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The impact of immigration on the Norwegian Labour Market

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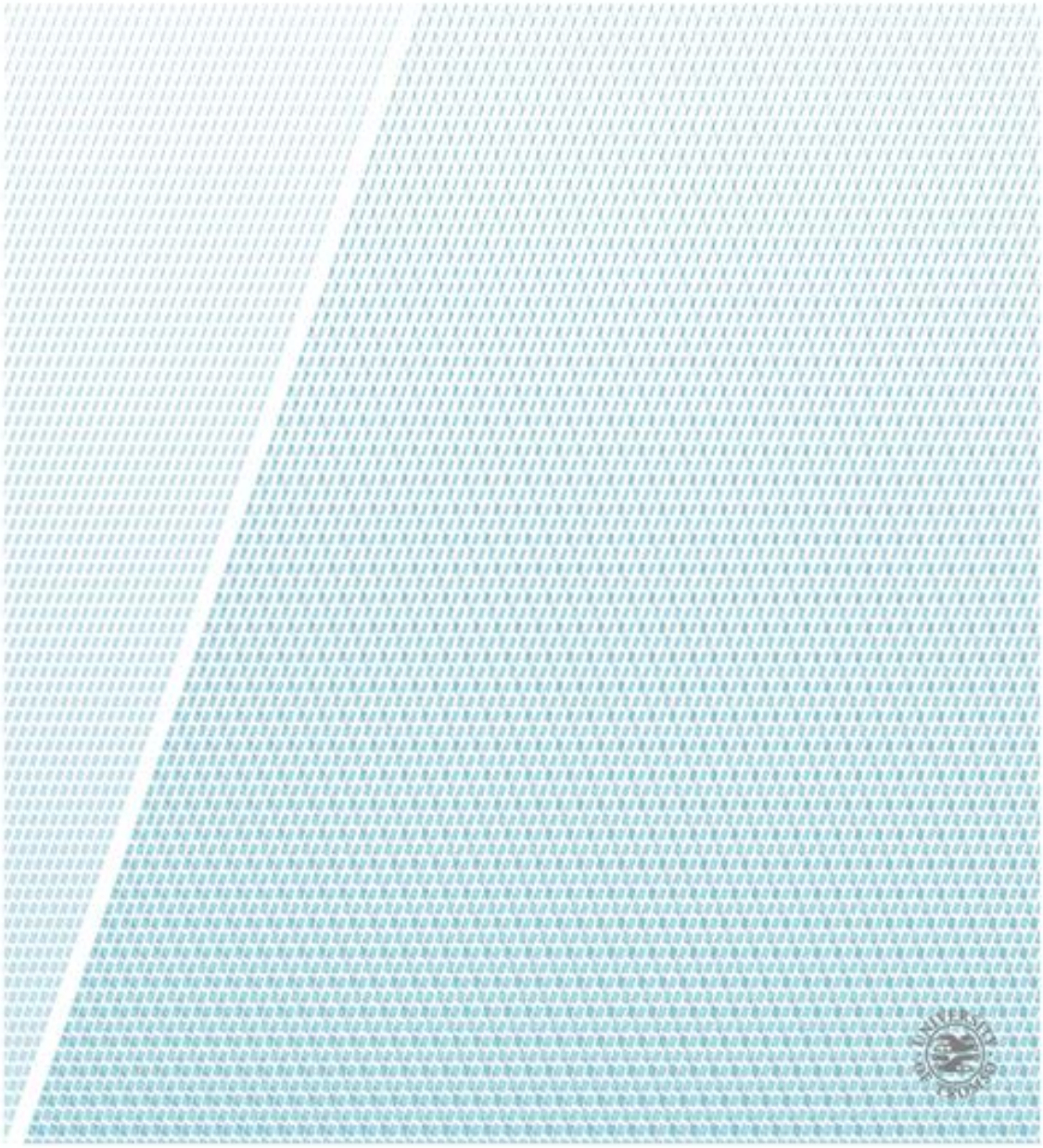

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Abstract

As immigration levels increase in Norway, there has been a growing concern of whether jobs of native workers are being taken by immigrants. Another issue is: does an increase in labour supply (as a result of immigration) lead to a fall in wages of native workers? These two concerns have been at the centre of most policy debates in recent year.

This thesis provides a blueprint on how research on the impact of immigration on the unemployment rate and wages of native workers can be carried out using natural experiments. Particularly, I present a difference-in-differences research design which can be applied in an empirical immigration study involving different groups and periods within a natural experiment framework. I also present a theoretical model based on modern labour economics which gives a detailed explanation of how immigration affects the labour market of the host country which is globally applicable and can be applied within the context of Norway. This thesis also provides a summary of the Norwegian migration history, and a brief account of the labour market. To the best of my knowledge there is no literature on the labour market impact of immigration which makes use of natural experiments in Norway. This study maybe a starting point for a possible empirical immigration study which makes use of natural experiments in Norway.

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Chapter 1

Introduction

The issue of immigration has been a topic of debate in most advanced developed countries. In the last few decades immigration has been on the rise in most developed nations like Canada, USA and most European countries including Norway. With poor educational facilities, increase in unemployment levels, low wages and increase in insecurity in most developing countries, citizens from these countries often to migrate to other developed nations in search of better opportunities. This migration might be voluntary or involuntary.

As the immigration level increase in most countries it also creates an impact on the economies of these countries and more specifically on their labour market. This impact might be positive or negative. With respect to the labour market, some countries are of the view that as immigration increases, immigrant labour turns to compete with domestic labour on available job opportunities and as such unemployment rate will increase and wages will fall since labour supply increases. However, this impact on the labour market depends on several factors like: the skill level of the workers, immigrant status, age structure of immigrants and the institution policies put in place to enter the job market and migration policies. shows that the effects of immigration vary and depends on immigrant characteristics and the labour market institutions of the host country "which affect relative reservation wages"(Moreno-Galbis & Tritah, 2016).

Immigration can also affect the economy in the form of contributing to GDP in both sending and receiving country, government spending/expenditure on immigrants, and immigration effects on housing rents and prices. Though most empirical studies on immigration and its impact on the labour market of the host country suggest that immigration has no significant effect on wages and unemployment or employment, this thesis will be structured to contribute to the literature on the impact of immigration on the labour market in Norway. The main objective of this study is to provide a blueprint for an empirical study on the labour market impact immigration can be done using natural experiments. It will therefore be structured to provide an approach that maybe be applied in immigration studies which seek to answers the question: "Does immigration have a significant impact on the wages and unemployment level in the host country (Norway)"?

1.1 Motivation

Though there exist an extensive literature on immigration and its impact on the labour market of the host country, it will be interesting to take a closer look at this in Norway. This is because immigration has been on the rise in Norway. This is a major concern for the government as it tries to verify how this might affect the economy of Norway and implementing immigration policies which will be beneficial to the country. In that last few years immigration has been a major subject for policy debates. In addition, given that there is little literature on this in Norway, this study will contribute by providing a research design which can be applied in a feasible study which makes use of natural experiments.

1.2 Road map

This thesis is organised in seven chapters. It makes use of a theoretical model with equilibrium unemployment to show how immigration affects unemployment. The theoretical explanations used in this paper will be drawn from previous papers/articles on the effect of immigration. The rest of this thesis will be organised as follows: Chapter two looks at existing studies within the area of immigration and its impact on wages and unemployment rate of the host country. chapter three presents a historical overview of migration and labour market in Norway. chapter four presents a theoretical framework(model) on how immigration can affect the wages and unemployment rate in the host country. Chapter five contains a general discussion on experimental methodology, the natural experiment approach with examples where it has been applied, and the pros and cons of this approach. Chapter six provides an experimental design (difference in difference research design) which can be applied in empirical studies involving natural experiments. It also contains examples of migration studies which have made use of this research design. The last contains the conclusion.

Chapter 2

Literature Review

In this chapter, some existing studies on the impact of immigration on the labour market of host countries are reviewed starting from studies related to Norway. Though this study is not quantitative, most studies on the impact of immigration on unemployment and wages of host country are quantitative and make use of econometric techniques in illustrating this effect.

2.1 Studies in Norway

(Feridun, 2005) investigated the impact of immigration on host country's economy using Norway as a case study. He used data from 1983 to 2003 and the Granger causality test for his estimations. His results suggest that GDP per capita increases as immigration increases. On the other hand, it was also found that immigration has no effect on unemployment rate.

(Zorlu & Hartog, 2005) also analysed the impact of immigration on the wages of native workers in Netherlands, United Kingdom and Norway. They estimated wage elasticities of both immigrants and natives using data from 1989 – 1996. Their results suggest that the wages of both low- and medium-income skilled workers are positively affected by pooled immigrants. Finally, they conclude that the immigration impact on the wages of native workers is so little and there exist no main or strong "pattern of complementarity or substitution".

(Tellez, 2008) examined the impact of immigration on unemployment and wages in Norway. To test the significance of immigration on unemployment, he used regression analysis and data from 2001 – 2006. His results were not statistically significant thus there was no sufficient evidence to show that immigration reduces wages and increases unemployment.

2.2 Other related studies

(Chassamboulli & Palivos, 2013) who analysed the impact of immigration employment and wages of native workers in Greece using data from 2000 to 2007. He used a matching and search framework which gave room for differentials in unemployment income and heterogeneity of skills. They found that the native workers who complemented immigrant workers in the production turn to experience benefits in both employment and wages. While the way minimum wages are determined, and statutory minimum wages are the key factors which the wage and employment impact of unskilled native workers who compete with immigrant workers. The results from this were found to be ambiguous.

(D'Amuri, Ottaviano, & Peri, 2010) examined the impact of immigration in western Germany using data from 1987 to 2001 and a "labour market equilibrium model". His results suggest that despite the large inflow of immigrants in the 90s, it had a very little negative effect on the employment level and wages of native workers. In addition, high adverse were noticed on the employment level of previous immigrants with little negative effects on wages of previous immigrants. They however they attributed their results to wage rigidity and the fact that new immigrants and old immigrants were highly substitutable in the labour market.

(Fromentin & Policy, 2013) examined the relationship which exist between immigration, unemployment and economic development in France. Using a system of equations, they estimated the cointegration relationship between these variables, their results show that in the long run there is no visible increase in aggregate unemployment resulting from an increase in migration rate. However, their results from a vector correlation model show a negative effect on unemployment rate because of immigration and past immigration had very little effect on wage increase in the short run and conclude that though there exist institutional differences, "migration flows have weak effect on employment in the long run"

Not all studies on the impact of immigration on host countries wages and unemployment have been econometric in nature. (Dustmann, Fabbri, & Preston, 2005) analysed the impact of immigration on labour market outcomes of native-born British workers. They did a theoretical discussion on the underlying economic issue and did empirical analysis. Their results show that there is no strong evidence to show that immigration influences the overall aggregate level of unemployment, employment, participation and wages.

2.3 Empirical studies

(Friedberg & Hunt, 1995) examined the impact of immigration on host country wages, employment and growth using empirical approaches to evaluate the responses in the labour market. Their results show that wages drop by 0 to 1 percent when there is a 10 percent increase in the portion of immigrants in the population. In addition, the results suggest that there is no significant fall in employment of native workers because of immigration and concluded that the human capital levels of immigrants are crucial in determining the impact on native's per capita income growth.

(Borjas, 2003) re-examined the impact of immigration on the labour market, using U. S data from Decennial censuses from 1960 – 1990 and population data from 1998 - 2001. He used

differences in supply shifts across education-experience groups to carry out his analysis. He assumed that workers with similar education levels, but different levels of experience are active in the national labour market and are not substitutes. His results show that "immigration lowers the wage of competing workers. More specifically, "a 10 percent increase in supply reduces wages by 3 to 4 percent".

(Glitz, 2012) analysed the labour market impact of immigration in Germany using immigration inflow as a quasi-experiment of immigration. Analysing the effect of the flow on wages and skill-specific employment rates, his results show that there is no effect on relative wages and "a displacement effect of 3.1 unemployed workers for every 10 immigrants who get employed"(Glitz, 2012).

(Cohen-Goldner & Paserman, 2011) examined the wage and employment impact of highly skilled workers from the Soviet Union to the native workers in Israel using data from 1989 to 1999. Their findings show that in the case were immigrant labour and native labour is highly substitutable, the effect on wages will be very great in the short run but turns to decrease with time. More specifically, "a 10% increase in the share of immigrants lowers natives' wages in the short run by 1–3%, but this effect finishes after 4–7 years"(Cohen-Goldner & Paserman, 2011).

Chapter 3

Migration

This chapter provides an overview of the Norwegian migration history, discusses the evolution of Norway's immigration policies, and gives a brief account of the Norwegian labour market.

3.1 Overview of Norwegian migration history

In this section, an overview of Norwegian immigration and emigration history is given. Beginning with emigration, before the early 1900s Norway experience a large amount of emigration. Norway experienced the peak of its emigration in 1882 with US as their main destination. About 0.75million citizens left Norway before 1915. In addition, in terms of emigration intensity, Norway was second between the 1850s and the 1890s. After this period Italy overtook Norway in the ranking list of countries with the most emigration intensity. This massive emigration of Norwegian citizens had an impact on the Norwegian Labour market since most of its labour was being sold. There were even more concerns as approximately 0.5million emigrants were registered before the 1900 and these numbers later increased to about 0.75million by the year 1915.

However, despite this massive emigration rate Norway was still attractive to its Neighbours like Sweden since the wages in Norway were relatively higher at the time. Though there was a massive exodus in Europe during this period, we can also say emigration also generated immigration. Between 1880 and 1931, it was estimated that that about 4 million people returned to Europe, with a greater majority (about 3million) coming back in the early 1990s (that is between 1908 to 1923) (Brochmann & Kjeldstadli, 2008). US statistics show that that the Jews were the most reluctant group to return with only about 5% of its emigrants returning. On the other hand, the Serbs, Montenegrins and Bulgarians experienced the highest return rate with about 89% while approximate 22% of Scandinavians returned alongside other emigrants of western and Northern Europe. (Brochmann & Kjeldstadli, 2008).

In the 1880s and early 1990s, Norway experienced alternating streams of immigration and emigration. The 1801 census documents that of all the sure names registered, only 2% were of foreign origin. Though this period was dominated by emigration, Norway registered more immigrants than emigrants between 1814 to 1843. After this period, emigration dominated until 1930. From the mid-1990s to the early parts of the 20th century Norway transformed to a

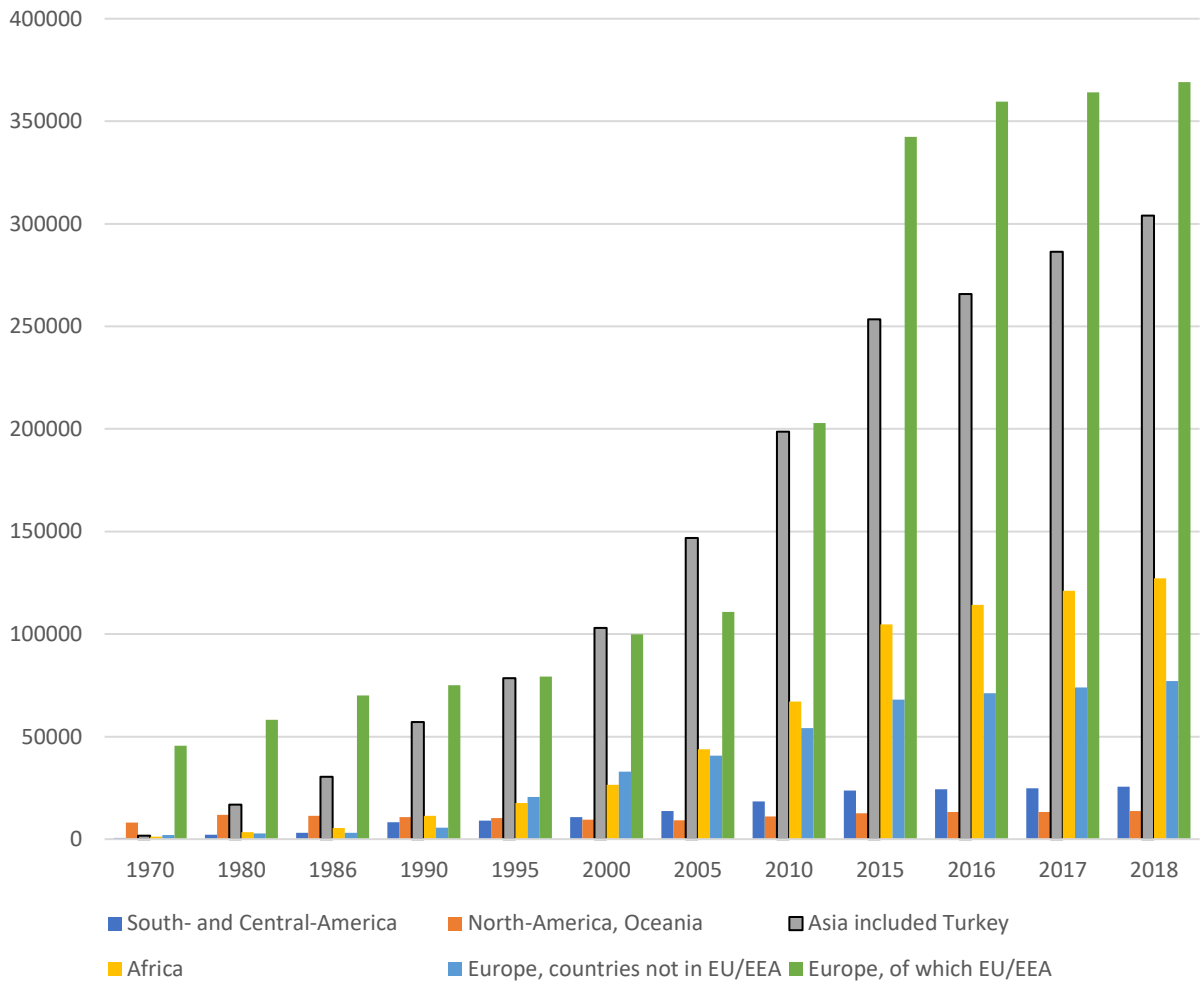
modern society with technological advancement, a more ordered social classes, industrial capitalism and urban absorptions.

Norway experienced its first immigration wave in the early 1960s. This was because of an increase in labour demand in the oil sector. Pakistanis and Turkish men dominated this wave. However, this immigration wave ended because of the oil crises in 1973. Norway experienced another immigration wave in the late 1970s and a third wave by the mid-1980s which was dominated by asylum seekers. This suggests that immigration during this wave was not mainly due to employment preferences. Dating back to 1992, it was estimated that the immigrant population made up 4.3% of the Norwegian population with a total of 183000 immigrants. In addition, the net migration during this year was 9,105 individuals. Net migration rose to a peak of 48,714 individuals in 2012. Since then, net migration was on a decline and by 2016, net migration figures stood at 27,778 individuals (Wikipedia, no date: online).[1]

According to SSB (2018), Norway is host to 5 295 619 inhabitants. The total male population is 2 668 371 inhabitants (50.4% of the total population) while the female population constitutes 2 627 428 inhabitants (49.6%). As of January 1st, 2018, it was estimated that immigrants make up about 14.1% of the total population of Norway and 3.2% constituted Norwegians-born to immigrants.

[1] https://en.wikipedia.org/wiki/Immigration_to_Norway

Figure 1 Immigrants and Norwegian-born to immigrant parent by country background from 1970 to 2018

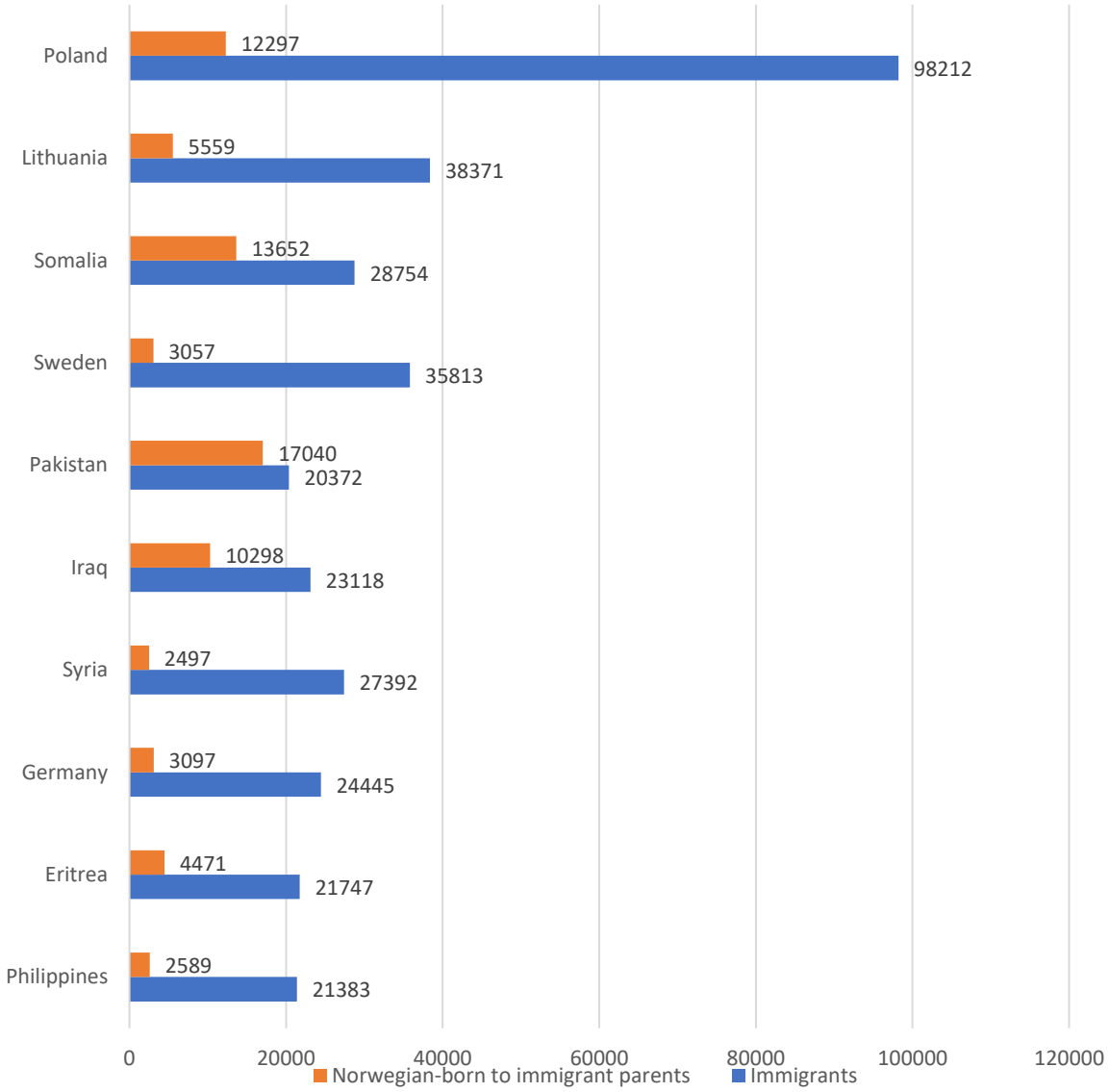


Source: Statistics Norway.

From figure 1 above, most of the immigrants come from Europe excluding Turkey, Asia including Turkey and Africa. Europe makes up the highest share of immigrants followed by Asia, Africa, South and Central-America North America and Oceania respectively. Immigration levels among immigrants from Europe, Asia and Africa have increased since 2010 until date while changes in immigration levels of immigrants from North America, Oceania, south and central-America have been negligible since 2010 until date.

To have a better understanding of which countries dominate the immigration population in Norway, figure 2 below gives an overview of the top 10 largest immigrant groups as of January 1st, 2018.

Figure 2 Immigrants and Norwegian-born to immigrant parents by country background. The ten largest groups, 1 January 2018. absolute



Source: Statistics Norway (SSB)

From figure 2 Poland make up the largest percentage of the immigrant population in Norway with 98212 immigrants and 12297 Norwegians born to immigrant parents. Lithuania in second place, Somalia in third place Sweden in fourth and Pakistan in fifth place. In addition, Pakistan has the highest Norwegian-born to immigrant parents (17040).

Table 1 Immigrants by reason for immigration

	2017	Change in percent		Total immigration since 1990
		2016-2017	2007-2017	
Total	42064	-17.6	-5.3	831166
Labour	13839	-5.1	-35.3	276724
Family	15974	-4.5	16.0	299733
Refuge	7808	-48.7	48.0	164456
Education	4052	-2.50	4.6	85022
Other	390	25.0	242.1	4473
Unknown	1			758

Source: Statistics Norway (SSB)

Table 1 presents statistics on immigrants by reason for immigration from 1990-2017. From the table we see that Norway has received a total of 831166 immigrants. In addition, the aggregate values indicate that the number of immigrants for labour reasons is higher than for any other reasons (family, Refuge, education, other and unknown). However, we also observe that between 2016-2017, the total percentage change in the number of immigrants dropped to -17.6% compared to a -5.3% between 2007-2017. In 2017, Family was the main reason for immigration with a total of 15974 immigrants.

3.2 The Evolution of labour immigration policies.

In the late 1950s and early 1960s, Norway experienced an increase in labour immigration due to an increase in the demand for workers in the oil sector. This phase of labour immigration until the early 1970s was characterised by no immigration labour policies (Brochmann & Kjeldstadli, 2008). Immigration during this phase was not high but there were some basic rules on how to receive new immigrants in different counties. The non-policy phase however stopped in 1975 with the introduction of the immigration stop. One of the reasons for this policy was the shortage of housing since immigration was viewed to be increasing the problem of housing at the time. This policy saw the start of restrictive policies on immigration in Norway. This policy however targeted mainly labour immigrants. There were restrictions on immigrant

labour and visa issuing occasionally depending on the skill level of the immigrant. Companies were also expected to employ a limited number of immigrants. For example, "the 25%-rule was introduced and required that under no conditions could there be more than 25%-immigrant workers in a company" (Tellez, 2008). As immigration levels started rising in the southern part of the country, policy establishments were therefore created to handle all immigration issues. This phase was known as "the phase of policy establishment". During this phase new measures included: "limited, controlled immigration combined with active policy of integration and recognition of cultural diversity" (Brochmann, 2012). Immigrant workers were also required to be proficient in the Norwegian language (speak, read and write).

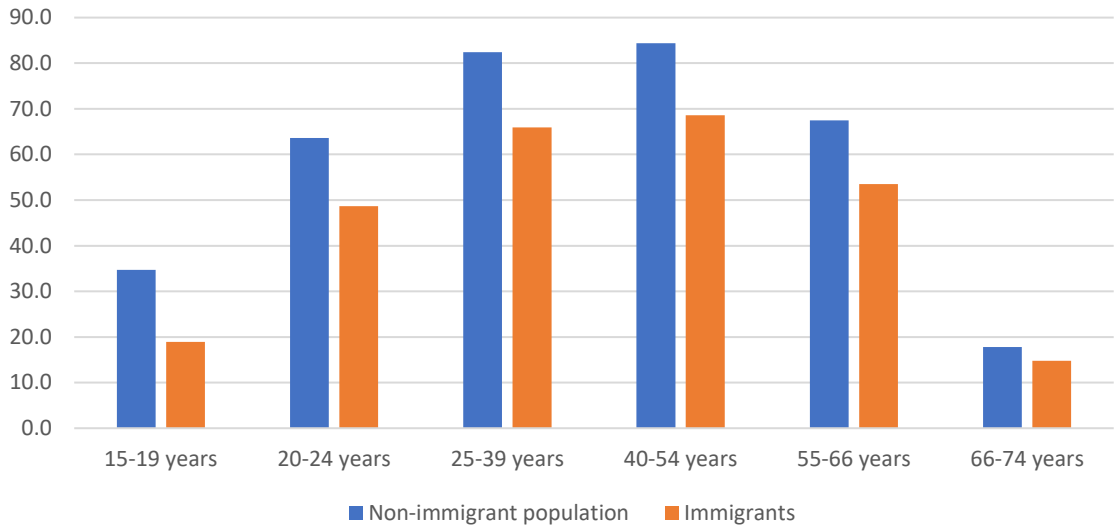
These new policies of the 1970s were consolidated in the 1980s and 1990s. All through these two decades, the policies were expanded, well carved out and new establishments created. In addition, the policies were for targeted at specific groups. Policy reappraisal began in the 2000s. This period saw the introduction of new legal rules with more importance on the obligations of new immigrants in the society. However, because of rapid economic growth, Norway instead experience a labour shortage in the 2000s. There were major concerns on how to resolve this labour shortage problem in Norway since Norway was also facing competition with other EU countries in the demand for labour. However, to resolve this Labour shortage problem a law was passed in 2008 which required that EU citizens were free to move to Norway and work and will not require a resident permit nor a visa. The only requirement was a job offer and backing from their employer. On the other hand, non-EU citizens needed a resident and a work permit. This therefore means that the labour immigration policies had an impact mostly on non-EU immigrants. In summary most immigration policies targeted mostly immigrant workers from non-EU countries and were more restrictive as they paid a lot of attention to "the quality and characteristics of the immigration flow and their performance in the Norwegian labour market"(Tellez, 2008).

3.3 The Norwegian labour market

According to an SSB report published on March 30th, 2017, the 4th quarter report of 2016 indicates that "390000 immigrants were employed". In addition, immigrants between the age of 15-74 years made up 60.2% of this category while the employment rate in the rest of the Norwegian population was 66.7%. However, employment rates between the different immigration groups were different. Immigrants from Nordic countries had the highest employment rate of 72.6%. This was closely followed by immigrants from EU countries in

Eastern Europe with an employment rate of 70.1% while 67.2% employment rate was registered for immigrants from western Europe. Employment rates of Immigrants from North and Latin America were between 60 and 62% while Asian immigrants had a 52% employment rate. African immigrants registered the lowest employment rates of 42.3%.[2]

Figure 3 Employed, 15-74 years by immigrant background and age. In per cent of person in total within each group. Q4.2016



Source: Statistics Norway

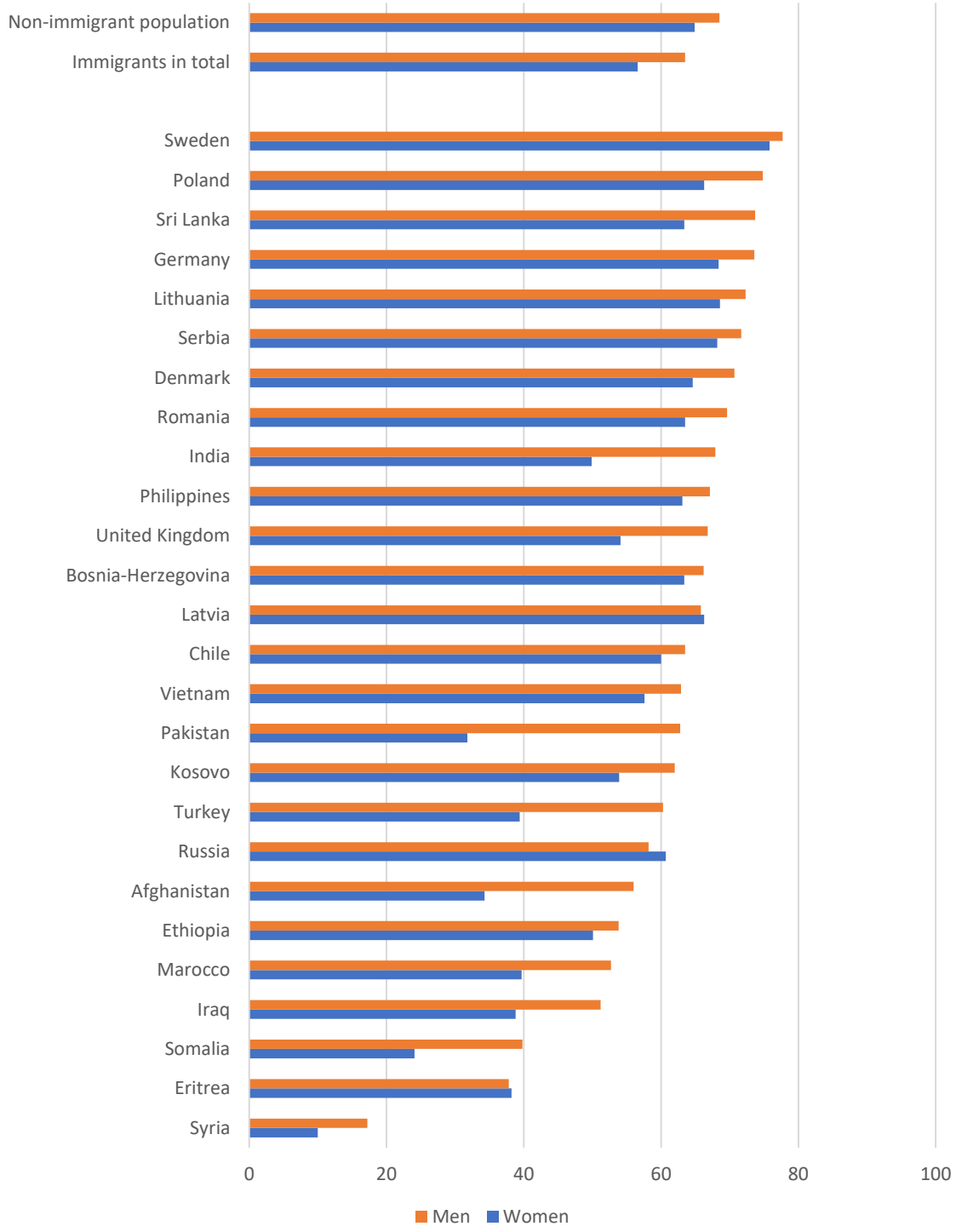
There exist a 6.5% difference in the employment rate between non-immigrant and immigrant population. This is based on the Labour market report of statistics Norway which covers individuals from 15-74years. For individuals between 15-66years, this disparity is higher (11.3%). Individuals between the ages of 25-54 years are considered the most active economic group. 75% of immigrants fall within this group. However, the employment rate difference between immigrants and non-immigrant population in this group is even higher at 16.2%.[3]However the employment rate of immigrants based on the 4th quarterly report of 2016 was 63.5% and 56.6% for immigrant men and women respectively with a 6.9% disparity. In

[2] https://www.ssb.no/en/arbeid-og-lonn/artikler-og-publikasjoner/60-per-cent-of-immigrants-are-employed

[3] https://www.ssb.no/en/arbeid-og-lonn/artikler-og-publikasjoner/60-per-cent-of-immigrants-are-employed

addition, this disparity also differs among the various immigration groups with some countries having a very big difference. This is shown on figure 4 below

Figure 4 Employed, 15-74 years by immigrant background and age. In per cent of persons in total within each group. Q4. 2016



Source: Statistics Norway.

From figure 4 above we see that the gender employment disparity is greater among immigrants from Iraq, Chile, Turkey, United Kingdom, Somalia, Afghanistan, Morocco, Pakistan and India. However, the disparity among immigrants of Eritrea, Ethiopia, Russia, Latvia and Sweden are similar. Though the employment rate of men is greater in most immigrant group. Women dominate in a few groups like Eritrea, Russia and Latvia.

Chapter 4

Theoretical Framework

This chapter of the thesis presents a theoretical framework which provides a better understanding of how the labour market of a host nation is influenced by immigration. A modern theoretical model with equilibrium unemployment on how immigration affects unemployment and wages of host country will be used.

4.1 The Model

The selected model to help capture this effect is the "search-matching analysis of the labour market" adopted from (Ortega, 2000). The model is advantageous in that it offers a "basic structure for the labour market to open the door for analysis of co-ordinational issues"(Ortega, 2000). However, others who have written extensively on the search market analysis are Peter Diamond (U.S.), Dale T. Mortensen (U.S.), and Christopher A. Pissarides (UK**)**, 2010 Economics Nobel prize winners for "their analysis of markets with search frictions"[4]

To better understand the model, we make some assumptions:

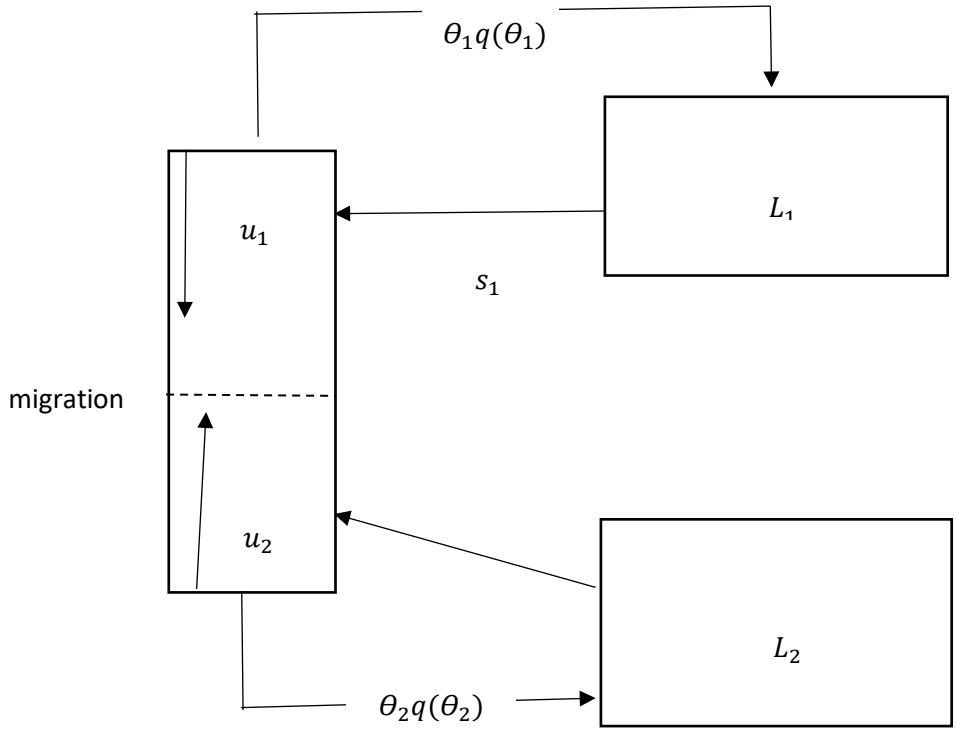
- The economy is made up of two countries which differ in terms of structural characteristics which in this case is the rate of separation from unemployment.
- Workers originate (born) from both countries and can decide to search for a job abroad or in their country of origin when they are unemployed.
- Wages are the Nash cooperative outcome that results from the bargain between each firm and a worker.
- Firms provide job vacancies and consider the average cost of job search of workers in search of jobs in both countries.
- Time is not fixed(infinite) and analysis are done in steady state.

  Next the model is presented as follows:

The economy is made up of two countries represented as $i = 1, 2$. the number of individuals born in each country is given by N which is normalised to 1 in this model. The model structure is illustrated below.

[4] https://www.infoplease.com/arts-entertainment/nobel-prizes/nobel-prize-economic-science

Figure 5 The dynamic structure of the model



Source: adopted from Ortega (2000).

It should be worth noting that workers are in four different stages at any point in time in both countries. That is, they are either unemployed or employed in each of the countries. These stages are denoted as u_i and L_i respectively where $i = 1, 2$. The probability of transition between the two countries take Poisson rates.

$m_i =$ Flow from unemployment to employment in the various countries.

$v_i =$ the number of job vacancies in the respective countries.

m_i is determined by constant return to scale of the matching function. Which is given as:

$$m_i = m(v_i, u_i) \qquad i = 1, 2 \tag{1}$$

The probability that a firm contacts a worker is given as:

$$q(\theta_i) \equiv \frac{m(v_i, u_i)}{v_i} = m\left(1, \frac{1}{\theta_i}\right) \qquad i = 1, 2 \tag{2}$$

The probability that a worker contacts a firm is given as:

$$\frac{m_i}{u_i} = \frac{m(v_i, u_i)}{u_i} = m(\theta_i, 1) = \theta_i q(\theta_i) \quad (3)$$

Market tightness in the respective countries ($i = 1, 2$) is given as $\theta_i \equiv \frac{v_i}{u_i}$

Assuming s_i = the exogenous separation rate between in the respective countries. The dynamic form of the model is given as:

$$\frac{dL_i}{dt} = \theta_i q(\theta_i) u_i - s_i L_i \quad (4)$$

Next, we consider the "***employment and unemployment income of workers"***. Here the productivity and the cost of job search when workers are unemployed is assumed to be heterogenous and highly depends on if the individual is abroad or in his country of birth. The economic cost of emigration is captured by the extra cost incurred in looking for a job out of the home country.

Next, we denote the cost of job search of an unemployed worker born in country *j* looking for a job abroad i ($i, j = 1,2$). as C_{ij}

Let $C_{11} = C_{22} = 0$ and $C_{12} = C_{21} = 1$ (5)

U_{ij} = expected discounted income flow when a native of country *j* ($i, j = 1,2$) is unemployed in country i . when employed, the value is denoted as E_{ij}. Considering a stationary environment, the equation is given as:

$$rU_{ij} = -C_{ij} + \theta_i q(\theta_i)(E_{ij} - U_{ij}) \quad (6)$$

Where $E_{ij} - U_{ij}$ = capital gain from finding a job

$$rE_{ij} = w_{ij} + s_i(E_{ij} - U_{ij}) \quad (7)$$

Where w_{ij} = what a worker born in country *j* earns when he gets employed in country *i*, and

$E_{ij} - U_{ij}$ = capital loss in case of a separation.

We now consider a "***Firms Optimisation decision and informational Hypothesis***"

The endogenous probability of filling a job vacancy posted by a firm is $q(\theta_i)$, v_i = value when the job is unfilled and let γ = cost of posting a job vacancy. In addition, we assume that

the firm is not biased between native and immigrant workers when posting a job[5]. Here, $J_i^e =$ expected value of job being filled. In addition, the expected value of a job being unfilled (unfilled vacancy) can be written in terms of J_i^e.

$$rV_i = -\gamma + q(\theta_i)(J_i^e - V_i) \tag{8}$$

When a firm gets in contact with a worker it can determine her nationality. However, a firm in country *i* will earn an income (J_{ij}) based on the wage bargain process. The income function is specified below.

$$rJ_{ij} = y - w_{ij} + s_i(V_i - J_{ij}) \tag{9}$$

Where y= productivity of a worker (identical for all workers), w_{ij}=wages paid to workers from country j, $(V_i - J_{ij})$= capital loss which is borne with probability of separation ($s_i$dt).

$$J_i^e \equiv \eta_i J_{ii} + (1 - \eta_i)J_{ij} \quad i \neq j \tag{10}$$

Equation 10 above is the equation of the expected value of a job being filled in country *i*, where η_i=probability for a native in country *i* to fill a job vacancy when she meets a firm. This is given below.

$$\eta_i = \frac{1 - \pi_i}{1 - \pi_i + \pi_j} \tag{11}$$

Where π_j= fraction of individuals born in country *j* leaving country *j*. we now assume that firms can post job vacancies continuously and only stop when the expected benefits(income) from posting an extra vacancy is zero. From (8), ($v_i = 0$, for $i = 1, 2$) this implies the following.

$$J_i^e = \frac{\gamma}{q(\theta_i)} \quad i = 1, 2 \tag{12}$$

Thus, the cost of posting a job=expected income from the vacancy being filled at equilibrium.

[5] This hypothesis could be well understood if there is a law (legislation) which forbids the specification of vacancies in terms of nationality(Ortega, 2000).

We now consider a ***wage setting and unemployment income.***

Wages are assumed to determine by the firm and each individual through a bilateral Nash bargain. When an agreement is reached, workers income $=E_{ij}$, U_{ij}=workers threat point. On the other hand, the firm receive an income J_{ij} when there is a match while its threat point is given as V_i.

$$\max_{w_{ij}}(E_{ij}-U_{ij})^{\beta}(J_{ij}-V_i)^{1-\beta} \qquad (N)$$

w_{ij} is the solution of (N) which is solved below. The bargaining power of workers = β.

$$w_{ij}=\frac{\beta y(r+s_i+\theta_i q(\theta_i))}{r+s_i\beta\theta_i q(\theta_i)}-\frac{(1-\beta)(r+s_i)}{r+s_i\beta\theta_i q(\theta_i)}C_{ij} \qquad (13)$$

It's worth noting that wages are positively influenced by labour market tightness (θ_i). In addition, the wages of natives are higher than that of immigrants in any given country[6]. Based on the solution of the Nash bargain, the expected wage in any given country *i* is given as:

$$w_i^e=\beta y+\beta\gamma\theta_i-(1-\beta)c_i^e \qquad (14)$$

Based on the cost of job search structure in (5), the average search cost of country i also signifies the portion of immigrants in the country (i).

$$c_i^e=1-\eta_i \qquad (15)$$

Substituting (15) in (14) we have

$$w_i^e=\beta y+\beta\gamma\theta_i-(1-\beta)(1-\eta_i) \qquad (16)$$

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[6] "Indeed, the position of an immigrant in the wage bargaining is 'weak', since in the absence of an agreement, she must continue to bear a high cost (Cij= 1) while unemployed. This leads to a division of the surplus generated by the match which is more favourable for the firm. There is empirical evidence that this may be the case. Kee (1995) studies whether native-immigrant wage differentials in the Netherlands (in 1984-5) can be explained by 'wage discrimination' (lower pay for given productivity). His conclusion is that: 'discrimination exists against Antilleans and Turks. Respectively 11 percentage points (35%) and 6 percentages points (15%) of their log wage difference with natives is attributable to tastes for discrimination' (p. 315).16 Interpreting the higher search cost for immigrants in terms of the cost of learning a language, there is also an empirical literature analysing the effects of language proficiency on the earnings of immigration".(Ortega, 2000)

The expected income when a native of country *j* is unemployed in country *i* is given below. This will however depend negatively on C_{ij}, s_i and positively on the ease of finding a job $(\theta_i q(\theta_i))$.

In addition, the matching probability and workers region of origin account for the variation in expected income resulting from unemployment.

$$rU_{ij} = \frac{\beta y \theta_i q(\theta_i) - (r + s_i)C_{ij}}{r + s_i + \beta \theta_i q(\theta_i)} \tag{17}$$

Next, we look at ***the migration decision and matching probability*.**

Here, the average wage which a firm is expected to pay its workers is the major determinant of the expected value of a filled vacancy. Taking $v_i = 0$ and using the expectations in equation (9)

$$J_i^e = \frac{y - w_i^e}{r + s_i} \tag{18}$$

Recall that $J_i^e = \frac{\gamma}{q(\theta_i)}$ from (12) that is the cost of posting a job=expected income from the vacancy being filled at equilibrium. Equating (12) and (18) and using the expression (w_i^e) in (16), we obtain an equation which determines θ_i as a "function of the conditional probability of meeting an immigrant $(1 - \eta_i)$.

$$\beta y \theta_i + \gamma(r + s_i)\theta_i^{1/2} - (1 - \beta)y - (1 - \beta)(1 - \eta_i) = 0 \tag{19}$$

We assume a Cobb-Douglas function for convenience and α=0.5. The sole solution(positive) of (19) is given as:

$$\theta_i = \left[\frac{-\gamma(r + s_i) + \sqrt{\gamma^2(r + s_i)^2 + 4\gamma(1 - \beta)(1 - \eta_i)}}{2\gamma\beta}\right]^2. \tag{20}$$

The tightness in Region *i* and $\theta_i q(\theta_i)$ is a positive function of the portion of immigrants in search of jobs in that country. Thus, given that a firm takes a decision on the number of vacancies to be posts based on average cost of jobs search and can simultaneously pay low wages when the cost of job search is high, it there for means that there will be there will be an increase in labour demand by firms in a country where immigrant labour is high. In addition, when the matching probability is high individuals will turn to migrate more.

Let's now consider the following: $rU(c,\theta) =$ unemployment value for workers with cost of job search (c), with a market tightness (θ) . The labour market tightness for country *i* when $\pi_j = 0, \pi_j = 1$ is $\widetilde{\theta_i}$ and θ_i^{**} respectively. The decision to migrate in country $(i = 1, 2)$:

$\pi_j = 0$ if $rU(0,\theta_j) > rU(0,\widetilde{\theta_i})$

$\pi_j = 1$ if $rU(0,\theta_j) > rU(0,\theta_i^{**})$ (M)

$\pi_j = \pi_j^*/rU(0,\theta_j) = rU(0,\theta_i)$

The first equation indicates that natives in country *j* should not migrate if the unemployment income of remaining in country *j* is higher than that of country *i* when there is no emigration. On the other hand, the second situation shows an extreme circumstance where everyone emigrates. Here, individuals will all be advised to migrate if the income from emigration is greater than the unemployment income of remaining in country *j*. The last equation shows a situation where only a portion of the population of country *j* profits from emigration.

4.2 Equilibria

It's worth noting that the separation rate accounts for the exogenous differences in the regions. In addition, if $s_i > s_j$ then country *i* is said to be a structurally bad region. For our analysis in this paper region *i* is assumed to be the structurally bad region.

4.2.1 No-immigration Equilibrium.

Here, workers are not motivated to emigrate from country *i* to another country*(j)* in search of jobs. Country *i* labour market tightness is $\widetilde{\theta_i}$ at equilibrium where there is no-migration. Workers fail to migrate because $rU(0,\widetilde{\theta_1}) > rU(0,\widetilde{\theta_2})$ and $rU(0,\widetilde{\theta_2}) > rU(0,\widetilde{\theta_1})$ respectively. In addition, workers search for jobs only in their country of origin this means $(\pi_1 = 0, \pi_2 = 0)$ and $\eta_1 = \eta_2 = 1$ since firms contact only native workers. Substituting in (20) we realise a low labour market tightness in both countries when there is no-migration. Assuming $C_{11} = C_{22} = 0$ in (13) and substituting for $\widetilde{\theta_i}$(labour market tightness) in (20), the equilibrium wage $w_{11}^* \; and \; \widetilde{w}_{22}$ is given below:

$$\widetilde{w}_{ii} = \frac{y(2\beta - 1 + \sqrt{F_i})}{1 + \sqrt{F_i}} \; for \; i = 1,2, \qquad (21)$$

Wages depend on *y*(productivity) in each region while $F_i \equiv 1 + 4\gamma^{-1}(r + s_i)^{-2}(1 - \beta)\beta y$. Furthermore, the equilibrium level of employment in the respective countries is $\widetilde{L_1}, \widetilde{L_2}$ respectively. Assuming $dL_1 = dL_2 = 0$ in (4) then:

$$\tilde{L}_i = \frac{\tilde{\theta}_i^{1/2}}{s_i + \tilde{\theta}_i^{1/2}} N_i = \frac{\tilde{\theta}_i^{1/2}}{s_i + \tilde{\theta}_i^{1/2}} \tag{22}$$

Since $N_i = 1$.

4.3 Migration Equilibria

Here we look at the various solutions which are attainable under migration equilibria which include: Interior solution, corner solution and lastly the uniqueness or multiplicity of equilibria.

4.3.1 Interior solution

When there is emigration of the population from the structurally bad to another country, an equilibrium exists for certain parameter values. This is in accordance to proposition 1.

Proposition 1. If $s_1 > s_2$ and

$$y\sqrt{F_2} - 1 < (1 + y)\sqrt{F_1} < +y\sqrt{F_2}\sqrt{1 + \frac{1 - F_2^{-1}}{2y}}$$

An interior equilibrium exist "with migration from country 1 to country 2 characterised by"(Ortega, 2000):

(i) Market tightness:$\theta_1^* = \widetilde{\theta_1}$ and

$$\theta_1^* = \left[\frac{r+s_i}{2\beta}\left(\frac{1-y}{y} + \frac{1+y}{y}\sqrt{F_1}\right)\right]^2 > \widetilde{\theta_2}$$

(ii) Migration

$$\frac{\pi_1}{1 + \pi_1} = 1 + y - \frac{\beta y \theta_2^*}{1 - \beta} - \frac{\gamma(r + s_2)\theta_2^{*1/2}}{1 - \beta}$$

(iii) Employment level:

$$(L_1^*, L_2^*) = \left(\frac{\tilde{\theta}_1^{1/2}}{s_1 + \tilde{\theta}_1^{1/2}}(1 - \pi_1), \frac{\theta_2^{*1/2}}{s_2 + \theta_2^{*1/2}}(1 + \pi_1)\right)$$

(iv) Wages: $w_{11}^* = w_{21}^* = \tilde{w}_{11}$ and

$$w_{22}^{*} = \frac{\beta\gamma\left(r + s_2 + \theta_2^{*1/2}\right)}{r + s_2 + \beta\theta_2^{*1/2}} > \widetilde{w}_{22}$$

At the equilibrium, as migration takes place from country 1 to 2, region 1 population is made up of only natives born in that country($\eta_1 = 1$). In addition, the vacancies available per worker in search of job is same ($\theta_1^{*} = \widetilde{\theta_1}$) since there is constant returns to scale. Natives of country 1 who do not migrate earn the same wages ($w_{11}^{*} = \widetilde{w}_{11}$). On the other hand, employment and firms labour demand in region 2 is boosted ($\theta_2^{*} = \widetilde{\theta_2}$) due to the presence of immigrants. In addition, immigrants in region 2 earn same wages as the would have had they remained in their region of origin.[7]

When immigrant search for jobs in Region 2, its natives earn higher wages ($w_{22}^{*} > \widetilde{w}_{22}$) because immigrants increase labour market tightness and wage bargaining is reinforced since immigrants compete with natives on newly posted vacancies.

We can demonstrate that when there is migration there will be no other equilibrium. Thus, a possible candidate is two equilibria. Since $s_1 \geq s_2$ that is thinking that country 2 is better does not stop an equilibrium from being reached when there is migration from country 2 to 1. However, if there exist greater employment Shocks(negative) than in country 2, this cant occurs since country 1 can't provide enough vacancies to motivate natives of country 2 to move to move to country 1.

Proposition 2 if $s_1 \geq s_2$ there will be no equilibrium when people migrate from country 2 to country 1.

Candidate number 2 occurs when people migrate simultaneously between country 1 and 2. However, this cannot be a possibility for an equilibrium to occur because incentives can't be created in both countries for migration to take place in both directions. Thus, once there is an incentive for natives of country 1 to move to country 2, the natives of country 2 will prefer to

[7] "The economic intuition behind this result is that all adjustments due to the arrival of immigrants are channelled through the matching probabilities. In other words, the firms' willingness to post additional vacancies does not lead to an adjustment in prices (higher wages for immigrants) but to an adjustment in quantities (a higher number of immigrants)"(Ortega, 2000)

remain in their home country because their employment prospects improve as immigrants arrive.

Proposition (3). It states that "there exist no equilibrium with simultaneous migration in both directions.

4.3.2 Corner solution

Here it simply means an equilibrium is attained when all agent in country 1 migrate to country 2. The conditional values of unemployment is:

$$rU\left(0,\widetilde{\theta_1}\right) < rU(1,\theta_2^{**}) \tag{23}$$

Where $\widetilde{\theta_1} =$ the labour market tightness of country 1 when there is no job search by immigrants in country 1. On the other hand, when natives of country 1 search for jobs in country 2 the labour market tightness is θ_2^{**} in country 2. This equilibrium exists when there is an interior equilibrium. At this equilibrium when the probability of meeting immigrants is high, more vacancies can be created, immigrant and native workers' wages increases. However, since native workers have a higher wage bargaining power.

4.3.3 Uniqueness or multiplicity of equilibria

The different qualitative outcomes of this model depend on how much a worker receives looking for a job without moving away from country 1 (the bad region) ($rU(0,\theta_1)$ and the value when the look for a job in in country 2 the better country ($rU(0,\theta_1)$. The number of individuals leaving country 1(π_1) does not influence the value of an individual who remains in country 1. In addition, though individuals in country 1 job search in country 2, the population of country 1 is homogeneous and firms keep wages constant in country 1. Hence, ($rU(0,\theta_1) = rU\left(0,\widetilde{\theta_1}\right)$ for all π_1.

As earlier mentioned, when there are more immigrants in a country (2), average wages in that country falls and it gives room for more vacancies to be created thus matching probability increases and the number of people leaving country 1 to job search in country 2.

The figure below shows the various equilibrium outcomes based on the structural characteristics of the various countries. The first outcome possibility occurs when the structural characteristics of both countries are similar. Thus, workers do not deem it necessary to migrate

in search of jobs in another country because the benefits from being employed abroad cannot compensate the migration cost. Thus, equilibrium can only occur when there is no-migration. This can be shown below where the constant wages of firms in country 1 = $rU\left(0,\widetilde{\theta_1}\right)$

Figure 6 Regions with close Structural characteristics

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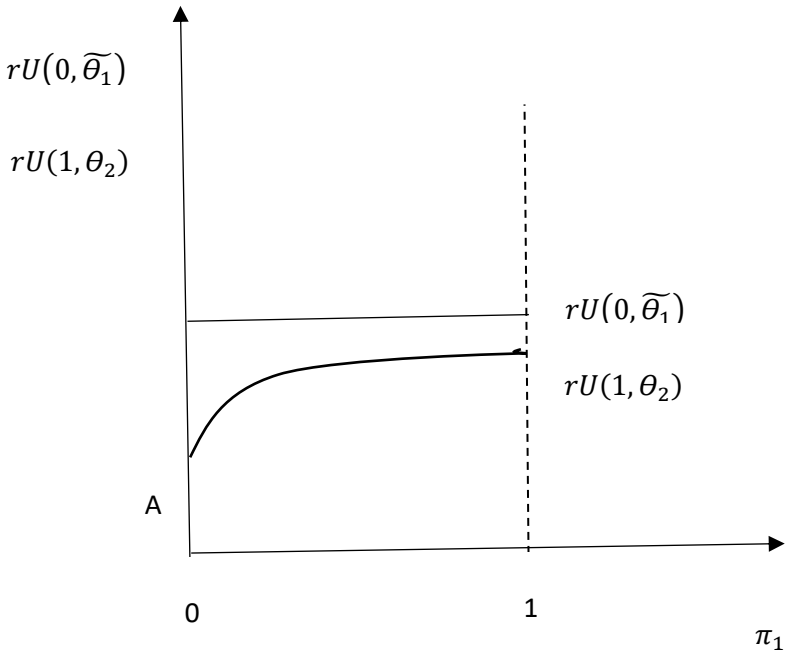

Source: adopted from Ortega (2000)

In addition, the second outcome possibility occurs when the structural characteristics in country 1 are very bad. This therefore means individuals in country 1 are encouraged to move in search of jobs in country 2 no matter how small the number of emigrants are. The unique solution in this case is C as shown in figure 7 below

Figure 7 Country 1 with very bad structural characteristics

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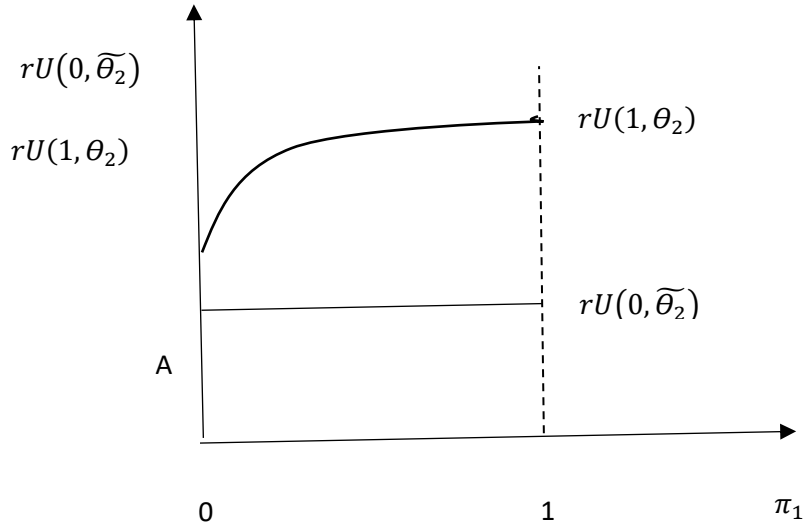
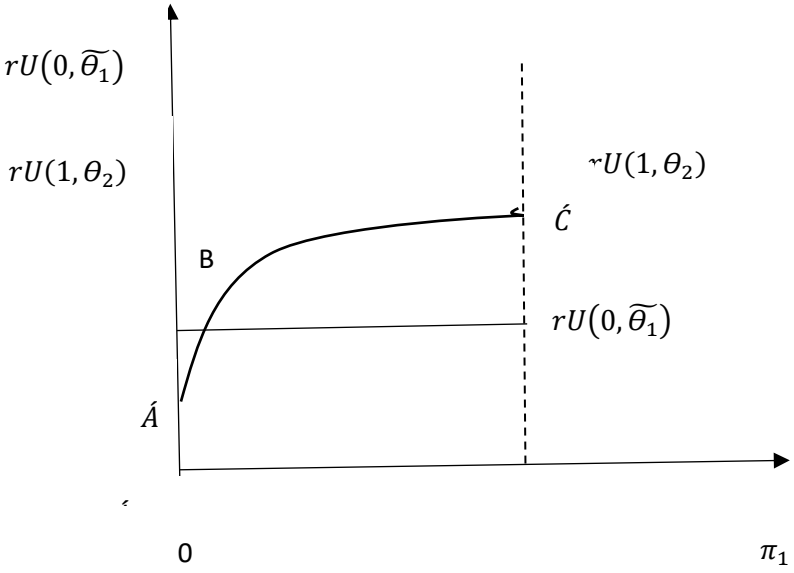


Source: adopted from Ortega (2000)

The third outcome possibility is that which results to a multiple equilibrium in this country/economy. This outcome relies on the interaction between agents thus structural characteristics of the country cannot directly determine this outcome. Because of the compatibility of the structural characteristics in the various regions, three outcomes can be generated: An equilibrium when there is full migration given as $(\acute{C})$,an equilibrium with no-migration $((\acute{A})$. These two equilibria are stable while the 3 equilibrium (B) which results from the interior migration situation is unstable. This is illustrated on the figure below.

Figure 8 Multiple equilibria



Source : adopted from (Ortega, 2000)

4.4 Welfare Analysis for the Multiple Equilibria Case

Here, the Pareto optimality measure will be used to rank the equilibria. Based on this criterion we show that the full-migration solution dominates the interior-migration equilibrium which in turn dominates the no-migration equilibrium. For our analysis we compare the various equilibria based on the situation of the different agents and assuming that even when migration does occur, it is from country 1 to 2.

4.4.1 No-migration versus Interior-migration

Here, $W(c_{ij}, \theta_i) =$ welfare measure which incorporates "into account the value of their expected discounted income when employed and when unemployed, and the respective probabilities of each of these state"(Ortega, 2000). The welfare measure is written as:

$$W(c_{ij}, \theta_i) \equiv e_i E(c_{ij}, \theta_i) + (1 - e_i) U(c_{ij}, \theta_i), \tag{24}$$

$e_i =$ employment rate $V_i = 0$. in addition, firms are identical and are not belong based only in a country. With the case of an interior-equilibrium, W_F(the expected value of a filled vacancy) is higher. This value is given by:

$$W_F \equiv \frac{L_1}{L} J_1^e + \frac{L_2}{L} J_2^e \tag{25}$$

In addition, at we must note that at each equilibrium has the same number of jobs filled and the aggregate number of filled jobs is greater that is $L^* > \tilde{L}$. Based on this we present the following proposition.

Proposition 4. This proposition states that "The interior migration equilibrium is Pareto-preferred to the no- migration equilibrium: the natives of 1 who do not migrate are indifferent $W(0, \theta_1^*) = W(0, \theta_1)$, immigrants and natives of 2 are strictly better-off $W(1, \theta_2^*) > W(0, \tilde{\theta}_1)$, and $W(0, \theta_2^*) > W(0, \tilde{\theta}_2)$, respectively). Firms are also strictly better-off ($W_F^* > \widetilde{W}_F$ and $L^* > \tilde{L}$)"(Ortega, 2000). The understanding behind this proposition shows that the conditions faced by natives of country who choose not to migrate are same after emigration.

4.4.2 Corner-Migration versus interior migration

The last proposition (5) states that the interior-migration equilibrium is pareto dominated by the corner-immigration equilibrium.

The model shows a general increase in welfare when immigration occurs. However, the cost of migration is too high that it cannot be covered by the benefits from migration, the no-migration in this case is the ideal equilibrium. In addition, when migration occurs from the bad country (1) to the good country (2) natives in the good country are better off there it will be wise to subsidise immigration to some extent.[8]

[8] "a system of Pareto improving transfers from natives to immigrants can be found"(Tellez, 2008).

Chapter 5

Experimental Methodology

Generally, people migrate from one region or country to another in search of better opportunities. However not all migration decisions are based on employment or location preferences. Individuals might sometimes migrate because of a change in policies, political instability and natural hazards which often result to large streams of immigration flows. The most appropriate approach to for estimating the labour market effect of immigration in this situation is the natural experiment approach.

Though this is not an empirical immigration study, in this section I discuss a research design which may be useful and applicable in future research involving the use of natural experiment. Choosing a method for estimating or analysing causal effects in Economics is becoming more interesting as experimental approaches/techniques are being implemented in research. Most migration studies have focused on standard econometric estimation techniques in showing the labour market effects of immigration on the host nation labour market outcomes, this study discusses an experimental design/approach of migration to capture this effect. I will start by discussing some experimental approaches followed by a more explicit discussion and explanation on natural experiments. After that I will present the difference in difference research design which can be used in empirical studies, examples of studies which have made use of this method and finally the advantages and disadvantages of using the natural experiments in migration studies.

5.1 Brief explanation of some experimental approaches in research

Experimental approaches to research have been very vital in many fields of study. Field experiments in particular have been used by many social scientists. (Harrison & List, 2004) provides a proposed taxonomy of field experiments. According to this taxonomy, field experiments are classified into artefactual field experiments, framed field experiments and natural field experiments. Artefactual field experiments in this case a much like lab experiments but the subject(s) which is being used for experimentation is not standard. Framed field experiments are simply artefactual experiments, but their difference is in the fact that the field here may be a task, a set of information which subjects can make us of or a community.

While natural field experiments are like the framed field experiments but the subjects in this case unconsciously take part in experiments and the task is are naturally undert Thus, the taxonomy of field experiments which classifies the various types field experiments also identifies their similarities and differences with laboratory experiments. (Harrison & List, 2004) identifies that laboratory experiments, artefactual field experiments and framed field experiments are associated with controlled data while Natural field experiments, Natural experiments, propensity score estimations, instrumental variable estimation and structural modelling are associated with Naturally-Occurring Data. When using naturally-occurring data, assumptions must be made to recognise the treatment effect.

Table 2 below illustrates how the earlier mentioned field experiments compare and differ with laboratory experiments. It also provides an "analysis of natural-occurring data"(Levitt & List, 2009).

Table 2 A field experiment bridge

	Controlled Data		**Natural-Occurring Data**				
Lab	AFE	FFE	NFE	NE	PSM	IV	STR
Lab	Lab experiments						
AFE	Artefactual field experiments						
FFE	Framed field experiments						
NFE	Natural field experiments						
NE	Natural experiments						
PSM	Propensity score estimation						
IV	Instrumental variable estimation						
STR	Structural Modelling						

Source: Adopted from Levitt and List (2009)

5.2 Natural experiments

This study discusses a natural experiment research design which can be applied in an empirical study using an econometric technique.

Firstly, a natural experiment can be defined as "an empirical study where individuals (or groups of individuals) are open to control and experimental conditions which are determined by nature or by other issues beyond the influence of the researcher" (Wikipedia, no date: online).

It could also be defined as "historical episodes that provide observable, quasi-random variations in treatment subject to a plausible identifying assumption"(Fuchs-Schündeln & Hassan, 2016). Based on the above definitions, we can deduce that the elements/episodes used in natural experiments can be observed and analysed but can't be controlled or designed by the researcher. As such, the researcher cannot assign participants to a specific control or treatment groups. The changes or differences which come because of a policy change or a law change provides researchers with a chance to examine the population as if it were part of an experiment.

Based on the second definition, the major episode which is considered in the natural experiment approach is policy intervention which is done by the policy makers of a nation or even a local government. These policies might include changes in migration policies/laws, tax laws etc. These policies might directly or indirectly influence immigration. To capture the effect of such episodes, analysis is done before and after changes take place to capture the effect of this policy change.

(Baláž, Williams, & Place, 2017) suggests that in migration research, natural experiments might include the analysis of data on migrants leaving from their country of origin prior to and after "an economic shock, migrants entering a host country under different regulatory regimes, or the health of migrants versus non-migrants"(Baláž et al., 2017). However, using an experimental approach in migration will depend on its accuracy and reliability.

(McKenzie & Yang, 2010) suggest that the majority of natural experiments conducted within the field of migration are linked to variations in the institutional setting and are sometimes referred to as policy experiments. In addition, such changes include: changes in migration policies for example, (Cattaneo & Wolter, 2012) used findings from natural experiments to show how changes in migration policy in Switzerland can boost/improve PISA results. Because

of this policy change, Switzerland experienced an increase in immigration from developed nations. In addition, the 2009 PISA test results of immigrant children experienced significant improvement as compared to 2000.

In Economics, natural experiments can be used for three purposes: the verification of fundamental model premises, quantification of policy parameters, and identification of causal instruments/mechanisms which are not present in conventional models.

In addition, natural experiments differ from other experimental approaches in social sciences. Researcher using field or Laboratory experiments are obliged to design these experiments in a way that permits causal interpretation/inference. On the other hand, the main job of researchers analysing natural experiments is to argue that the historical episode which are being considered looks like an experiment and to deal with limitations of the "ex-post experimental" setup that the researcher could have evaded a priori in a planned/designed experiment. To express that the episode which is being considered looks like a natural experiment, it very important to identify valid control and treatment groups and arguing that the identified treatment is assigned randomly.

(Tumen, 2015) suggest that an immigrant population consists of persons with characteristics which are different from those who are selected randomly from a sample. He therefor suggests that a solution could be to focus on episodes/events like natural catastrophes or hazards (floods, landslides, earthquakes, eruptions, etc) and Civil wars which cause fast and unanticipated streams of immigrants (refugees) into a country which are not related to their location, employment preferences and personal characteristics. Natural experiments conducted from natural catastrophes as outlined above are referred to as "natural natural" experiments.

5.2.1 Pros/advantages of the natural experiment approach

Using standard econometric techniques for estimating causal effects might be inaccurate in cases where relevant variables are omitted. The use of the natural experiment approach there for helps to eliminate this bias which stems from omitted variables. Therefore, the bias from sampling is very small.

In addition, this method can be applied in studies where instrumental variables cannot be manipulated due to ethical motives or other reasons. Another advantage of natural experiments

is that it has a high-level ecological soundness/validity. This makes it possible for this method to be applied in many other fields and thus it is applicable in the real world.

With natural experiments, the data is real, unchanged and cannot be influenced by the researcher doing the natural experiment.

5.2.2 Disadvantages of natural experiments

Despite the advantages of natural experiments, it also has its limitations. Given that researchers cannot control or influence the experiment, it is at times very difficult to estimate a causal effect since the instrumental variables cannot be manipulated. In addition, as compared to other standard econometric techniques, testing for reliability is not easy when using natural experiments and it is not easy to repeat/replicate such experiments.

When using natural experiments, the researcher may encounter unnecessary variables which can affect the validity of results. In addition, most natural experiments use historical episodes and therefore more useful in comprehending the past rather than the future.

Chapter 6

Econometric Methodology: The Difference in Difference (DID) Research Design

In this section, we present the Difference in difference research design. This is an econometric technique/tool which is used for the estimation of causal effects. More specifically, this design is very useful in a Quasi-experimental research which involves the comparison of the outcomes of various groups which are subject to various environmental conditions and policies over distinct time periods. Furthermore, this design provides a blueprint which can be applied in migration research and other Quasi-experimental studies involving different groups and time periods. Hence the design is applicable in empirical studies which examine or estimate the impact of changes in policies.

In many natural experiments/Quasi-experimental research/studies where this design in highly applicable, times is a key variable in the identification of the different groups. The Difference in difference research design can be used in studies involving multiple groups and time periods, I will present a simple design involving two groups and two time periods and a brief summary of a design which can be applied in research which involves multiple groups and time periods.

6.1 The two group two-period design

For easy understanding, we begin by assuming the following: firstly, we assume two groups: a control and a treatment group $(g = 1,2)$ respectively. These groups are observed before a policy change and after there is a change in policy. Thus, we consider two time periods $(t = 1,2)$. The period $t = 1$ denotes the period before treatment (the first period) while the period after the treatment (the second period) is denoted by $t = 2$. In addition, we assume that the control group is unaffected or uninfluenced by the change in policy while the treatment group is affected by this policy change.

Next, we introduce a dummy variable T_g which identifies the observations of the second group (2) this dummy variable is denoted $T_g = 1(g = 2)$. Since membership does not vary with time it justifies why the dummy variable has no time subscript. The observations of period 2 are denoted by $P_t = 1(t = 2)$. Since time does not change across the groups, P_t therefore has no group subscript. The product of the two dummy variables give the treatment variable (D_{gt}) in a simple Difference in Difference estimation. That is $D_{gt} = T_g$ x P_t.

However, since common trends are assumed in this two groups and two period difference in difference research design, this leads to " a simple statistical model of the treated and untreated potential outcomes"(Wing, Simon, & Bello-Gomez, 2018). In a simple difference in difference design, $Y(0)_{gt} = \beta_0 + \beta_1 T_g + \beta_2 P_t + \epsilon_{gt}$ is untreated likely outcome. In this case $\beta_0 =$ group 1 average untreated outcome in the first period (period 1) and $\beta_0 + \beta_1$ in the second period (period 2). On the other hand, in group 2, its average untreated outcome in the first period is = $\beta_0 + \beta_1$ and $\beta_0 + \beta_1 + \beta_2$ in the second period. However, based on the assumption that there is a common trend, the value of T_g indicates the time-invariant change/difference of the outcomes of the two groups while the value of P_t measures the joint effect of any uncaptured covariates which varies between both periods but influences the output of both groups in the same way. Practically, researchers refer to the value of β_1 as the group effect while β_2 = time trend.

Next the model of the treated outcome $Y(1)_{gt} = Y(0)_{gt} + \beta_3$ where $\beta_3 =$ treatment effect.

Based on both outcome specifications, the realised potential outcome is gotten by combining the treatment effect with both potential outcome models. The realised outcome is given as;

$Y_{gt} = Y(0)_{gt} + D_{gt}\left[Y(1)_{gt} - Y(0)_{gt}\right]$. Substituting the values of $Y(0)_{gt}$ and $Y(1)_{gt}$ we have

$Y_{gt} = \beta_0 + \beta_1 T_g + \beta_2 P_t + \epsilon_{gt} + D_{gt}\left[Y(0)_{gt} + \beta_3 - Y(0)_{gt}\right]$

Since $D_{gt} = T_g$ x P_t , the standardize Difference in difference equation is rewritten as:

$Y_{gt} = \beta_0 + \beta_1 T_g + \beta_2 P_t + \beta_3 (T_g \text{ x } P_t) + \epsilon_{gt}$.

This standard DID equation is easy to estimate especially when the study is dealing with data on time periods, outcomes, and group membership. However, this design doesn't accommodate the difficulty encountered in applications which comprise of multiple time periods and groups.

6.2 Multiple Groups and Time Periods.

The design under multiple groups and time periods is slightly different from the two group two period design. However, the main properties of the Difference in difference design can also apply in a wider set of circumstances. In the case of multiple groups and time periods (G ≥ 2 and T ≥ 2), $D_{gt} = 1$ implies the treatment is present in the group (g) and time (t). When the

treatment is absent, $D_{gt} = 0$. We also assume that any uncaptured determinants of the outcomes are group or time invariant.

The potential untreated outcome is expressed as $Y(0)_{gt} = a_g + b_t + \epsilon_{gt}$, where $a_g =$ joint effect of the time invariant feature of group g, while $b_t =$ joint effect of time changing but invariant group features.

On the other hand, the model of the treated outcome $Y(1)_{gt} = Y(0)_{gt} + \delta$ where δ = treatment effect parameter.

The realised outcome in this case which is obtained by combining both equations is given as

$Y_{gt} = Y(0)_{gt} + D_{gt}\left[Y(1)_{gt} - Y(0)_{gt}\right]$.

Substituting $Y(0)_{gt}$ and $Y(1)_{gt}$ we have $Y_{gt} = a_g + b_t + \epsilon_{gt} + D_{gt}\left[Y(0)_{gt} + \delta - Y(0)_{gt}\right]$. $Y(0)_{gt}$ cancels out and the resulting generalized difference in difference equation for estimation is given as:

$$Y_{gt} = a_g + b_t + \delta D_{gt} + \epsilon_{gt}$$

However, researchers employ "fixed regression models" for estimating δ.

For strict exogeneity, the following formula is required

$$E\left[Y(j)_{gt} \backslash a_g, b_t, D_{g1} \dots \dots D_{gT}\ \right] = E\left[Y(j)_{gt} \backslash a_g, b_t\ \right] for\ j = 0, 1.$$

6.3 Important points to note

The generalized difference in difference research design depends on the assumption that the "important unmeasured variables are either time-invariant group attributes or time-varying factors that group are group invariant"(Wing et al., 2018).

However, this design has some limitations/ challenges when it comes to causal inference. Migration studies which make use of natural experiments demonstrate that immigration might not be driven by economic motives and therefore seek episodes which show that the location and time of movement is due to political reasons. It is therefore logical to say that not all migration decisions are based on employment or location preferences.

6.4 Migration studies which have made use of the difference in differences technique

(Card, 1990) examined the labour market effect of Mariel Boatlift of 1980 in Miami. The number of Cuban immigrants in Miami was estimated at about 125000 by September 1980. These immigrants were dominated by unskilled workers. Miami's labour market also experienced some rapid changes within that period. There was a 7 per cent growth/increase in the labour force and a 2.1 per cent (from 5% to 7%) increase in the unemployment rate between the months of April and July in 1980. (Card, 1990) used data from the current population survey to carry out his analysis. He considered the unemployment rate, the employment rate and the wages of unskilled Cubans, non-Cuban Hispanic, Blacks and whites. His results show that Cubans were affected negatively.

However, to ascertain if these labour market changes in Miami were because of the influx of immigrants, Card (1990) compared Miami's labour market with that of Houston, Los Angeles, Tamp-St. Petersburg, and Atlanta which all have a high population of blacks and secondly because in the late 1970s and early 1980s these cities showed similar economic growth patterns with that of Miami. Card further did a comparison of Miami's unemployment rate in 1979 and 1981 that's is before and after the Mariel Boatlift. He employed the difference in difference technique in carrying his analysis. His results from this technique, show that black worker witnessed a 1.3 percentage increase in their unemployment rate while the white workers experienced a fall in unemployment rate (dropped by 1.1 Percent). However, despite Miami's 7 percent population growth which was caused by the Mariel boatlift, (Card, 1990) suggests that Miami's ability to contain such an increase was due to the fact the boatlift led to a displacement of both natives and other potential immigrants who would have move to Miami had the boatlift not occurred. In addition, he suggests that Miami might have experienced an increase in industrial growth with new industries who made more use of unskilled labour. Thus, it was possible to absorb this immigrant population given that they were dominated by unskilled labour.

Another study which made use of natural experiments and whose approach is similar to that of (Card, 1990) is (Hunt, 1992) who examined the French labour market impact of the 1962 repatriates from Algeria. In 1962 France received an influx of about 900,000 immigrant who were Algerian repatriates and of European origin. This repatriation happened after Algeria gained its independence in 1962. The timing of this immigration was exogenous and was not

due to economic reasons. This sudden influx of immigrants in to France led to a shock in the French labour market which accounted for a 1.6 percent increase in the French labour force. However, these immigrants were made up of mostly skilled workers and had location preference which was based on temperatures. Hunt used census data for 1962 and 1968 to carry out his analysis. The Census data of 1992 was conducted before the repatriation. The results indicate that in 1968, non-repatriates experienced a 0.3 percentage increase in their unemployment rate. In addition, in 1967, the national average annual salaries dropped by 1.3 percent. Furthermore, a 1 percent point rise in the proportion of repatriates is related to wages which were not greater than 0.8 percent in 1967. However, there was no evidence that internal migrants and other immigrants were not willing to move to regions/areas which had more repatriates.

This approach has also been applied in studies where the migration flow is very massive and, in most cases, driven by natural hazards civil wars and political instability. (Ceritoglu, Yunculer, Torun, & Tumen, 2017) examined the impact of Syrian refugees on Turkeys natives labour market outcomes using a Quasi-experimental design. This massive flow of Syrian refugees to the South-eastern Part of Turkey started on March 2011 and was caused by a civil war in Syria thus these migrants had no location preference. "The UN estimates that, by the end of 2014, around 3.6 million Syrian refugees had fled to neighbouring countries, and that Turkey alone had received more than 1.6 million"[9](Tumen, 2015) .

In addition, this study captures the native labour market impact of Syrian refugees using the natural experiment approach. Applying a difference-in-differences approach, it was found that because of the massive influx of refugees in this region, employments outcomes of native workers were affected to a considerable level while wage affects were found to be negligible. In addition, the study also found that increase in social services resulting from refugee influx caused a small increase in formal employment. On the other hand, many native workers in the refugee receiving regions lost their jobs. Given that informal employment prevails or dominates in the Turkish labour market, the negative impact of refugee influx on native labour outcomes

[9] https://wol.iza.org/articles/use-of-natural-experiments-in-migration-research/long

The use of natural experiments in migration research

increases. The most affected groups according to this study were worker who were less educated, younger workers and women.

However, the difference in difference method though helpful, it can also be problematic when applying it in migration studies. This stems from the fact that it is not clear how the control and treatment groups are defined when dealing with immigration.

Chapter 7

Concluding discussion

The main aim of this thesis has been to provide a blueprint and a research design which can be applied in migration studies which make use of natural experiments and attempts to answer the question: does immigration have an impact on a host countries wages and unemployment?

The thesis also reviews other studies on the labour market impact of immigration and discusses general experimental methods. In addition, the natural experiment approach to migration is explained with examples of migration studies which have made use of this approach, and the pros and cons of the approach. In chapter 6 I present the difference in difference research design which is applicable to natural experiment studies involving two groups and two time periods or multiple groups and multiple time periods. However, most of the reviewed migration studies which make use of this difference in difference research design suggest that immigration has no significant effect on the wages and unemployment rate of the host country at the national level. The case of the Mariel Boatlift of 1980 in Miami shows that the labour market impact of immigration can differ from region to region with the same country. This is because some regions receive more immigrants than others.

Though Norway has not really experienced any economic shock as a result of an increase in immigration, it is still possible to examine the labour market impact immigration in Norway using a natural experiment approach which makes use of the difference in difference research design. One way could be do adopt the approach of Card (1990) which he used in his study of labour market effect of the Mariel Boatlift of 1980 in Miami. It there fore means it will be interesting to identify the highest immigrant receiving county in Norway and compare its labour market with other counties in Norway with similar economic growth patterns and then look at the labour market impact of immigration in these counties.

Looking at the evolution of Norway's immigration policies we see that they have become more restrictive especially to non-EU citizens and thus individuals with the intention of working in Norway must go through several requirements before obtaining a working permit. Given the country's continuous increase in growth, development and need for labour, it will be wise from an economic point of view to adopt more flexible policies in coming years which will make it easier for immigrants to work in the country. In addition according to a study carried out by

(Tellez, 2008) on the impact of immigration on unemployment and wages we discover that a high percentage of Norway's skilled labour is made up of immigrants who are mainly from USA, Russia, China and India.

Norway has put in place a programme which can evaluate and recognise foreign education and training. This is one good policy which has helped in increasing the number of skilled workers and have made it relatively easier for some immigrants to be gainfully employed.

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