Investigating the Economic Impact of Immigration on the Host Country

THE CASE OF NORWAY

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1 Introduction

International migration and the role that it plays in the economies of the originating and receiving countries has frequently been a topic of interest. To our knowledge, such a study does not exist in the literature particularly for Norway. The present study aims at filling this gap in the literature through investigating the nature of the causal relationship between immigration and two macroeconomic indicators, GDP per capita and unemployment, using Granger causality tests based on Norwegian data during the period between 1983 and 2003.

Literature on the economic impact of immigration focuses primarily on the effects of immigration on the unemployment of domestic workers. Marr and Siklos (1994, 1995), Konya (2000), Akbari and DeVoretz (1992), Withers and Pope (1985), Winegarden and Khor (1991), Gross (1997), Marr (1973), and Altonji and Card (1991) studied how immigration affects the unemployment of domestic workers in various Western countries and found mixed results. The effects of immigration on the income of the host country citizens have also been widely investigated. Laryea (1998a, 1998b), Gruen (1986), Jolley (1971), Easton (1990), Grossman (1982), and Feridun (2004, 2005) have investigated the nature of the causal relationship between immigration and income in many countries using various econometric methods. Their results mostly showed that immigration has a positive impact on the income of the host country.

As is the case for many developed nations, Norway faces the challenges of an ageing population. The combination of the demographic effects of the baby booms that marked the immediate post war period, the fall in fertility rates that began from the late 1960s, and longer life expectancy have led to a very marked acceleration of the ageing process of the population in Norway. This has serious implications for the sustainability of the pension and benefit systems and for labour market equilibrium. With more elderly people and fewer young people, Norway is expected to experience a decline in the labour supply within the next few decades. This will have to be accompanied by an increasing number of people of foreign origin entering the labour market. Inflow of aliens into the country in the last decade has made immigration and immigration policy a major public issue in Norway. Norwegian people are concerned that immigration reduces employment opportunities for the existing workforce, depresses wage rates in already low-wage labour markets, and financially strains taxpayers via their receipt of transfer payments and use of social service programs. In this respect, it is essential to assess the impact of foreign workers on GDP per capita and unemployment in order to assist policymakers in designing policies regarding immigration.

This paper is structured as follows. The next section provides a theoretical framework through which immigration may have an impact on the economy of the host countries. Section three reviews the data and presents the results obtained. The last section provides conclusions and policy implications that emerge from the study.

2 Theoretical framework

This section presents the theoretical framework through which immigration may affect the labour market in the host country. According to the traditional neoclassical model of labour markets, effects of immigration on the income of the host country citizens can be studied in two ways, namely supply side effects and demand side effects. In the supply side effects, inputs, i.e. foreign labour force and domestic labour force, can be either substitutes or complements. When two inputs are substitutes in production, an increase in the supply of an input will decrease the demand for its substitute.

An increase in the labour supply through increased immigration in a given labour market will lead to an increased competition for jobs among immigrants. This would reduce the market wage for immigrants. Depending upon their skill requirements, employers are likely to substitute immigrant labour for the native worker since the former is cheaper. This competition for jobs in the local labour market between natives and immigrants would reduce the earnings of natives. If variation in the number of immigrants relative to the native-born workers across selected labour market demonstrates that a higher ratio of foreign-born to native-born workers is associated with a lower wage rate of native born, then immigrants and native born are substitutable labour inputs in production. In this case, foreign-born workers would affect the earnings and job opportunities of native workers adversely.

When immigrants and native workers are perfect substitutes, they compete for jobs in the same labour market. The effect of immigrants entering the labour market is a shift of the labour supply curve to the right. The market wage rate decreases. In the case of complementary inputs, immigration flows could lead to increased wages for native workers. If there are skill shortages in the host country and immigrants relieve these bottlenecks, it would expand job opportunities in general, resulting in an increased demand for labour and eventually leading to higher wages of native-born workers. In this case immigrants and native workers are employed in two distinct labour markets and they are complementary inputs in production. When they are complements in production, then an increase in the demand for labour can increase the wage rate of indigenous workers. When foreign-born and native-born workers are complements in production, an inflow of foreign-born workers would augment the productivity of native workers. Therefore, the demand for native-born workers goes up. This will cause an increase in the wage rate.

When we study demand side effects, we assume that the product demand is fixed. However, immigration has both demand and supply side effects in goods markets. Immigrants demand goods and services, make expenditures and, therefore, the expenditure generated by the inflow of immigration causes the demand curve for goods and services to shift rightward. This will, in turn, cause an increase in the demand for labour. When both demand and supply effects are present, the net effect on the native would depend on the immigrants' marginal propensity to spend and the chance of getting a job relative to natives. If, for example, immigrants' relative expenditures are less than their relative employment, then the demand for labour will shift to a lesser extent than the supply of labour and therefore some natives will lose their jobs.

The impact of immigration on the unemployment level in the host country can be studied through two perspectives. Some people contend that the employment of immigrants decreases the employment of domestic workers on a one-for-one basis. They argue that a given number of jobs exist in the economy and that if one of these positions is taken by an immigrant, then the specific job is no longer available for a legal resident. At the other extreme it is claimed that immigrants only accept work that resident workers are unwilling to perform and thus take no jobs from native workers. According to McConnell and Brue (2003), immigration does cause some substitution of illegal aliens for domestic workers but the amount of displacement is most likely less than the total employment of immigrants. In light of this theoretical background, this study aims at testing two null hypotheses. The first hypothesis assumes that the immigrants and the native workers are perfect substitutes, and states that immigration will lead to decreased per capita income in the host country. The second hypothesis states that immigration leads to unemployment in the host country.

3 Data and methodology

This study uses data that consists of annual observations spanning the period between 1983 and 2003. All data are obtained from the World Bank World Development Indicators database and were transformed into logarithmic returns in order to achieve mean-reverting relationships, and to make econometric testing procedures valid. Immigration, denoted by IMMG, is measured by the size of foreign or foreign-born residents as a percentage of total population. GDP per capita, denoted by GDP, is calculated as gross domestic product divided by mid-year population. Unemployment, denoted by UNEM, refers to the percentage of the total labour force that is without work but available for and seeking employment.

Table 1 presents the descriptive statistics of the logarithmic transformations of time series data. The measures of skewness and kurtosis as well as the probabilities of the Jarque-Berra test statistic provide evidence in favour of the null hypothesis of a normal distribution for all data sets. In addition, simple correlations are estimated for the first differences of the series for each country and no evidence of correlation was found, as can be seen in table 2.

Table 1 *Descriptive statistics*

	IMMG	UNEM	GDP
Mean	26.6002	35.9001	4.1471
Median	10.3169	4.1132	6.2715
Maximum	18.1591	35.3916	8.8479
Minimum	2.6668	1.9662	2.6216
Std. Dev.	2.8702	1.5368	0.3051
Skewness	0.0226	0.4746	0.0565
Kurtosis	3.3561	3.2092	2.5651
Jarque-Bera	1.7628	2.9719	1.8645
Probability	0.6102	0.4972	0.4859
Sum Squared	15.3002	0.2825	17.3681

Table 2 *Correlation matrix*

	GDP	UNEM	IMMG
GDP	1	0.2465	0.3245
UNEM		1	0.2356
IMMG			1

Table 3 *Augmented Dickey-Fuller unit root test results*

	Test with an intercept		Test with an intercept and trend		Test with no intercept or trend	
	Levels	1st differences	Levels	1st differences	Levels	1st differences
IMMG	2.024	-13.3055	4.324	-14.398	0.4255	-8.579
GDP	2.369	-7.981	3.2775	-8.441	2.967	-12.926
UNEM	2.0355	-6.4745	4.0825	-7.2795	1.518	-11.868
CV* (1%)	-4.0135	-4.6345	-6.3825	-6.4975	-3.151	-3.036
CV (5%)	-3.8755	-4.025	-4.232	-4.324	-2.208	-2.1505

* McKinnon Critical Value; the lag length was determined using Schwartz Information Criteria (SIC)

The first necessary condition to perform Granger causality tests is to study how stationary the times series under consideration is, and to establish the order of integration present. The Augmented Dickey-Fuller (ADF) (1979) unit root test is used in examining how stationary the data series is. It consists of running a regression of the first difference of the series against the series lagged once, lagged difference terms, and optionally, a constant and a time trend. This can be expressed as:

$$(1) \quad \Delta yt = \beta 1yt - 1 + \beta 2\Delta yt - 1 + \beta 3\Delta yt - 2 + \beta 4 + \beta 5t$$

The test for a unit root is conducted on the coefficient of yt-1 in the regression. If the coefficient is significantly different from zero, then the hypothesis that y contains a unit root is rejected. Rejection of the null hypothesis implies it is stationary. If the calculated ADF statistic is higher than McKinnon's critical value, then the null hypothesis is not rejected and it is concluded that the considered variable is non-stationary, i.e. has at least one unit root. Then, the procedures are re-applied after transforming the series into first differenced form. If the null hypothesis of being non-stationary can be rejected, it can be concluded that the time series is integrated of order one, $I(1)$. Table 3 summarises the results of the ADF unit root tests on levels and in first differences of the data. Strong evidence emerges that all the time series are $I(1)$.

3.1 Cointegration tests

Next, we perform a cointegration analysis. Cointegration analysis helps to identify long-run economic relationships between two or several variables and to avoid the risk of spurious regression. Cointegration analysis is important because if two non-stationary variables are cointegrated, a VAR model in the first difference is incorrectly specified due to the effect of a common trend. If a cointegration relationship is identified, the model should include residuals from the vectors (lagged one

Table 4 *Johansen cointegration test results*

Null Hypothesis	Trace Statistic	5% Critical Value	Maximum Eigenvalue Statistic	5% Critical Value
$r = 0$	41.4018	48.8802	23.7021	28.6467
$r <= 1$	16.8756	29.7906	13.0011	26.3835
$r <= 2$	5.1168	12.8535	7.7859	14.0712

period) in the dynamic Vector Error Correcting Mechanism (VECM) system. In this stage, the Johansen cointegration test is used to identify the cointegrating relationship among the variables. Within the Johansen multivariate cointegrating framework, the following system is estimated:

$$(2) \quad \Delta z_t = \Pi_1 \Delta z_{t-1} + \ldots + \Pi_{k-1} \Delta z_{t-k-1} + \Pi z_{t-1} + \mu + \eta_t : t = 1, \ldots, T$$

Where Δ is the first difference operator, z denotes vector of variables, η_t ~ niid (0, Σ), μ is a drift parameter, and Π is a $(p \times p)$ matrix of the form $\Pi = \alpha\beta'$, where α and β are both $(p \times r)$ matrices of full rank, with β containing the r cointegrating relationships and α carrying the corresponding adjustment coefficients in each of the r vectors. The Johansen approach can be used to carry out Granger causality tests as well. In the Johansen framework the first step is the estimation of an unrestricted, closed p*th* order VAR in k variables. Johansen (1995) suggests two tests statistics to determine the cointegration rank. These are the trace statistic and the maximum eigenvalue test. Based on the power of the test, the maximum eigenvalue test statistic is often preferred. Table 4 presents results from the Johansen cointegration test among the data sets. Neither maximum eigenvalue nor trace tests rejects the null hypothesis of no cointegration at the 5 per cent level.

A linear deterministic trend is assumed; r is the number of cointegrating vectors under the null hypothesis.

3.2 Granger causality tests

According to Granger (1969), Y is said to G*ranger-cause* X if and only if X is predicted better by using the past values of Y than by not doing so with the past values of X being used in either case. In short, if a scalar Y can help to forecast another scalar X, then we say that Y Granger-causes X. If Y causes X and X does not cause Y, it is said that unidirectional causality exists from Y to X. If Y does not cause X and X does not cause Y, then X and Y are statistically independent. If Y causes X and X causes Y, it is said that feedback exists between X and Y. Essentially, Granger's definition of causality is framed in terms of predictability.

Granger (1969) originally suggested the Granger test. To implement the Granger test, we assume a particular autoregressive lag length k (*or* p) and estimate equations (3) and (4) by OLS:

$$(3) \quad X_t = \lambda_1 + \sum_{i=1}^{k} a_{1i} X_{t-i} + \sum_{j=1}^{k} b_{1j} Y_{t-j} + \mu_{1t}$$

$$(4) \quad Y_t = \lambda_2 + \sum_{i=1}^{p} a_{2i} X_{t-i} + \sum_{j=1}^{p} b_{2j} Y_{t-j} + \mu_{2t}$$

F test is carried out for the null hypothesis of no Granger causality $H_0 : b_{i1} = b_{i2} = \cdots = b_{ik} = 0, \mathrm{i} = 1, 2$ where F statistic is the Wald statistic for the null hypothesis. If the F statistic is greater than a certain critical value for an F distribution, then we reject the null hypothesis that Y does not Granger-cause X (equation (1)), which means Y Granger-causes X.

A time series with stable mean value and standard deviation is called a stationary series. If d differences have to be made to produce a stationary process, then it can be defined as integrated of order d. Granger (1983) proposed the concept of cointegration, and Engle and Granger (1987) made further analysis. If several variables are all I(d) series, their linear combination may be cointegrated, that is, their linear combination may be stationary. Although the variables may drift away from equilibrium for a while, economic forces may be expected to act so as to restore equilibrium, thus, they tend to move together in the long run, irrespective of short run dynamics. The definition of the Granger causality is based on the hypothesis that X and Y are stationary or $I(0)$ time series. Therefore, we can not apply the fundamental Granger method for variables of $I(1)$.

The classical approach to dealing with integrated variables is to difference them to make them stationary. Hassapis et al. (1999) show that in the absence of cointegration, the direction of causality can be decided upon via standard F-tests in the first differenced VAR. The VAR in the first difference can be written as:

$$(5) \quad \Delta X_t = \lambda_1 + \sum_{i=1}^{k} a_{1i} \Delta X_{t-i} + \sum_{j=1}^{k} b_{1j} \Delta Y_{t-j} + \mu_{1t}$$

$$(6) \quad \Delta Y_t = \lambda_2 + \sum_{i=1}^{p} a_{2i} \Delta X_{t-i} + \sum_{j=1}^{p} b_{2j} \Delta Y_{t-j} + \mu_{2t}$$

Table 5 *Granger causality test results*

	F - Statistics			
Null Hypothesis	**Lag 1**	**Lag 2**	**Lag 3**	**Lag 4**
Immigration does not Granger-cause GDP per capita	67.9722**	3.2103	0.0042	0.9223
GDP per capita does not Granger-cause immigration	1.2921	1.4312	0.5511	0.4227
Immigration does not Granger-cause unemployment	1.7281	1.2121	1.3334	0.5414
Unemployment does not Granger-cause immigration	1.0012	0.2992	1.5316	3.8132

**Reject the null hypothesis at the 5 per cent level

Since, maximum eigenvalue and trace tests do not reject the null hypothesis of no cointegration at the 5 per cent level, the aforementioned VAR method can be used. Table 5 shows the results of these regressions.

Results of a Granger causality test show that the null hypothesis in which immigration does not Granger-cause GDP per capita is rejected in a one-year lag, at the 5 per cent level. Results show no evidence of reverse causality. On the other hand, the null hypothesis in which immigration does not Granger-cause unemployment is not rejected in any lag at the 5 per cent level. Again, results show no evidence of reverse causation either.

4 Conclusions and policy implications

The aim of this paper is to assess the impact immigration has on economic development and unemployment in Norway. The results on the unit root test indicate that all the series are non-stationary and in $I(1)$ process. The Johansen cointegration test reveals that there is no cointegration among the data sets. The Granger causality test shows that when the level of immigration increases, GDP per capita also increases. It has also been found that immigration has no impact on unemployment, and vice versa.

A number of policy implications emerge from the study. As the analysis has shown, the future development of the Norwegian society will depend, among other things, on whether the country is capable of securing a successful integration of foreigners. This includes not only the foreigners currently residing in the country but also those that are expected to immigrate in the future. A number of actions should be taken in order to cope with the expected decline of the labour force. For instance, Norway may choose to mobilise the latent labour supply among various target groups such as the ageing population, inactive and unemployed youth, inactive adults, and inactive and unemployed foreign-born residents. As evident from their positive impact on GDP per capita growth, immigrants and their children will be a great asset to Norway in the future. Therefore, taking care of immigrants' basic requirements and making Norway attractive to foreign employees must be a priority for policymakers. Policies should be developed to educate domestic societies to tolerate the temporary and permanent presence of an increasing number of people with foreign backgrounds. However, authorities should determine how many and what type of immigrants are needed. Norway has to define clear goals and guidelines for their immigration and integration policies. In this respect, restricting the immigration of people with low qualifications to prevent integration difficulties and the negative impact on the economy can be considered as a policy option.

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