \alpha + \beta_1 After_t + \beta_2 Treat_s + \delta After_t \times Treat_s + \beta_3 X_{st} + \lambda_t + \epsilon_{st} \quad (3.1)$$

where $Immig_{st}$ is the dependant variable which is the flow of immigration to region s in year t. $After_t$ is a dummy variable that takes the value of 1 from year 2011 onwards. $Treat_s$ is a dummy for North West England which is the treatment group while Wales is the control. $After_t \times Treat_s$ is our variable of interest and the coefficient δ captures the effect of the Academies Act on the immigration levels. X_{st} is a set of control variables which includes the industry sectors in which immigrants work in period t in region s, religion, mean pay from job, average house prices, unemployment rate and the rate of economic activity. Ideally, immigrants would want to locate in places which have lower crime rates and where they have greater chances of employment, as measured by the economic activity rate, but may be constrained by their economic resources. Religion also plays an important role in location decisions due to network effects with existing immigrants and the role of ethnic clustering. Finally, λ_t captures the year fixed effects which controls for common macro-economic shocks for accounting the year-to-year variation.

3.3.4 Results

Table 3.8, reports results from estimating regression equation (1) without dividing immigrants according to their occupation groups.[5] Thus, every observation is at the region–year level. Column (1) shows the difference-in-difference results without any control variables, while in both columns (2) and (3) we include the controls. In column (3), we also include year fixed effects. The difference in the magnitudes of final effect between the three specifications shows that controlling for year fixed effects and other control variables is important. Based on the most

[5]Table with the coefficients on the full set of controls is shown in Appendix C.1.

general specification (3), we can infer that as a result of the Act, approximately 14,800 more immigrant males with children chose to locate in the North West of England. This represents about 2% of the total male immigrants to the North West after 2010 in the sample.

Table 3.8: Effect of Academies Act on Male Immigrants with Children

Variable	(1)	(2)	(3)
$After_t \times Treat_s$	11,005.600***	9,703.907***	14,752.456***
	(3,006.260)	(2,770.921)	(2,573.225)
Controls	No	Yes	Yes
Observations	22	22	22
R-squared	0.965	0.983	0.997
Year FE	No	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

We then categorise immigrants according to their occupation categories. Every observation now is at the occupation group–region–year level. Table 3.9 reports the estimation results.[6] Column (1) shows the simple difference-in-difference analysis when we do not control for any characteristics of the regions under consideration (no control variables). Post 2010, approximately 1,130 more male immigrants with children moved to the North West due to the Act and the effect is statistically significant at the 1% level. They constituted about 0.16% of total male immigrants to the North West after 2010 in the sample. Column (2) reports the estimates after we control for average house price, unemployment rate, economic activity rate, mean net pay of adult male immigrants and religion in the region. Use of time varying controls like mean net pay can lead to potential endogeneity concerns that may arise due to reverse causality. However, it is plausible to think that an increase in the number of immigrants in a particular region may lead to a downward movement in wages in a region but this would only affect subsequent (and not current) immigration into the region. In Column (3), we also control for the year fixed effects, in addition to the aforementioned controls and

[6] Table with the complete coefficients on controls in shown in Appendix C.2.

find similar results. These estimates show us that the post 2010, immigration to the North West increased by about 1,300 and this formed 0.20% of the total male immigrants to the North West after 2010.

Table 3.9: Effect of Academies Act on Male Immigrants with Children, by Occupation Group

VARIABLES	(1)	(2)	(3)
$After_t \times Treat_s$	1,132.549***	980.242***	1,354.149***
	(320.870)	(354.727)	(480.608)
Controls	No	Yes	Yes
Observations	195	195	195
R-squared	0.751	0.763	0.770
Major occ group FE	Yes	Yes	Yes
Year FE	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Subsequently, we compare our results to the sample of male immigrants without any children. Table 3.10 reports results from estimating equation (1) for male immigrants without children, but without dividing the immigrants by their occupation categories. Table 3.11 reports the results of the same analysis on adult immigrant males without children, but categorized according to their occupational groups.[7] Both tables confirm that post 2010 i.e. after the implementation of the Act, there has not been any significant increase in immigration of adult males without children to the North West relative to the Wales. Hence, we can infer that the introduction of the Academies Act significantly impacted the location choice of immigrants with children only. This result suggests that one of the factors which immigrants take into account while deciding where to migrate depends on the education facilities in that particular region, specifically the number of schools. Overall, we can conclude that immigrants take the provision of public goods into account while choosing where to locate.

As a robustness check, we also estimate a specification of equation (1) where the dependent variable is the share of the various groups of male immigrants to

[7]The coefficients on the full set of controls is shown in Appendices C.3 and C.4.

Table 3.10: Effect of Academies Act on Male Immigrants without Children

VARIABLES	(1)	(2)	(3)
$After_t \times Inter_s$	6,914.033	7,189.675	7,799.312
	(4,437.606)	(4,668.104)	(7,439.728)
Controls	No	Yes	Yes
Observations	22	22	22
R-squared	0.967	0.979	0.991
Major occ group FE	Yes	Yes	Yes
Year FE	No	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.11: Effect of Academies Act on Male Immigrants without Children, by Occupation Group

VARIABLES	(1)	(2)	(3)
$After_t \times Treat_s$	568.948	591.592	929.751
	(376.751)	(422.855)	(574.063)
Controls	No	Yes	Yes
Observations	198	198	198
R-squared	0.727	0.735	0.740
Major occ group FE	Yes	Yes	Yes
Year FE	No	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

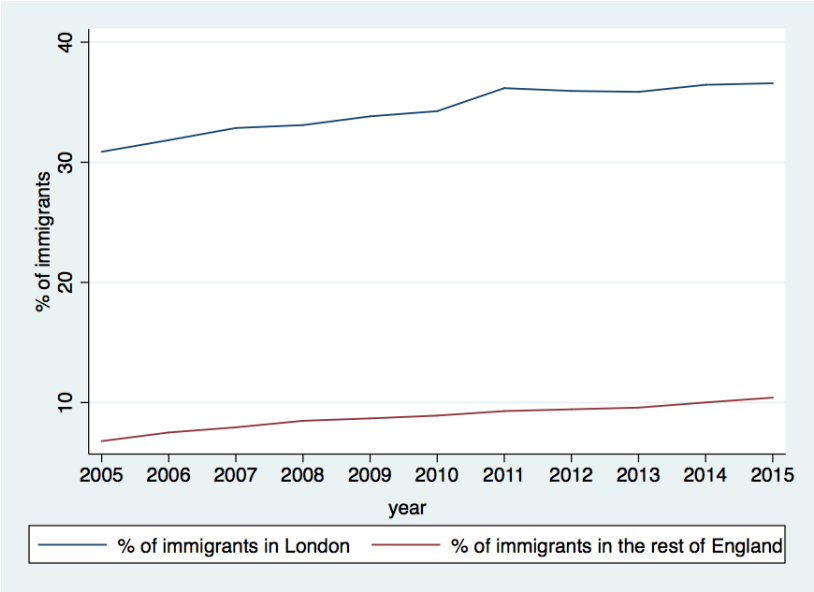
the total population in the regions. Although, the statistical significance reduces while using the shares, the main finding still holds. Detailed tables with coefficients on full controls can be found in Appendix C.5. To verify similarity in immigration trends between North West and Wales prior to the Academies Act, we conduct a test for parallel trends assumption in equation (1) by including interactions of time dummies with the treatment indicator for three years (i.e. 2007, 2008 and 2009) before the introduction of the Act (C.6). We find that the coefficients on these interaction terms are insignificant, suggesting that there was no significant difference in the immigration trend between North West and Wales prior to the Academies Act.

3.4 An Empirical Model of Discrete Choice

In this section, we focus on the impact of public good provision on the location choice of immigrants within the London boroughs using a discrete choice model. The case of London is particularly important because it has the highest number of immigrants among all regions in the United Kingdom (3.2 million foreign born people in 2015 compared to approximately 5.5 million foreign born in the whole of U.K.). According to the Commons Briefing Paper on Migration Statistics (January 2018), approximately 38% of people living in London were born outside the U.K. compared with 14% in the UK as a whole. In Figure 3.3, we can see that immigration to London has always been considerably higher than any other parts of England while Figure 3.4 shows that the immigration to population ratio in London is considerably higher than the rest of England. These migrants once they have decided to move to London, try to make a choice regarding settling in one of the boroughs by taking into account multiple factors like demographics of the boroughs and provision of public goods. Our primary focus is to investigate the role of number of schools in the location choice of an immigrant.

Figure 3.3: Immigration in London vs Other Parts of England

Figure 3.4: Immigrants as a Percentage of Total Resident Population



3.4.1 Data

Immigration Data

We utilize data for the flow of immigrants from Flag 4 records provided to the Office of National Statistics from the Patient Register Data Service (PRDS) by NHS Connecting for Health (NHSCfH) between the periods 2005-2015. A Flag 4 is generated when an individual registers with a General Practitioner (GP) if the individual was born outside the U.K. and enters England and Wales for the first

time and registers with a NHS GP. An individual's registration will also generate a Flag 4 if the previous address of an individual is reported as outside the United Kingdom, and time spent outside the U.K. is more than three months. When an international migrant subsequently moves internally within the UK, and re-registers with a second GP, the 'Flag 4' demarcation is not retained as the individual's last residence is now within the U.K. As compared to the APS data used in the previous section where the sample set of immigrants are foreign born residents chosen from a random sample of residents, GP data differs in the sense as it comprises only of the newly arrived immigrants.

We obtain data for total population and number of dependent children from the Office of National Statistics. We find that Brent, Ealing, Newham and Tower Hamlets have the highest immigrant population among other boroughs. The reliability of the GP data can be verified from the fact that the numbers are approximately the same as obtained from Long Term International Migration data published by the ONS.

Data on Schools

We obtain data for schools from the Edubase database for 2005–2015. This dataset contains information on all types of schools in the London boroughs, including their date of establishment, and closure date (if applicable) as well the date of conversion into an Academy. In order to get a unique set of schools, we first identify those set of local authority maintained infant and junior schools which amalgamated to form a primary school. We also enlist those schools which converted into Academies. This strategy prevents us from double counting the number of schools.[8]

Table 3.12 shows how the number of various types of schools have changed over the years in London. There has been an increase in the total number of

[8]As an example, if in 2010 in a particular borough, if there were 3 Local Authority (LA) maintained and 2 Academies (5 schools in total), and if in 2011, one primary LA maintained converted into an academy, then the number of schools in the borough in 2011 would not change. The only change would in the composition of the schools i.e. in 2011 there would be 2 LA maintained schools and 3 Academies.

schools after 2010. Most of this increase can be attributed to the opening of new free schools as the decrease in the LA maintained schools is offset by an almost equal increase in the number of Academies. Also, there has been a marginal increase in the number of independent schools.

Table 3.12: Number of Different types of Schools in London, 2005-2015

Year	Maintained	Academies	Free Schools	Independent	Total
2005	2,373	16	0	480	2,869
2006	2,367	25	0	472	2,864
2007	2,359	36	0	474	2,869
2008	2,346	44	0	472	2,862
2009	2,325	53	0	475	2,853
2010	2,299	74	0	479	2,852
2011	2,174	215	9	497	2,895
2012	2,074	307	28	505	2,914
2013	1,979	395	60	512	2,946
2014	1,907	471	93	509	2,980
2015	1,860	530	111	507	3,008

Source: Edubase, Department of Education, Govt. of UK

Demographic Data

Data on crime for the London boroughs is obtained from the London Metropolitan Police database. Crime is measured as the total number of offences in a financial year and includes violence against a person, sexual offences, robbery, burglary, theft and handling, fraud and forgery, criminal damage, drugs and other notifiable damages. House prices are obtained from the Department of Communities and Local Government (DCLG) and is measured in pounds. Unemployment rates are model based estimates obtained from the ONS. Active enterprises are defined as those enterprises which had either turnover or employment at any time during the reference period, and are obtained from ONS. Table 3.13 describes the summary statistics in the dataset. Newham is one of the most deprived boroughs with a high unemployment rate, small number of active enterprises and is also on the higher end in regards to the number offences recorded. This is also a borough which has a high immigrant population.

Table 3.13: Summary Statistics of the Sample

	Mean	Std Dev	Minimum	Maximum
Net immigration	6,600	3,407	953	25,429
Population	251,945	54,387	152,489	37,9691
Population (3-18yrs)	47,806	13,281	22,368	80,935
Crime (No. of offences)	25,459	9,883	9288	71,582
Unemployment rate (%)	8	12.2	3.5	14.2
House prices (pounds)	323,801	144,795	16,000	120,000
Active enterprises	12,787	7758	3,190	55,385

3.4.2 Model

We develop and estimate a discrete choice model to study the effect of the number of schools in a London borough on the immigrant location decision. Immigrants may either choose to locate in any one of the 32 London boroughs or outside London (rest of the U.K.). Utility of an immigrant i from locating in a borough j at time t can be represented by,

$$U_{ijt} = \alpha S_{jt} + \beta X_{jt} + \xi_{jt} + \epsilon_{ijt}, \tag{3.2}$$

where S_{jt} is the number of schools in a borough j at time t. X_{jt} is a set of borough characteristics in year t. It includes a range of factors such as crime rate, unemployment rate, house prices, number of active enterprises, and religious distribution in a borough. It is important to include these factors since socio-economic factors could have an important bearing on the location choice of a migrant. Crime (measured as number of offences in a year), unemployment rate and house prices reflect how safe a borough is and the level of economic affluence. House prices also act as a proxy for rent in an area which helps a migrant to identify the kind of property he wants to live in. Religious distribution controls for ethnic clustering as migrants often tend to locate in boroughs where they would expect greater opportunities for social networking. In practice, we use the control variables in X_{jt} lagged by one year because immigrant decisions are often taken well in advance to the final movement. ξ_{jt} captures unobserved characteristics of a borough j in a given year t such as social ties among residents or

culture in a borough. ϵ_{ijt} is an individual specific error term which is assumed to have a Type 1 extreme value distribution.

An individual will choose location j if it gives her the highest utility among all the destinations. Probability that an immigrant i chooses location j is given by,

$$\begin{aligned} P_{ijt} &= P(U_{ijt} > U_{ikt} \quad \forall k \neq j) \\ &= P(\alpha S_{jt} + \beta X_{jt} + \xi_{jt} + \epsilon_{ijt} > \alpha S_{kt} + \beta X_{kt} + \xi_{kt} + \epsilon_{ikt} \quad \forall k \neq j) \\ &= P(\epsilon_{ikt} - \epsilon_{ijt} < \alpha S_{jt} - \alpha S_{kt} + \beta X_{jt} - \beta X_{kt} + \xi_{jt} - \xi_{kt} \quad \forall k \neq j). \end{aligned} \tag{3.3}$$

The outside option, denoted by 0, for an immigrant is the decision to locate in any other part of the U.K. outside of London. Since only the difference in utilities between the destinations are identified, the outside option utility is normalized to 0.

Since all ϵ_{ijt} disturbances are assumed to be Type 1 extreme value distributed, the probability that immigrants will choose borough j is given by,

$$P_{jt} = \frac{e^{\alpha S_{jt} + \beta X_{jt} + \xi_{jt}}}{1 + \sum_{k=1}^{32} e^{\alpha S_{kt} + \beta X_{kt} + \xi_{kt}}}. \tag{3.4}$$

The above equation can also be interpreted to represent the share of immigrants for borough j in time t as a fraction of the total number of immigrants in the U.K. The model exhibits the Independence of Irrelevant Alternatives (IIA) property since we have the logit error assumption. This implies that the unobserved portion of utility of one alternative is uncorrelated to the unobserved portion of utility of another alternative. Hence, after controlling for all the observed borough characteristics if an immigrant moves out of a particular borough, then she is indifferent between locating in any of the other boroughs. This may not be an unrealistic assumption because London has a very unified and extensive transportation system.

Subtracting log of equation (4) from log of the probability of choosing the out-

side option gives us,

$$\begin{aligned} \ln P_{jt} - \ln P_{0t} &= \ln\left(\frac{e^{\alpha S_{jt}+\beta X_{jt}+\xi_{jt}}}{1+\sum_{k=1}^{32} e^{\alpha S_{kt}+\beta X_{kt}+\xi_{kt}}}\right) - \ln\left(\frac{e^{\alpha S_{0t}+\beta X_{0t}+\xi_{0t}}}{1+\sum_{k=1}^{32} e^{\alpha S_{kt}+\beta X_{kt}+\xi_{kt}}}\right) \\ &= \alpha S_{jt} + \beta X_{jt} + \xi_{jt} - \alpha S_{0t} - \beta X_{0t} - \xi_{0t}. \end{aligned} \tag{3.5}$$

Since the outside option utility is normalized to 0, the equation becomes,

$$\ln P_{jt} - \ln P_{0t} = \alpha S_{jt} + \beta X_{jt} + \xi_{jt}. \tag{3.6}$$

The above equation is used to compute ξ_{jt} which is used in the estimation procedure using GMM,

$$E[Z_{jt}\xi_{jt}] = 0, \tag{3.7}$$

where Z_{jt} are variables exogenous to ξ_{jt}. One of the concerns is that the number of schools, S_{jt}, may be correlated to the unobserved structural error, ξ_{jt}, which measures the strength of social ties or culture in a borough. The social ties among communities in a borough are not only a driver of the location choice of an immigrant due to network effects but also directly impact the opening up of new free schools after the Academies Act was passed. To address this endogeneity issue, we use the instrumental variable (IV) approach which relies on the exogenous variation provided by the Academies Act of 2010 brought in by the Conservative-Liberal Democrat coalition government. We instrument the total number of schools by two IVs: a dummy variable which holds value 1 after 2010; 0 otherwise; and a lagged number of schools by two years in a borough. The binary instrument created using the Academies Act can be a valid instrument because the timing of the Act may not be correlated to the social ties in a borough. Also, the Academies Act implemented in the whole of England was not introduced to tackle an increased demand for education due to increased immigration. The lagged number of schools by two years is a good instrument as well because it is less likely that the choice of immigrants at time t will be affected the number of

schools in the past. The decision to migrate to UK and to a specific borough can take some months due to the various processes involved such as visa applications and formal job contracts. However, it is unlikely that any of these procedures extend over an year. Hence, number of schools lagged by 2 years or more is likely to be uncorrelated to an immigrants location choice which is a requirement for it to be a valid instrument. Increasing the lag by more than two years, will also satisfy the exclusion restriction but the correlation with the number of schools in the current period also decreases. So, we use the number of schools lagged by 2 years as an instrument.[9]

3.4.3 Results

Table 3.14 reports the results from estimating equation (3.7). Columns (1) and (2) shows the estimation results without using any IV and using both IVs respectively. We find that an increase in the number of schools in the boroughs does not have any statistically significant impact on the immigration to a borough. Column 3 and 4 represent estimation results where we control for borough level fixed effects as well.

We find that once borough level fixed effects are included and using IV, an increase in the number of schools has a positive effect on immigration and is statistically significant as well. Comparing specifications (1) and (3) shows us that just accounting for borough fixed effects is not sufficient to provide a significant result. Similarly, comparing specifications (1) and (2) shows that without controlling for borough level fixed effects, if we only use an IV approach, schools have no statistically significant effect on immigration as well. However, once we use the IV, in addition to controlling for borough fixed effects (column 4), an increase in the number of schools in a borough actually has a positive and significant effect. Thus, although columns (2) and (4) are both correcting for endogeneity, the significant impact of schools on immigration in only column (4) enables us to con-

[9] Increased immigration to a borough may increase demand for education and thereby lead to an increase in the number of schools in the borough. Thus there arises a problem of reverse causality which can be addressed using the instrumental variable approach.

Table 3.14: Effect of Academies Act on Immigration to London borough

VARIABLES	(1) Without IV	(2) IV	(3) Borough FE	(4) Borough FE + IV	elasticity
Schools	0.003	0.003	0.005	0.016**	1.441
	(0.003)	(0.003)	(0.007)	(0.008)	
Crime	4.020***	4.033***	1.325**	1.325**	0.336
	(0.813)	(0.819)	(0.603)	(0.606)	
House price	0.152**	0.151**	0.042	0.037	0.114
	(0.070)	(0.069)	(0.032)	(0.028)	
Active enterprise	-3.606***	-3.614***	3.246**	2.479**	0.305
	(1.294)	(1.297)	(1.409)	(1.216)	
Unemployment	0.036	0.036	0.041***	0.046***	0.367
	(0.023)	(0.023)	(0.008)	(0.009)	
Christian	-0.021***	-0.021***	0.006**	0.006**	0.343
	(0.006)	(0.006)	(0.003)	(0.003)	
Jew	0.006	0.006	0.022	0.024*	0.044
	(0.019)	(0.020)	(0.013)	(0.013)	
Buddhist	-0.008	-0.008	0.002	-0.002	-0.001
	(0.050)	(0.050)	(0.015)	(0.016)	
Hindu-Sikh	0.023**	0.023**	0.003	0.003	0.021
	(0.008)	(0.008)	(0.006)	(0.006)	
Observations	288	288	288	288	
R-squared	0.642	0.642	0.139		
Borough FE	No	No	Yes	Yes	
Number of Boroughs			32	32	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

clude that borough fixed effects are also important. Also, the OLS model (3) in 3.14 biases the coefficients on the number of schools downward as compared to the IV model (4). This suggests that the potential omitted variable, strength of social ties, is likely to be positively correlated to the probability of an immigrant choice but negatively correlated to the number of schools in a borough. However, since this effect is weaker than the borough fixed effects it did not show up in specification (2).

The coefficients on the control variables only tell us the correlation between the variables and immigration, without throwing any light on causality. We find that there is a positive correlation between the immigrant share in a borough and unemployment and crime rate in a borough. This may imply that immigrants tend

to locate in deprived neighbourhoods.[10] The location choice of immigrants are also positively correlated to the number of active enterprises in the borough. This seems reasonable as immigrants may choose to locate in boroughs with a higher scope of employment. The corresponding elasticities tell us by how much the probability of locating in a borough changes if the variables under consideration change. We find that if the number of schools increase by 1%, then the probability of choosing a borough increases by 1.4%. It is particularly interesting that the elasticity for number of schools is in the elastic range, which suggests that immigrants are very responsive to the provision of public goods (number of schools) in London. All the columns report standard errors which are clustered at the borough level.

3.5 Conclusion

The main objective in this paper has been to investigate the impact of the provision of public goods on immigration. We study public goods in the form of education, specifically the number of schools, and explore this issue using two separate analyses. Both approaches rely on an exogenous variation to the number of schools provided by the Academies Act (2010). First, using a difference-in-difference method we compare immigration patterns in North West England and Wales. We estimate the difference-in-difference specification for two samples, with and without children. We conclude that the North West witnessed a significantly greater influx of immigrants with children as compared to Wales, where the Act was not introduced. There was no significant difference between the two regions for immigrants without children. Subsequently, using a discrete choice analysis, we develop and estimate a discrete choice model for immigrant location choice using data from London boroughs. We mitigate the endogeneity bias using an instrumental variable approach, and find that a 1% increase in the number of schools leads to 1.4% increase in the share of immigrants to a borough.

[10] This could also imply that a larger number of immigrants in a particular borough lead to higher unemployment rates and crime in such boroughs, making a case for reverse causality.

Both the analyses using different econometric methodologies conclude that immigrant households in the UK allow their location decision to be guided by the availability of educational facilities. This investigation also leaves scope for further research where one could analyse the impact of other public goods such as social housing and medical facilities on immigration.

Appendix A

Chapter 1

A.1 Derivation of the structural form of total employment for the ith country : Stage 3

In the second stage wages are equalized between countries all the countries. Therefore if wages are equalized between country i and j, $j \neq i$,

$$\begin{aligned} \frac{1}{2}\phi_j \frac{K_j^{\alpha}}{\sqrt{1+l_j^l+\tilde{l}_j}} &= \frac{1}{2}\phi_i \frac{K_i^{\alpha}}{\sqrt{1+l_i^l+\tilde{l}_i}} \\ \frac{1+l_j^l+\tilde{l}_j}{1+l_i^l+\tilde{l}_i} &= \frac{\phi_j^2}{\phi_i^2} q_{ji} \qquad q_{ji} = \left(\frac{K_j}{K_i}\right)^{2\alpha} \end{aligned} \tag{A.1}$$

If there are N countries in the Union, we have N equations with $(N-1)$ unknowns. In equilibrium

$$\tilde{l}_1 + \tilde{l}_2 + ... + \tilde{l}_i + ... + \tilde{l}_N = 0 \tag{A.2}$$

Substituting from (A.13),

$$\frac{\phi_1^2}{\phi_i^2} q_{1i}(1+l_i^l+\tilde{l}_i) - 1 - l_1^l + \frac{\phi_2^2}{\phi_i^2} q_{2i}(1+l_i^l+\tilde{l}_i) - 1 - l_2^l + ... + \tilde{l}_i + ... + \frac{\phi_N^2}{\phi_i^2} q_{Ni}(1+l_i^l+\tilde{l}_i) - 1 - l_N^l = 0 \tag{A.3}$$

Rearranging the above equation we get

$$\begin{aligned}
&\left[\phi_1^2 q_{1i} + ... + \phi_{i-1} q_{(i-1)i} + \phi_{i+1} q_{(i+1)i} + ... + \phi_N^2 q_{Ni}\right] \tilde{l}_i + \phi_i^2 \tilde{l}_i \\
&+ \left[\phi_1^2 q_{1i} + ... + \phi_{i-1} q_{(i-1)i} + \phi_{i+1} q_{(i+1)i} + ... + \phi_N^2 q_{Ni}\right] (1 + l_i^l) + \phi_i^2 \sum_{\substack{j=1 \\ i \neq j}}^{N} (1 + l_j^l) = 0 \\
&\tilde{l}_i \sum_{j=1}^{N} \phi_j^2 q_{ji} = \phi_i^2 \sum_{\substack{j=1 \\ i \neq j}}^{N} (1 + l_j^l) - \sum_{\substack{j=1 \\ i \neq j}}^{N} \phi_j^2 q_{ji} (1 + l_i^l)
\end{aligned} \tag{A.4}$$

Thus, net migration into country i from other members of the Union is given by

$$\tilde{l}_i = \frac{\phi_i^2 \sum_{\substack{j=1 \\ i \neq j}}^{N} (1 + l_j^l) - \sum_{\substack{j=1 \\ i \neq j}}^{N} \phi_j^2 q_{ji} (1 + l_i^l)}{\sum_{j=1}^{N} \phi_j^2 q_{ji}} \tag{A.5}$$

The structural form of total employment in country i is

$$\begin{aligned}
1 + l_i^l + \tilde{l}_i &= 1 + l_i^l + \frac{\phi_i^2 \sum_{\substack{j=1 \\ i \neq j}}^{N} (1 + l_j^l) - \sum_{\substack{j=1 \\ i \neq j}}^{N} \phi_j^2 q_{ji} (1 + l_i^l)}{\sum_{j=1}^{N} \phi_j^2 q_{ji}} \\
&= \frac{(1 + l_i^l) \sum_{j=1}^{N} \phi_j^2 q_{ji} + \phi_i^2 \sum_{\substack{j=1 \\ i \neq j}}^{N} (1 + l_j^l) - \sum_{\substack{j=1 \\ i \neq j}}^{N} \phi_j^2 q_{ji} (1 + l_i^l)}{\sum_{j=1}^{N} \phi_j^2 q_{ji}} \\
&= \frac{(1 + l_i^l) \left[\sum_{j=1}^{N} \phi_j^2 q_{ji} - \sum_{\substack{j=1 \\ i \neq j}}^{N} \phi_j^2 q_{ji} (1 + l_i^l) \right] + \phi_i^2 \sum_{\substack{j=1 \\ i \neq j}}^{N} (1 + l_j^l)}{\sum_{j=1}^{N} \phi_j^2 q_{ji}}
\end{aligned} \tag{A.6}$$

Thus,

$$
\begin{aligned}
1 + l_i^l + \tilde{l}_i &= \frac{(1 + l_i^l)\phi_i^2 + \phi_i^2 \sum_{\substack{j=1 \\ i \neq j}}^{N} (1 + l_j^l)}{\sum_{j=1}^{N} \phi_j^2 q_{ji}} \\
&= \frac{\phi_i^2 \sum_{j=1}^{N} (1 + l_j^l)}{\sum_{j=1}^{N} \phi_j^2 q_{ji}} \\
&= \frac{\phi_i^2 \sum_{j=1}^{N} (1 + l_j^l)}{\phi_1^2 \left(\frac{K_1}{K_i}\right)^2 + \phi_2^2 \left(\frac{K_2}{K_i}\right)^2 + ... + \phi_N^2 \left(\frac{K_N}{K_i}\right)^2} \\
&= \frac{\phi_i^2 K_i^{2\alpha} \sum_{j=1}^{N} (1 + l_j^l)}{\sum_{j=1}^{N} \phi_j^2 K_j^{2\alpha}}
\end{aligned}
\tag{A.7}
$$

Using the above expression for total employment, we can get the structural form for wages, rental rate and profits as

$$
\tilde{w}_i = \frac{1}{2} \sqrt{\left(\sum_{j=1}^{N} {\phi_j}^2 K_j^{2\alpha} \right) / \left(\sum_{j=1}^{N} (1 + l_j') \right)} \tag{A.8}
$$

$$
\tilde{r}_i = {\phi_i}^2 \alpha K_i^{2\alpha - 1} \sqrt{\left(\sum_{j=1}^{N} (1 + l_j') \right) / \left(\sum_{j=1}^{N} {\phi_j}^2 K_j^{2\alpha} \right)} \tag{A.9}
$$

$$
\tilde{\pi}_i = (\frac{1}{2} - \alpha) {\phi_i}^2 K_i^{2\alpha} \sqrt{\left(\sum_{j=1}^{N} (1 + l_j') \right) / \left(\sum_{j=1}^{N} {\phi_j}^2 K_j^{2\alpha} \right)} \tag{A.10}
$$

A.2 Derivation of optimal immigration quota and total employment for country i : Stage 1

The government maximizes its welfare function to obtain the optimal immigration quota from the rest of the world. The government welfare is given by

$$GW(l_i^l) = s(\pi(l_i^l) + r(l_i^l)K_i) + w(l_i^l)(1 + \tilde{l}_i) + (w(l_i^l) - \eta)l_i^l \tag{A.11}$$

Substituting the structural form of the wage, rental rate, profits and total labor employment,

$$\begin{aligned} GW(l_i^l) &= \frac{s}{2}\phi_i^2 K_i^{2\alpha} \sqrt{\frac{\sum_{j=1}^{N}(1 + l_j^l)}{\sum_{j=1}^{N}\phi_j^2 K_j^{2\alpha}}} - \eta l_i^l + \frac{1}{2}\sqrt{\frac{\sum_{j=1}^{N}\phi_j^2 K_j^{2\alpha}}{\sum_{j=1}^{N}(1 + l_j^l)}}\phi_i^2 K_i^{2\alpha}\frac{\sum_{j=1}^{N}(1 + l_j^l)}{\sum_{j=1}^{N}\phi_j^2 K_j^{2\alpha}} \\ &= \left(\frac{s+1}{2}\right)\phi_i^2 K_i^{2\alpha}\sqrt{\frac{\sum_{j=1}^{N}(1 + l_j^l)}{\sum_{j=1}^{N}\phi_j^2 K_j^{2\alpha}}} - \eta l_i^l \end{aligned} \tag{A.12}$$

Maximizing the above welfare function with respect to l_i^l to obtain optimal immigration quota for country i from the rest of the world.The first order condition is

$$\begin{aligned} \left(\frac{s+1}{2}\right)\phi_i^2 K_i^{2\alpha}\frac{1}{2}\sqrt{\frac{\sum_{j=1}^{N}\phi_j^2 K_j^{2\alpha}}{\sum_{j=1}^{N}(1 + l_j^l)}}\frac{1}{\sum_{j=1}^{N}\phi_j^2 K_j^{2\alpha}} - \eta &= 0 \\ \left(\frac{s+1}{4}\right)\phi_i^2 K_i^{2\alpha}\frac{1}{\sqrt{\sum_{j=1}^{N}(1 + l_j^l)}\sqrt{\sum_{j=1}^{N}\phi_j^2 K_j^{2\alpha}}} &= \eta \end{aligned} \tag{A.13}$$

Rearranging the above equation, we get the government's optimal immigration

quota for a given stock of capital

$$\hat{l}_i^l = \left[\frac{s+1}{4\eta}\right]^2 \frac{{\phi_i}^4 K_i^{4\alpha}}{\sum_{j=1}^{N} {\phi_j}^2 K_j^{2\alpha}} - N - \sum_{\substack{j=1 \\ i\neq j}}^{N} l_j^l \tag{A.14}$$

Using the optimal immigration quota we can get total employment for country i as

$$\begin{aligned}
1 + \hat{l}_i^l + \tilde{l}_i &= \frac{\phi_i^2 K_i^{2\alpha} \sum_{j=1}^{N}(1 + l_j^l)}{\sum_{j=1}^{N} \phi_j^2 K_j^{2\alpha}} \\
&= \frac{\phi_i^2 K_i^{2\alpha}\left[1 + n_2 + ... + 1 + ...n_N + l_1^l + l_2^l + ... + l_i^l + ... + l_N^l\right]}{\sum_{j=1}^{N} \phi_j^2 K_j^{2\alpha}} \\
&= \frac{\phi_i^2 K_i^{2\alpha}\left[\left(\frac{s+1}{4\eta}\right)^2 \frac{\phi_i^4 K_i^{4\alpha}}{\sum_{j=1}^{N} \phi_j^2 K_j^{2\alpha}}\right]}{\sum_{j=1}^{N} \phi_j^2 K_j^{2\alpha}} \\
&= \left(\frac{s+1}{4\eta}\right)^2 \frac{\phi_i^2 K_i^{2\alpha}}{\left(\sum_{j=1}^{N} \phi_j^2 K_j^{2\alpha}\right)^2}
\end{aligned} \tag{A.15}$$

The immigration quota of country i from ROW is lower as the number of countries in the Union N increases, for given immigration quotas of the other countries in the Union. The quota $\hat{l}_i^l$ is directly proportional to the proportion of entrepreneurs in the economy

A.3 Floor with Symmetric countries : detailed calculations

The immigration quota of country 1 when there are N = θ countries in the Union is given by

$$\hat{l}_1^l = \left[\frac{s+1}{4\eta}\right]^2 \frac{{\phi_1}^4 K_1^{4\alpha}}{\sum_{j=1}^{\theta} {\phi_j}^2 K_j^{2\alpha}} - \theta - \sum_{j=2}^{\theta} l_j^l \tag{A.16}$$

With the entry of the (θ + 1)th country, and the immigration quota being fixed at the afore mentioned level, we can evaluate total employment in country 1.

$$\begin{aligned}
1 + \hat{l}_1^l + \tilde{l}_1^l \Big|_{\theta+1} &= \left[\frac{(s+1)}{4\eta}\right]^2 \frac{\phi_1^4 K_1^{4\alpha}}{\sum_{i=1}^{\theta} \phi_i^2 K_i^{2\alpha}} - (\theta - 1) - \sum_{i=2}^{\theta} l_i^l + \frac{\phi_1^2 K_1^{2\alpha} \sum_{i=2}^{\theta+1} (1 + l_i^l)}{\phi_i^2 K_i^{2\alpha}} \\
&= \left[\frac{(s+1)}{4\eta}\right]^2 \frac{\phi_1^4 K_1^{4\alpha}}{\sum_{i=1}^{\theta} \phi_i^2 K_i^{2\alpha}} - \sum_{i=2}^{\theta} (1 + l_i^l) + \frac{\phi_1^2 K_1^{2\alpha} \sum_{i=2}^{\theta+1} (1 + l_i^l)}{\sum_{i=1}^{\theta+1} \phi_i^2 K_i^{2\alpha}} \\
&- \frac{\sum_{i=2}^{\theta+1} \phi_i^2 K_i^{2\alpha}}{\sum_{i=1}^{\theta+1} \phi_i^2 K_i^{2\alpha}} \left(1 + \left[\frac{(s+1)}{4\eta}\right]^2 \frac{\phi_1^4 K_1^{4\alpha}}{\sum_{i=1}^{\theta} \phi_i^2 K_i^{2\alpha}} - n_1 - \sum_{i=2}^{\theta} (1 + l_i^l)\right) \\
&= \left[\frac{(s+1)}{4\eta}\right]^2 \frac{\phi_1^4 K_1^{4\alpha}}{\sum_{i=1}^{\theta} \phi_i^2 K_i^{2\alpha}} \left[1 - \left[\frac{(s+1)}{4\eta}\right]^2 \frac{\phi_1^4 K_1^{4\alpha}}{\sum_{i=1}^{\theta} \phi_i^2 K_i^{2\alpha}}\right] - \sum_{i=2}^{\theta} (1 + l_i^l) \\
&+ \frac{\phi_1^2 K_1^{2\alpha} \sum_{i=2}^{\theta+1} (1 + l_i^l)}{\sum_{i=1}^{\theta+1} \phi_i^2 K_i^{2\alpha}} + \frac{\sum_{i=2}^{\theta+1} \phi_i^2 K_i^{2\alpha}}{\sum_{i=1}^{\theta+1} \phi_i^2 K_i^{2\alpha}} \left[\sum_{i=2}^{\theta} (1 + l_i^l)\right]
\end{aligned} \tag{A.17}$$

Thus,

$$
\begin{aligned}
1+\hat{l}_1^{l}+\tilde{l}_1^{l}\Big|_{\theta+1} &= \left[\frac{(s+1)}{4\eta}\right]^2 \frac{\phi_1^4 K_1^{4\alpha}}{\sum_{i=1}^{\theta}\phi_i^2 K_i^{2\alpha}} \frac{\phi_1^2 K_1^{2\alpha}}{\sum_{i=1}^{\theta+1}\phi_i^2 K_i^{2\alpha}} + \sum_{i=2}^{\theta}(1+l_i^{l})\left[\frac{\sum_{i=2}^{\theta+1}\phi_i^2 K_i^{2\alpha}}{\sum_{i=1}^{\theta+1}\phi_i^2 K_i^{2\alpha}} - 1\right] \\
&\quad + \frac{\phi_1^2 K_1^{2\alpha}}{\sum_{i=1}^{\theta+1}\phi_i^2 K_i^{2\alpha}}\left[\sum_{i=2}^{\theta}(1+l_i^{l}) + 1 + l_{\theta+1}^{l}\right] \\
&= \left[\frac{(s+1)}{4\eta}\right]^2 \frac{\phi_1^6 K_1^{6\alpha}}{\sum_{i=1}^{\theta}\phi_i^2 K_i^{2\alpha}\sum_{i=1}^{\theta+1}\phi_i^2 K_i^{2\alpha}} + \sum_{i=2}^{\theta}(1+l_i^{l})\left[\frac{\sum_{i=2}^{\theta+1}\phi_i^2 K_i^{2\alpha}}{\sum_{i=1}^{\theta+1}\phi_i^2 K_i^{2\alpha}} + \frac{\phi_1^2 K_1^{2\alpha}}{\sum_{i=1}^{\theta+1}\phi_i^2 K_i^{2\alpha}} - 1\right] \\
&\quad + \frac{\phi_1^2 K_1^{2\alpha}}{\sum_{i=1}^{\theta+1}\phi_i^2 K_i^{2\alpha}}(1+l_{\theta+1}^{l}) \\
&= \left[\frac{s+1}{4\eta}\right]^2 \frac{{\phi_1}^6 K_1^{6\alpha}}{\sum_{j=1}^{\theta}{\phi_j}^2 K_j^{2\alpha}\sum_{j=1}^{\theta+1}{\phi_j}^2 K_j^{2\alpha}} + \frac{{\phi_1}^2 K_1^{2\alpha}}{\sum_{j=1}^{\theta+1}{\phi_j}^2 K_j^{2\alpha}}(1+l_l^{\theta+l})
\end{aligned}
\tag{A.18}
$$

Country 1's total employment when there are N = θ countries in the Union is given by

$$
1+\hat{l}_1^{l}+\tilde{l}_i\Big|_{\theta} = \left[\frac{s+1}{4\eta}\right]^2 \frac{{\phi_1}^6 K_1^{6\alpha}}{\left[\sum_{j=1}^{\theta}{\phi_j}^2 K_j^{2\alpha}\right]^2} \tag{A.19}
$$

If countries are symmetric in all respects such that $\phi_1 = \phi_2 = ... = \phi_{\theta+1}$ and $K_1 = K_2 = ... = K_{\theta+1}$, (A.19) and (A.18) can be expressed as respectively

$$
1+\hat{l}_1^{l}+\tilde{l}_i\Big|_{\theta} = \left[\frac{s+1}{4\eta}\right]^2 \frac{\phi^2 K^{6\alpha}}{\theta^2} \tag{A.20}
$$

$$
1+\hat{l}_1^{l}+\tilde{l}_i\Big|_{\theta+1} = \left[\frac{s+1}{4\eta}\right]^2 \frac{\phi^2 K^{6\alpha}}{\theta(\theta+1)} + \frac{1}{\theta+1}(1+l_{\theta+1}^{l}) \tag{A.21}
$$

If the difference between (A.21) and (A.20) is positive, it implies that employ-

ment is higher in the N = (θ + 1) case,

$$\begin{aligned}
\left[\frac{s+1}{4\eta}\right]^2\left[\frac{1}{\theta(\theta+1)}-\frac{1}{\theta^2}\right]\phi^2K^{2\alpha}+\frac{1}{\theta+1}(1+l^l_{\theta+1})>0\\
\frac{1}{\theta+1}(1+l^l_{\theta+1})>\frac{1}{\theta^2(\theta+1)}\left[\frac{s+1}{4\eta}\right]^2\phi^2K^{2\alpha}\\
1+l^l_{\theta+1}>\left[\frac{s+1}{4\eta}\right]^2\frac{\phi^2K^{2\alpha}}{\theta^2}\\
1+l^l_{\theta+1}>\frac{1}{\theta}\left[\sum_{i=1}^{\theta}(l^l_i+1)\right]
\end{aligned} \tag{A.22}$$

Since countries are all symmetric, $\hat{l^l_1} = l^l_2 = ... = l^l_{\theta+1}$, both sides of the above equation is similar. Thus, we can conclude that total employment and hence , wages stay at the same level as achieved under the N = θ country case.

A.4 Profits

The net profit function of the entrepreneurs is given by

$$\pi(\hat{l^l_1}) = \pi(\hat{l^l_1}) + r(\hat{l^l_1})K \tag{A.23}$$

Substituting the structural form of the wage, rental rate, profits and total labor employment, we get the net profit function as

$$\pi(\hat{l^l_1}) = (\frac{1}{2}-\alpha)\phi_i^2K_i^{2\alpha}\sqrt{\frac{(1+\hat{l^l_1})+\sum_{j=2}^{\theta}(1+l^l_j)}{\sum_{j=1}^{\theta}\phi_j^2K_j^{2\alpha}}}+\phi_i^2\alpha K_i^{2\alpha-1}\sqrt{\frac{(1+\hat{l^l_1})+\sum_{j=2}^{\theta}(1+l^l_j)}{\sum_{j=1}^{\theta}\phi_j^2K_j^{2\alpha}}}K_i \tag{A.24}$$

$$\pi(\hat{l}_1^l) = \frac{1}{2}\phi_i^2 K_i^{2\alpha} \sqrt{\frac{(1+\hat{l}_1^l) + \sum_{j=2}^{\theta}(1+l_j^l)}{\sum_{j=1}^{\theta}\phi_j^2 K_j^{2\alpha}}}$$
$$= \frac{1}{2}\phi_i^2 K_i^{2\alpha} \sqrt{\frac{\left(\frac{s+1}{4\eta}\right)^2 \frac{\phi_i^4 K_i^{4\alpha}}{\sum_{j=1}^{\theta}\phi_j^2 K_j^{2\alpha}}}{\sum_{j=1}^{\theta}\phi_j^2 K_j^{2\alpha}}} \tag{A.25}$$
$$= \frac{1}{2}\frac{\phi_i^4 K_i^{4\alpha}}{\sum_{j=1}^{\theta}\phi_j^2 K_j^{2\alpha}}\left(\frac{s+1}{4\eta}\right)$$

A.5 Asymmetric countries : Mathematical Proof

1. When there are N = θ countries in the Union, net profits of the entrepreneurs are given by

$$\pi_i(\hat{l}_1^l)\Big|_{\theta} = \frac{1}{2}\phi_i^2 K_i^{2\alpha} \sqrt{\frac{(1+\hat{l}_1^l) + \sum_{j=2}^{\theta}(1+l_j^l)}{\sum_{j=1}^{\theta}\phi_j^2 K_j^{2\alpha}}} = \frac{1}{2}\phi_i^2 K_i^{2\alpha} \sqrt{\frac{\left(\frac{s+1}{4\eta}\right)^2 \frac{\phi_i^4 K_i^{4\alpha}}{\sum_{j=1}^{\theta}\phi_j^2 K_j^{2\alpha}}}{\sum_{j=1}^{\theta}\phi_j^2 K_j^{2\alpha}}} \tag{A.26}$$

The net profits of the entrepreneurs, when there are N = θ + 1 countries in the Union, and if country 1 cannot lower its immigration quota below what it was at the N = θ country level, is

$$\pi_i(\hat{l_1^l})\Big|_{\theta+1} = \frac{1}{2}\phi_i^2 K_i^{2\alpha}\sqrt{\frac{(1+\hat{l_1^l})+\sum_{j=2}^{\theta+1}(1+l_j^l)}{\sum_{j=1}^{\theta+1}\phi_j^2 K_j^{2\alpha}}}$$

$$= \frac{1}{2}\phi_i^2 K_i^{2\alpha}\sqrt{\frac{(\theta+1)+\left(\frac{s+1}{4\eta}\right)^2\frac{\phi_i^4 K_i^{4\alpha}}{\sum_{j=1}^{\theta}\phi_j{}^2 K_j^{2\alpha}}-\theta-l_2^l-..-l_\theta^l+l_2^l+..+l_\theta^l}{\sum_{j=1}^{\theta+1}\phi_j^2 K_j^{2\alpha}}} \quad \text{(A.27)}$$

$$= \frac{1}{2}\phi_i^2 K_i^{2\alpha}\sqrt{\frac{\left(\frac{s+1}{4\eta}\right)^2\phi_1^4 K_1^{4\alpha}+\sum_{j=1}^{\theta}\phi_j^2 K_j^{2\alpha}(1+l_{\theta+1}^l)}{\sum_{j=1}^{\theta+1}\phi_j^2 K_j^{2\alpha}\sum_{j=1}^{\theta}\phi_j^2 K_j^{2\alpha}}}$$

2. Comparing the government welfare when there are N = θ countries in the Union and when there are N = $\theta+1$ countries but immigration quota is fixed at the N = θ country level. When there are N = $\theta-1$ and N countries in the Union, government welfare of country 1 can be expressed as respectively

$$GW(\hat{l_1^l})\Big|_{\theta-1} = \left(\frac{s+1}{2}\right)\phi_1{}^2 K_1^{2\alpha}\sqrt{(1+\hat{l_1^l})+\sum_{j=2}^{\theta-1}(1+l_j^l)/\sum_{j=1}^{\theta-1}\phi_j{}^2 K_j^{2\alpha}}-\eta l_1^l \quad \text{(A.28)}$$

$$GW(\hat{l_1^l})\Big|_{\theta} = \left(\frac{s+1}{2}\right)\phi_1{}^2 K_1^{2\alpha}\sqrt{(1+\hat{l_1^l})+\sum_{j=2}^{\theta}(1+l_j^l)/\sum_{j=1}^{\theta}\phi_j{}^2 K_j^{2\alpha}}-\eta l_1^l \quad \text{(A.29)}$$

Now we analyse what happens to government welfare when the number of countries in the Union increases from (N = $\theta-1$) to N = θ, we can see that the first order conditions for the government's welfare maximization for the

two cases are respectively

$$\underbrace{\left(\frac{s+1}{4}\right)\phi_1{}^2 K_1^{2\alpha}\frac{1}{\sqrt{\left((1+\hat{l}_1^l)+\sum_{j=2}^{\theta}(1+l_j^l)/\sum_{j=1}^{\theta}\phi_j^2 K_j^{2\alpha}\right)}}}_{X1}=\eta \tag{A.30}$$

$$\underbrace{\left(\frac{s+1}{4}\right)\phi_1{}^2 K_1^{2\alpha}\frac{1}{\sqrt{\left((1+\hat{l}_1^l)+\sum_{j=2}^{\theta}(1+l_j^l)/\sum_{j=1}^{\theta}\phi_j^2 K_j^{2\alpha}\right)}}}_{X2}=\eta \tag{A.31}$$

Since the RHS of (A.30) is same as the RHS of (A.31), it must be the case that X1 = X2. Thus we can rewrite (A.28) and (A.29) as respectively

$$GW(\hat{l}_1^l)\Big|_{\theta-1} = 2X1\left((1+\hat{l}_1^l)+\sum_{j=2}^{\theta-1}(1+l_j^l)\right)-\eta l_1^l \tag{A.32}$$

$$GW(\hat{l}_1^l)\Big|_{\theta} = 2X2\left((1+\hat{l}_1^l)+\sum_{j=2}^{\theta}(1+l_j^l)\right)-\eta l_1^l \tag{A.33}$$

Since X1 = X2 = η and immigration quota is lower when there are θ countries than when there are $(\theta-1)$ countries, if the government welfare has to be greater when there are θ countries than when there are $\theta-1$ countries in the Union, (A.33) should be larger than (A.32). For notational simplicity we assume that the immigration quota of country i when there are θ countries in the Union as $\hat{l}_i^{l'}$. Thus, for a given stock of capital

$$\eta\left[2+2(\hat{l_1^{l'}}-\hat{l_1^l})+...+2(l_{\theta-1}^{l\,'}-l_{\theta-1}^l)+2l_\theta^{l'}+\hat{l}_1^l-\hat{l_1^{l'}}\right]>0 \tag{A.34}$$

Since $\eta > 0$, it implies

$$
\begin{aligned}
& 2 + 2(\hat{l_1^{l}}' - \hat{l}_1^{l}) + ... + 2({l_{\theta-1}^{l}}' - l_{\theta-1}^{l}) + 2{l_\theta^{l}}' + \hat{l}_1^{l} - \hat{l_1^{l}}' > 0 \\
& => 2 + 2{l_\theta^{l}}' + \hat{l}_1^{l} - \hat{l_1^{l}}' > 2\left[\hat{l_1^{l}} + ... + l_{\theta-1}^{l} - \hat{l_1^{l}}' - {l_{\theta-1}^{l}}'\right] \\
& => (1 + {l_\theta^{l}}') + \frac{\hat{l_1^{l}} - \hat{l_1^{l}}'}{2} > (\hat{l_1^{l}} - \hat{l_1^{l}}') + \sum_{j=2}^{\theta-1}(l_j^{l} - l_j^{l\prime}) \\
& => (1 + {l_\theta^{l}}') > \frac{\hat{l_1^{l}} - \hat{l_1^{l}}'}{2} + \sum_{j=2}^{\theta-1}(l_j^{l} - l_j^{l\prime})
\end{aligned}
\tag{A.35}
$$

For given immigration quota of the other countries, this above condition can be written as

$$
2(1 + l_\theta^{l\prime}) > \hat{l}_1^{l} - \hat{l_1^{l}}' \tag{A.36}
$$

Using the expressions for the optimal immigration quota for country i when there are N = θ and N = $\theta + 1$ countries in the Union, the condition can be further simplified to

$$
1 + l_\theta^{l\prime} > \left[\frac{s+1}{4\eta}\right]^2 \left(\frac{\phi_1^4 K_1^{4\alpha}}{\sum_{j=1}^{\theta-1} \phi_j^2 K_j^{2\alpha}}\right)\left(\frac{\phi_\theta^2 K_N^{2\alpha}}{\sum_{j=1}^{\theta} \phi_j^2 K_j^{2\alpha}}\right) \tag{A.37}
$$

A.6 Proof of Proposition 4

If country 2 and country 3 had the same technology ($\phi_2 = \phi_3$) then country 1 would be indifferent between inviting either country to join the Union. However, if $\phi_3 = 0$ while $\phi_2 > 0$, this would imply that output in country 3 will be zero for any amount of factor inputs. Consequently, if country 1 wanted to invite country 3 to join the Union, all the labor from country 3 would want to move to country 1. Consequently, wage equalization in the Union would lead to wages being bid down to approximately 0.[1] For the current proof, without loss of generality we

[1] This is because for a Cobb-Douglas production function, as labor employment tends to infinity, the wage asymptotically tends to 0.

assume the wage in the rest of the world $w^* = 0$. This would again mean that immigration quota in country 1 would be 0 since quota rent would be equal to 0.

As a singleton, while maximizing welfare, government of country 1 always has the option of bidding down the wage to 0 by increasing their immigration quota. Since quota rent is $(w_i - \eta) * l_1^l$, once the wage is close to 0, the quota rent will also be close to 0. However, as a singleton country, we have already shown (section 1.3.2) that the government of country 1 maximizes welfare with a quota that does not take wages down to zero. This implies that bidding wages down to zero, cannot give the government the optimal level of welfare. The above argument implies that government welfare of country 1 (when $\phi_3 = 0$) is achievable when it is a singleton also. However, as a singleton country, the government of country 1 always chooses an immigration quota that does not bid down wages to zero to maximize welfare. Thus, by revealed preference we find that government welfare when country 1 is a singleton country is always greater than or equal to government welfare when country 1 invites country 3 to join the Union when country 3 has $\phi_3 = 0$.

We also know that government welfare for country 1 is higher when there is more than one country in the Union (with positive TFP parameters) than when it is a singleton country (Section 1.4.2). This implies government welfare of country 1 (when there are countries 1 and 2 in the Union) is greater than government welfare of country 1 (when Union is formed by countries 1 and 3 with ϕ_3=0). Therefore, since country 1's payoff from inducting country 3 is monotonically increasing in ϕ_3, there must exist a value of ϕ_3 say $\bar{\phi_3} < \phi_2$ such that for all ϕ_3 in (0, $\bar{\phi_3}$], government welfare is higher when countries 1 and 2 are in the Union than when country 1 invites country 3 to join the Union before country 2. This argument, delineated for a 3 country case, would also hold more generally.

Appendix B

Chapter 2

B.1 Derivation of the optimal contribution schedule

The government and the lobby share the surplus according to their bargaining powers-

$$\begin{aligned} B = &\left(SW^{D}(l_l) - SW^{PE}(l_l^{PE}) - ac(l_l^{PE})l_l^{PE}\right)^{\sigma} \\ &\left(\pi(l_l^{PE}) + r(l_l^{PE})K - K - c(l_l^{PE})l_l^{PE} - \pi(l_l^{D}) - r(l_l^{D})K + K\right)^{1-\sigma} \end{aligned} \tag{B.1}$$

This yields

$$c(l_l^{PE})l_l^{PE} = \frac{(1-\sigma)(SW^{D}(l_l^{D}) - SW^{PE}(l_l^{PE}))}{a} + \sigma\left(\pi(l_l^{a}) + r(l_l^{a})K - \pi(l_l^{D}) - r(l_l^{D})K\right) \tag{B.2}$$

To derive the optimal contribution schedule, we will analyse each component sep-

arately,

$$\begin{aligned} SW^{D}(l_l^{D}) &= s\Big(\pi(l_l^{D}) + r(l_l^{D})K - K\Big) + w(l_l^{D}) + (w(l_l^{D}) - w^{*} - \gamma)l_l^{D} \\ &= s\Big((\frac{1}{2} - \alpha)K^{\alpha}\sqrt{1 + l_l^{D}} + \alpha K^{\alpha-1}\sqrt{1 + l_l^{D}}K\Big) + \frac{1}{2}\frac{K^{\alpha}}{\sqrt{1 + l_l^{D}}} \\ &+ \left(\frac{1}{2}\frac{K^{\alpha}}{\sqrt{1 + l_l^{D}}} - w^{*} - \gamma\right)l_l^{D} - sK \\ &= \left(\frac{s+1}{2}\right)K^{\alpha}\sqrt{1 + l_l^{D}} - (w^{*} + \gamma)l_l^{D} - sK \end{aligned} \tag{B.3}$$

Similarly,

$$SW^{PE}(l_l^{PE}) = \left(\frac{s+1}{2}\right)K^{\alpha}\sqrt{1 + l_l^{PE}} - (w^{*} + \gamma)l_l^{PE} \tag{B.4}$$

Combining equation B.3 and B.4,

$$SW^{D}(l_l^{D}) - SW^{PE}(l_l^{PE}) = \left(\frac{k+1}{2}\right)K^{\alpha}\left[\sqrt{1 + l_l^{D}} - \sqrt{1 + l_l^{PE}}\right] - (w^{*} + \gamma)\Big(l_l^{D} - l_l^{PE}\Big) \tag{B.5}$$

Considering the second term of B.1,

$$\left(\pi(l_l^{PE}) + r(l_l^{PE})K - \pi(l_l^{D}) - r(l_l^{D})K\right) = \frac{1}{2}K^{\alpha}\left[\sqrt{1 + l_l^{PE}} - \sqrt{1 + l_l^{D}}\right] \tag{B.6}$$

Substituting B.5 and B.6 into the contribution schedule expressed in ,

$$\begin{aligned} c(l_l^{PE})l_l^{PE} = \Big(\frac{1-\sigma}{a}\Big)\Bigg[\Big(\frac{s+1}{2}\Big)K^{\alpha}\Big[\sqrt{1 + l_l^{D}} - \sqrt{1 + l_l^{PE}}\Big] - (w^{*} + \gamma)\Big(l_l^{D} - l_l^{PE}\Big)\Bigg] \\ + \frac{\sigma}{2}K^{\alpha}\left[\sqrt{1 + l_l^{PE}} - \sqrt{1 + l_l^{D}}\right] \end{aligned} \tag{B.7}$$

Thus, the contribution schedule simplifies to

$$c(l_I^{PE})l_I^{PE} = K^{\alpha}\left[\sqrt{1+l_I^{D}} - \sqrt{1+l_I^{PE}}\right]\left[\left(\frac{1-\sigma}{a}\right)\left(\frac{1+s}{2}\right) - \frac{\sigma}{2}\right] - \left(\frac{1-\sigma}{a}\right)(w^* + \gamma)(l_I^{D} - l_I^{PE}) \tag{B.8}$$

From the derivation of optimal immigration when a = 0 and a $>$ 0, we have already obtained the values for l_I^{D} and l_I^{PE}.

$$K^{\alpha}\left[\sqrt{1+l_I^{D}} - \sqrt{1+l_I^{PE}}\right] = K^{\alpha}\left[\left(\frac{1+s}{4}\right)\left(\frac{K^{\alpha}}{w^*+\gamma}\right) - \frac{K^{\alpha}}{4(w^*+\gamma)}(1+s(1+a))\right] \tag{B.9}$$

Consequently, the first term of the B.8 becomes

$$\begin{aligned} &K^{\alpha}\left[\sqrt{1+l_I^{D}} - \sqrt{1+l_I^{PE}}\right]\left[\left(\frac{1-\sigma}{a}\right)\left(\frac{1+s}{2}\right) - \frac{\sigma}{2}\right] \\ &= \frac{K^{2\alpha}}{4(w^*+\gamma)}\Big[(1+s) - (1+s(1+a))\Big]\left[\left(\frac{1-\sigma}{a}\right)\left(\frac{1+s}{2}\right) - \frac{\sigma}{2}\right] \\ &= -\frac{sK^{2\alpha}}{8(w^*+\gamma)}\Big[1+s(1-\sigma) - \sigma(1+a)\Big] \end{aligned} \tag{B.10}$$

Similarly, plugging in the values of l_I^{D} and l_I^{PE} into the second term of B.8 yields,

$$\begin{aligned} \left(\frac{1-\sigma}{a}\right)(w^*+\gamma)\left(l_I^{D} - l_I^{PE}\right) &= \left(\frac{1-\sigma}{a}\right)\frac{K^{2\alpha}}{16(w^*+\gamma)^2}\Big[(1+s)^2 - [1+s(1+a)]^2\Big] \\ &= -\frac{K^{2\alpha}(1-\sigma)}{16(w^*+\gamma)}[2s + 2s^2 + as^2] \end{aligned} \tag{B.11}$$

Plugging in B.9 and B.10 into B.8 and simplifying,

$$\begin{aligned} c(I_l^{PE})I_l^{PE} &= -s\frac{K^{2\alpha}}{8(w^*+\gamma)}\Big[1+s(1-\sigma)-\sigma(1+a)\Big]+\frac{K^{2\alpha}(1-\sigma)}{16(w^*+\gamma)}\Big[2s+2s^2+as^2\Big] \\ &= \frac{K^{2\alpha}}{16(w^*+\gamma)}\Big[2sa\sigma+as^2-\sigma as^2\Big] \\ &= \frac{sK^{2\alpha}}{16(w^*+\gamma)}\Big[2a\sigma+as(1-\sigma)\Big] \end{aligned} \tag{B.12}$$

The above equation is the optimal contribution schedule that the lobby is willing to provide the government to persuade the government to increase its quota of immigration.

B.2 Derivation of optimal investment by entrepreneurs in first stage

The net income of the entrepreneurs under political equilibrium is given by

$$\Pi(I_l^{PE}) = \pi(I_l^{PE}) + r(I_l^{PE})K - c(I_l^{PE})I_l^{PE} - K \tag{B.13}$$

Substituting the values for immigration and contributions from equations 2.15 and 2.18,

$$\Pi(I_l^{PE}) = \frac{1}{2}\frac{K^{2\alpha}}{4(w^*+\gamma)}[1+s(1+a)] - \frac{sK^{2\alpha}}{16(w^*+\gamma)}\Big[2a\sigma+as(1-\sigma)\Big] - K \tag{B.14}$$

The first order condition from maximization is

$$\frac{\partial\Pi(I_l^{PE})}{\partial K} = 0 => \frac{\alpha K^{1-2\alpha}}{8(w^*+\gamma)}\Big[2+2s(1+a)-2sa\sigma-as^2(1-\sigma)\Big] = 1 \tag{B.15}$$

Thus, optimal capital investment is

$$K^{PE} = \left[\frac{\alpha}{8(w^* + \gamma)}\Big[2(1 + s(1 + a)) - s[2a\sigma + as(1 - \sigma)]\Big]\right]^{\frac{1}{1-2\alpha}} \tag{B.16}$$

B.3 Dependence of government's utility on its bargaining power and capital intensity

For given stock of capital and immigration level, the Government's welfare under pure democracy is given by

$$GW^D = \left[\frac{\alpha(1 + s)}{4(w^* + \gamma)}\right]^{\frac{2\alpha}{1-2\alpha}} \frac{1}{(w^* + \gamma)}\left(\frac{1 + s}{4}\right)^2 + w^* + \gamma \tag{B.17}$$

Similarly, the government's welfare function under political equilibrium is

$$GW^{PE} = \left[\frac{\alpha}{8(w^* + \gamma)}\Big[2(1+s(1+a))-s(2a\sigma+as(1-\sigma)\Big]\right]^{\frac{2\alpha}{1-2\alpha}} \left[\frac{(1 + s)^2 + a^2 s\sigma(2 - s)}{16(w^* + \gamma)}\right] \tag{B.18}$$

When $\sigma = 0$

$$\begin{aligned} \mathrm{GW^{PE}} &= \left[\frac{\alpha}{8(\mathrm{w}^* + \gamma)}[2(1 + \mathrm{s}(1 + \mathrm{a})) - \mathrm{as}^2]\right]^{\frac{2\alpha}{1-2\alpha}} \frac{(1 + \mathrm{s})^2}{16(\mathrm{w}^* + \gamma)} + \mathrm{w}^* + \gamma \\ &= \left[\frac{\alpha(1 + \mathrm{s})}{4(\mathrm{w}^* + \gamma)} + \frac{\alpha\mathrm{as}(2 - \mathrm{s})}{8(\mathrm{w}^* + \gamma)}\right]^{\frac{2\alpha}{1-2\alpha}} \frac{(1 + \mathrm{s})^2}{16(\mathrm{w}^* + \gamma)} + \mathrm{w}^* + \gamma \\ &> \mathrm{GW^D} \end{aligned} \tag{B.19}$$

Similarly, when $\sigma = 1$,

$$\begin{aligned} GW^{PE} &= \left[\frac{\alpha}{8(w^* + \gamma)}[2(1 + s(1 + a)) - 2as]\right]^{\frac{2\alpha}{1-2\alpha}} \frac{[(1 + s)^2 + a^2 s(2 - s)]}{16(w^* + \gamma)} + w^* + \gamma \\ &= \left[\frac{\alpha(1 + s)}{4(w^* + \gamma)}\right]^{\frac{2\alpha}{1-2\alpha}} \frac{[(1 + s)^2 + a^2 s(2 - s)]}{16(w^* + \gamma)} + w^* + \gamma \\ &> GW^D \end{aligned} \tag{B.20}$$

To enable us to understand the changes in government welfare under political equilibrium due to changes in σ,

$$\begin{aligned} \frac{\partial GW^{PE}}{\partial \sigma} &= \frac{2\alpha}{1 - 2\alpha}\left[\frac{\alpha}{8(w^* + \gamma)}\Big[2(1 + s(1 + a)) - s(2a\sigma + as(1 - \sigma)\Big]\right]^{\frac{2\alpha}{1-2\alpha}-1} \\ &\quad \left[\frac{(1 + s)^2 + a^2 s\sigma(2 - s)}{16(w^* + \gamma)}\right]\left[\frac{\alpha(as^2 - 2as)}{8(w^* + \gamma)}\right] \\ &\quad \frac{2\alpha}{1 - 2\alpha}\left[\frac{\alpha}{8(w^* + \gamma)}\Big[2(1 + s(1 + a)) - s(2a\sigma + as(1 - \sigma)\Big]\right]^{\frac{2\alpha}{1-2\alpha}} \frac{a^2 s(2 - s)}{16(w^* + \gamma)} \\ &= \frac{\alpha}{8.16(w^* + \gamma)^2}\left[\frac{\alpha}{8(w^* + \gamma)}\Big[2(1 + s(1 + a)) - s(2a\sigma + as(1 - \sigma)\Big]\right]^{\frac{2\alpha}{1-2\alpha}-1} \\ &\quad \left\{\left[\frac{2\alpha}{1 - 2\alpha}\Big[(1 + s)^2 + a^2 s\sigma(2 - s)\Big]\Big[as^2 - 2as\Big]\right]\right. \\ &\quad \left. + \Big[2(1 + s(1 + a)) - s(2a\sigma + as(1 - \sigma))\Big]\Big[a^2 s(2 - s)\Big]\right\} \\ &= \frac{\alpha}{8.16(w^* + \gamma)^2}\left[\frac{\alpha}{8(w^* + \gamma)}\Big[2(1 + s(1 + a)) - s(2a\sigma + as(1 - \sigma)\Big]\right]^{\frac{2\alpha}{1-2\alpha}-1} (2as - as^2) \\ &\quad \left\{ - \frac{2\alpha}{1 - 2\alpha}\Big[(1 + s)^2 + a^2 s\sigma(2 - s)\Big] + a\Big[2(1 + s(1 + a)) - s(2a\sigma + as(1 - \sigma))\Big]\right\} \end{aligned} \tag{B.21}$$

Since $2as - as^2 = as(2 - s) > 0$, to show that government utility under political equilibrium decreases with its bargaining power, we need to show that the term within the curly brackets changes negatively with changes in σ. This, will yield us

a certain level of capital intensity which will guarantee that within that particular range, government's utility is negatively related to its bargaining power. Let the term within $\{\}$ in equation B.21 be denoted by M and it can be written then written as

$$M = \frac{1}{1-2\alpha}\left\{-2\alpha\left[(1+s)^2+a^2s\sigma(2-s)\right]+a(1-2\alpha)\left[2(1+s(1+a))-s(2a\sigma+ak(1-\sigma))\right]\right\} < 0 \tag{B.22}$$

Solving the above equation leads to

$$\alpha > \frac{2a(1+s)+2a^2s(1-\sigma)-a^2s^2(1-\sigma)}{2\left[(1+s)^2+2a(1+s)+a^2s(2-s)\right]} \tag{B.23}$$

Thus whenever capital is of more importance in the production process, given by the range $\frac{2a(1+s)+2a^2s(1-\sigma)-a^2s^2(1-\sigma)}{2\left[(1+s)^2+2a(1+s)+a^2s(2-s)\right]} < \alpha < \frac{1}{2}$, the government's utility under political equilibrium is a decreasing function of its bargaining power.

B.4 Derivation of political equilibrium under institutions and its relation with government's bargaining power : Proof of Proposition 5

We will compare between GW^{PE} and NGW^* to understand the government's choice of β at every level of its bargaining power. We will first show that at $\sigma = 0$, $NGW^* < GW^{PE}$. At $\sigma = 0$,

$$GW^{PE} = \{\frac{\alpha}{8(w^*+\gamma)}[2(1+s(1+a))-as^2]\}^{\frac{2\alpha}{1-2\alpha}}\frac{(1+s)^2}{16(w^*+\gamma)}+(w^*+\gamma)$$

and

$$\mathrm{GW}^{\mathrm{PE_i}} = \{\frac{\alpha}{4(\mathrm{w}^* + \gamma)}[(1 + \mathrm{s}(1 + \mathrm{a})) - \frac{\mathrm{P}}{\mathrm{a}}]\}^{\frac{2\alpha}{1-2\alpha}} \frac{1}{16(\mathrm{w}^* + \gamma)}[2(\mathrm{k} + 1)(1 + \mathrm{s}(1 + \mathrm{a})) - (1 + \mathrm{s}(1 + \mathrm{a}))^2 + 2\mathrm{P}] + (\mathrm{w}^* + \gamma) \tag{B.24}$$

where

$$P = P(\beta, \sigma) = [\beta(1+s)-(1+s(1+a))]\{1+s-\sigma(1+s+a)\}-(\frac{1-\sigma}{2})[\beta^2(1+s)^2-(1+s(1+a))^2]$$

At $\beta = 1$ and $\sigma = 0$,

$$\frac{dP}{d\beta} = 0 \Rightarrow \frac{d(GW^{PE_i})}{d\beta} = 0$$

$$\Rightarrow \frac{d(NGW^{PE_i})}{d\beta} = \frac{d}{d\beta}[GW^{PE'} - \beta^2 Q] = -2Q < 0$$

Thus as β increases , the government's net welfare from moving to an institution decreases. The government will not want to then choose a β which is higher than its minimum value and hence optimal $\beta = 1$ and hence, the threat point is the same as in pure democracy. Now at $\beta = 1$,

$$NGW^* = \max_{\beta=1} NGW^{PE_i} = GW^{PE_i}_{\beta=1} - Q$$

Also, at $\sigma = 0, \beta = 1$, $\mathrm{GW}^{\mathrm{PE_i}} = \mathrm{GW}^{\mathrm{PE}}$. Hence, at $\sigma = 0$, $\mathrm{NGW}^* = \mathrm{GW}^{\mathrm{PE}} - \mathrm{Q}$ as $\mathrm{Q} > 0$. This implies that $\mathrm{NGW}^* < \mathrm{GW}^{\mathrm{PE}}$ when $\sigma = 0$. Now we will show that at $\sigma = 1$, $\mathrm{NGW}^* > \mathrm{GW}^{\mathrm{PE}}$. At $\sigma = 1$,

$$GW^{PE} = \{\frac{\alpha}{4(w^* + \gamma)}[(1 + s(1 + a)) - as]\}^{\frac{2\alpha}{(1-2\alpha}}[\frac{(1 + s)^2 + a^2 s(2 - s)}{16(w^* + \gamma)}] + (w^* + \gamma)$$

and

$$GW^{PE_i} = \{\frac{\alpha\beta(1+s)}{4(w^*+\gamma)}\}^{\frac{2\alpha}{1-2\alpha}} \frac{1}{16(w^*+\gamma)}[2(s+1)(1+s(1+a))-(1+s(1+a))^2-2[\beta(1+s)-(1+s(1+a))]]$$

$$+(w^*+\gamma)$$

where

$$P = a[\beta(1+s) - (1+s(1+a))]$$

At σ = 1 and β = 1, If α is high enough (which is the case we have considered) then

$$\frac{dGW^{PE_i}}{d\beta} > 0$$

This implies that if production function is relatively capital intensive, as β increases, the government's net welfare from moving to an institution increases. Hence, government will want to choose a β (say, β^*) which is greater than its minimum value of 1.

Again it can be shown that at σ = 1, β = 1

$$GW^{PE} = GW^{PE_i}$$

Therefore, for $\beta = \beta^*$ when $\beta^* > 1$,

$$GW^{PE_i} > GW^{PE}$$

$$NGW^* = \max_{\beta=\beta^*} NGW^{PE_i} = GW^{PE_i}_{\beta=\beta^*} - \beta^{*2}Q$$

If Q is less than a certain threshold (that is the cost of tying hands is not too high) then at σ = 1,

$$NGW^* > GW^{PE}$$

Earlier we have shown that for σ = 0, $GE^I < GW^{PE}$. Since both GW^I and GW^{PE}

are continuous function of σ, we can apply the Intermediate value theorem and say that there exists a $\bar{\sigma} < 1$ such that for $\sigma > \bar{\sigma}$ we have $GW^{I} > GW^{PE}$. Thus government with high bargaining power will tie its hands and for low σ, $GW^{I} < GW^{PE}$.

Appendix C

Chapter 3

C.1 Effect of Academies Act on Male Immigrants with Children

VARIABLES	(1)	(2)	(3)
$After_t \times Treat_s$	11,005.600***	9,703.907***	14,752.456***
	(3,006.260)	(2,770.921)	(2,573.225)
Avg House prices		0.144	-0.177
		(0.125)	(0.358)
Unemployment rate		-304.570	1,780.215
		(565.287)	(2,902.265)
Eco activity rate		-1,866.503	3,398.949
		(2,281.922)	(2,469.253)
Prop. of Muslims		-195,436.630	-297,745.132
		(316,454.369)	(464,796.378)
Prop. of Hindus		-2,950,754.012**	-3,644,297.208*
		(1,120,954.756)	(1,361,845.216)
Observations	22	22	22
R-squared	0.959	0.959	0.987
Year FE	No	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

C.2 Effect of Academies Act on Male Immigrants with children, by occupation groups

VARIABLES	(1)	(2)	(3)
$After_t \times Treat_s$	1,132.549***	980.242***	1,354.149***
	(320.870)	(354.727)	(480.608)
Avg House prices		0.018	-0.007
		(0.017)	(0.068)
Unemployment rate		-13.725	85.170
		(73.214)	(541.142)
Mean net pay		0.046	-0.102
		(0.094)	(0.160)
Eco activity rate		-158.714	92.502
		(305.848)	(458.261)
Prop. of Muslims		-18,303.133	-30,649.156
		(41,624.095)	(86,203.955)
Prop. of Hindu		-297,422.198**	-363,534.573
		(146,873.666)	(250,415.595)
Observations	195	195	195
R-squared	0.751	0.763	0.770
Major occ group FE	Yes	Yes	Yes
Year FE	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

C.3 Effect of Academies Act on Male Immigrants without Children

VARIABLES	(1)	(2)	(3)
$After_t \times Treat_s$	6,914.033	7,189.675	7,799.312
	(4,437.606)	(4,668.104)	(7,439.728)
Avg house price		0.175	0.440
		(0.211)	(1.035)
Unemployment rate		-818.411	3,783.665
		(952.325)	(8,391.051)
Eco activity rate		-3,301.315	-876.571
		(3,844.300)	(7,139.123)
Prop of Muslims		-705,443.875	-800,349.384
		(533,123.065)	(1343822.714)
Prop of Hindu		-2,799,714.883	-2,963,438.428
		(1,888,445.521)	(3,937,376.925)
Observations	22	22	22
R-squared	0.967	0.979	0.991
Major occ group FE	Yes	Yes	Yes
Year FE	No	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

C.4 Effect of Academies Act on Male Immigrants without children, by Occupation groups

VARIABLES	(1)	(2)	(3)
$After_t \times Treat_s$	568.948	591.592	929.751
	(376.751)	(422.855)	(574.063)
Avg house price		0.006	-0.053
		(0.020)	(0.081)
Unemployment rate		-117.503	-38.007
		(87.155)	(639.401)
Mean net pay		-0.015	-0.166
		(0.112)	(0.191)
Eco activity rate		-102.193	232.234
		(362.671)	(543.828)
Prop of Muslims		-27,180.658	12,836.254
		(49,431.555)	(103,256.405)
Prop of Hindu		-170,033.901	-179,415.380
		(173,418.179)	(299,941.061)
Observations	198	198	198
R-squared	0.727	0.735	0.740
Major occ group FE	Yes	Yes	Yes
Year FE	No	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

C.5 Specification with dependent variable as share of male immigrants with/without children to total population in a region

C.5.1 Effect of Academies Act on share of male immigrants with children to total population, without occupation categories

VARIABLES	(1)	(2)	(3)
$After_t \times Treat_s$	0.002*	0.001	0.003**
	(0.001)	(0.001)	(0.008)
Avg house price		6.33e-08	-2.99e-08
		(4.58e-08)	(9.99e-08)
Unemployment rate		-1.74e-05	0.0003
		(0.0002)	(0.001)
Eco activity rate		-0.002*	-8.05e-05
		(0.001)	(0.001)
Prop of Muslims		-0.097	-0.089
		(0.116)	(0.130)
Prop of Hindus		-0.870*	-0.796
		(0.410)	(0.380)
Observations	22	22	22
R-squared	0.861	0.930	0.994
Major occ group FE	Yes	Yes	Yes
Year FE	No	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

C.5.2 Effect of Academies Act on share of male immigrants with children to total population, with occupation categories

VARIABLES	(1)	(2)	(3)
$After_t \times Treat_s$	0.005**	0.003	0.006*
	(0.002)	(0.003)	(0.003)
Avg house price		1.69e-07	-1.67e-07
		(1.17e-07)	(4.63e-07)
Unemployment rate		0.0002	-0.0012
		(0.0005)	(0.0037)
Mean net pay		3.76e-08	-2.42e-06**
		(6.56e-07)	(1.09e-06)
Eco activity rate		-0.004*	-0.002
		(0.002)	(0.003)
Prop of Muslims		-0.154	-0.0401
		(0.290)	(0.586)
Prop of Hindu		-1.608	-1.634
		(1.023)	(1.702)
Observations	195	195	195
R-squared	0.727	0.744	0.763
Major occ group FE	Yes	Yes	Yes
Year FE	No	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

C.5.3 Effect of Academies Act on share of male immigrants without children to total population, without occupation categories

VARIABLES	(1)	(2)	(3)
$After_t \times Treat_s$	0.001	5.95e-05	-0.0001
	(0.002)	(0.003)	(0.003)
Avg house price		4.51e-08	3.90e-07
		(1.11e-07)	(4.30e-07)
Unemployment rate		-0.0003	-0.0016
		(0.0005)	(0.0035)
Eco activity rate		-0.002	-0.002
		(0.002)	(0.003)
Prop of Muslims		-0.171	-0.441
		(0.280)	(0.558)
Prop of Hindu		-0.315	-0.776
		(0.991)	(1.634)
Observations	22	22	22
R-squared	0.661	0.738	0.926
Major occ group FE	Yes	Yes	Yes
Year FE	No	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

C.5.4 Effect of Academies Act on share of male immigrants without children to total population, with occupation categories

VARIABLES	(1)	(2)	(3)
$After_t \times Treat_s$	0.004	0.003	0.005
	(0.003)	(0.003)	(0.004)
Avg house price		-2.36e-08	-7.98e-07
		(1.41e-07)	(5.45e-07)
Unemployment rate		-0.001	-0.0041
		(0.001)	(0.004)
Mean Net Pay		-3.16e-07	-2.91e-06**
		(7.88e-07)	(1.29e-06)
Eco activity rate		-0.002	0.0004
		(0.003)	(0.0046)
Prop of Muslims		-0.008	0.659
		(0.349)	(0.694)
Prop of Hindu		-0.366	-0.259
		(1.223)	(2.017)
Observations	198	198	198
R-squared	0.637	0.645	0.683
Major occ group FE	Yes	Yes	Yes
Year FE	No	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

C.6 Parallel Trends

VARIABLES	(1)	(2)	(3)
$After_t \times Treat_s$	1,483.038***	1,188.398***	1,353.118*
	(379.203)	(439.802)	(778.480)
Avg house price		0.013	0.009
		(0.021)	(0.082)
Unemployment rate		-30.239	-29.856
		(87.434)	(810.453)
Mean Net Pay		0.059	-0.107
		(0.096)	(0.162)
Eco activity rate		-69.742	206.891
		(360.799)	(483.538)
Prop of Muslims		-9,054.229	-46,732.082
		(63,101.733)	(101,828.631)
Prop of Hindu		-268,273.700	-535,855.152
		(210,192.737)	(339,166.236)
2007 $\times Treat_s$	359.556	138.269	206.730
	(454.439)	(704.316)	(1,000.238)
2008 $\times Treat_s$	551.111	507.323	295.538
	(454.439)	(494.646)	(1,107.220)
2009 $\times Treat_s$	841.778*	258.935	-678.484
	(454.439)	(651.993)	(1,188.926)
Observations	195	195	195
R-squared	0.756	0.765	0.771
Major occ group FE	Yes	Yes	Yes
Year FE	No	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Bibliography

[1] Acemoglu, D., and J.A. Robinson, 2001. A Theory of Political Transitions. American Economic Review, 91(4): 938-963.

[2] Acemoglu, D., and J.A. Robinson, 2001. Inefficient Redistribution. American Political Science Review, Vol 95 No.3 649-661.

[3] Acemoglu, D., and J.A. Robinson, 2008. Persistence of Power, Elites, and Institutions. American Economic Review, 98:1, 267E93.

[4] Acemoglu, D., and J.A. Robinson, 20012. Why Nations Fail : The Origins of Power, Prosperity and Poverty. Crown Publishers.

[5] Acemoglu, D., S.Johnson, and J.A. Robinson, 2001. The Colonial Origins of Comparative Development: An Empirical Investigation. American Economic Review, Vol 91, No.5, 1369-1401.

[6] Banzhaf, H.Spencer, and Randall P.Walsh, 2008. Do People Vote with Their Feet? An Empirical Test of Tiebout. American Economic Review, 98(3):843-863.

[7] Bartel, Ann P., 1989. Where Do the New U.S. Immigrants Live? Journal of labor Economics, 7(4):371-391

[8] Benhabib,J., 1996. On the Political Economy of Migration. European Economic Review,Volume 40, Issue 9, 1737-1743

[9] Bertocchi,G., Strozzi,C., 2008. International Migration and the Role of Institutions. Public Choice, Volume 137, Issue 1, 81-102

[10] Besley,T., Persson,T.,2009. The Origins of State Capacity: Property Rights, Taxation and Politics. American Economic Review, Vol.99, No.4, 1218-1244

[11] Borjas, George J., 1999. Immigration and Welfare Magnets. Journal of Labor Economics, 17(4) Part 1:607-637

[12] Borjas,G.,2015. Immigration and Globalization: A Review Essay. Journal of Economic Literature, 53(4), 961-974

[13] Cebula, Richard J., 2009. Migration and the Tiebout-Tullock Hypothesis Revisited. American Journal of Economics and Sociology, 68(2).

[14] Dustmann, Christian, Francesca Fabbri and Ian Preston., 2005. The Impact of Immigration on the British labor Market. The Economic Journal, 115: F324-F341

[15] Dustmann, Christian and Tommaso Frattini, 2014. The Fiscal Effects of Immigration to the UK. The Economic Journal, 124: F593-F643

[16] Eyles, Andrew, Stephen Machin and Olmo Silva, 2015. Academies 2: The New Batch. CEP Discussion Paper No.1370

[17] Facchini,G.,Mayda,A.M.,2008. From Individual Attitudes towards Migrants to Migration Policy Outcomes:Theory and Evidence. Economic Policy, 23, 651-713

[18] Facchini,G.,Mayda,A.M.,2009. Does the Welfare State affect Individual Attitudes towards Immigrants?:Evidence Across Countries. The Review of Economics and Statistics, 91(2), 295-314

[19] Facchini,G.,Mayda,A.M.,Mishra,P., 2008. Do Interest Groups Affect US Immigration Policy. Journal of International Economics, 85(1), 114-128

[20] Facchini,G.,Willmann,G.,2005. The Political Economy of International Factor Mobility. Journal of International Economics, 67, 201-219

[21] Gawande, Kishore, Pravin Krishna and Marcelo Olarreaga, 2012. Lobbying Competition over Trade Policy. International Economic Review, Vol.53, No.1

[22] De Giorgi, Giacomo, and Michele Pellizzari, 2009. Welfare Migration in Europe. Labor Economics, 16(4): 353-363

[23] Goldberg, Pinelopi Koujianou and Giovanni Maggi, 1999. Protection for Sale : An Empirical Investigation. The American Economic Review, Vol.89, No.5 : 1135-1155

[24] Grossman, Gene M. and Elhanan Helpman, 1994. Protection for Sale. The American Economic Review, Vol.84, No.4 : 833-850

[25] Hall,R.E., Jones,C.I.,1999. Why Do Some Countries Produce So Much More Output Per Worker Than Others? Quarterly Journal of Economics, 1999

[26] Kimenyi, Mwangi S., Shugart, William F., Tollison, Robert., 1986. The Political Economy of Immigration Restrictions. Yale Journal of Regulation

[27] Knack,S., Keefer,P,1995. Institutions and Economic Performance: Cross Country Tests Using Alternative Institutional Measures Economic and Politics, Vol.7, No.3

[28] Lessem,R., Sanders,C., 2014. Immigrant Wage Assimilation in the United States: The Role of Occupational Upgrading. Working Paper

[29] Maggi,G., Rodíguez-Clare,Andres., 1998. The Value of Trade Agreements in the Presence of Political Pressures. Journal of Political Economy, Volume 106, Issue 3, 574-601

[30] Mayda,A.M., Patel. K., 2006. International Migration Flows: The Role of Destination Countries' Migration Policy. Commissioned by CSIS (Center for Strategic And International Studies) for the Social Security Administration Project on Long Term Immigration Projection Methods: Current Practice and How to Improve it

[31] North, Douglass C., 1991. Institutions. Journal of Economic Perspectives, Volume 5, No.1, 97-112

[32] Ortega,F.,2005. Immigration Quota and Skill Upgrading. Journal of Public Economics, Vol.89, Issues 9-10, 1841-1863

[33] Razin,A., Sadka,E., Swagel,P., 2002. Tax Burden and Migration:A Political Economy Theory and Evidence. Journal of Public Economics, Volume 85, Issue 2, 167-190

[34] Razin, A. and J. Wahba, 2015. Welfare Magnet Hypothesis, Fiscal Burden and Immigration Skill Selectivity. Scandinavian Journal of Economics, 117: 369-402

[35] Scott, Darren M., Coomes, Paul A., and Izyumov, Alexei, I., 2005. The Location Choice of Employment-based Immigrants among U.S. Metro Areas. Journal of Regional Science, 45(1): 113-145

[36] Stroup,C.,and B.Zissimos,2017. Pampered Bureaucracy, Political Stability and Trade Integration. Review of Development Economics, 21(3),425-450

[37] Tiebout, Charles M., 1956. A Pure Theory of Local expenditures. The Journal of Political economy, 64(5):416-424.

[38] Verdugo, Gregory., 2015. Public housing magnets: public housing supply and immigrants' location choices. Journal of Economic Geography, 1-29