The Causality Between Economic Growth and Immigration in Germany and Switzerland

MANUEL GONZÁLEZ-GÓMEZ*
University of Vigo, Spain

Mª SOLEDAD OTERO GIRÁLDEZ
University of Vigo, Spain

Abstract: This paper analyses the relationship between immigration and the economic growth in Germany and Switzerland during the period 1970-2005 by using a cointegration approach. Both countries have gone through a similar learning process. First they encouraged low-skilled and temporary workers. More recently, they have attracted high-skilled people and restricted the recruitment of low-skilled immigrants. Our empirical analysis reveals important differences between Germany and Switzerland. The results may be useful for other countries that attract immigrants to compensate for shortages in the labour market and in response to the ageing of the population.

I INTRODUCTION

The migration stream is growing in importance. One out of every 33 people in the world was an international migrant in 2005, compared to about 1 in 45 in the 1970s and 1980s. All the OECD countries have shown an increase in their immigration rates between the 1970s and 2008. Even countries that were emigration countries before the first oil price shock, such as Ireland,[1] Italy Portugal and Spain, have become immigration countries.

*Author for correspondence: Department of Applied Economics, University of Vigo, Spain. Email: mgonzalez@uvigo.es
[1] Those interested in the emigration and immigration flows in Ireland might begin with the recent paper written by Fanning (2010).

The need to fill labour market gaps in the host countries explains migration into industrialised nations. At the same time, demographic differences in age structure and fertility fertility rates are important driving forces. Consequently, immigration policy measures try to attract young and economically successful migrants as an answer to an ageing of the population. Countries such as Germany, Switzerland, Italy, Spain and Poland due to low fertility rates and increasing life expectancy, will experience a substantial decrease in their working-age population in the next 50 years. Additionally, immigration is increasingly being viewed in relation to skill-biased technical change. The increase in highly skilled labour in OECD countries is beyond the likely supply capacity of their domestic labour markets (Iredale, 1999).

Germany and Switzerland are countries with one of the most significant increases in immigration over the last half century. Both countries have actively recruited foreign nationals for labour purposes. Among all European countries, Switzerland has one of the highest shares of foreigners, and Germany has the highest number of foreign residents. Both countries have developed and revised their immigration policies with the goal of selecting/attracting high-skilled immigrants and so increasing the contributions of immigration to policy goals. As neither Germany nor Switzerland consider themselves immigration countries and since public acceptance of foreign policy is a major issue in both countries, the understanding of migrants' performance (relative wages dynamics of migrant workers and economic and social assimilation in the destination country), and the economic impact of immigration on indigenous population may provide valuable inputs for the debate. Policies governing the admission and status of foreigners have gained political importance.[2]

Researchers agree that demographic changes that occur through immigration have important effects on economic growth (Borjas, 1994 and 1999). Demographers, historians, sociologists, and economists agree that immigration was an important factor in the growth of countries like the United States, Canada, and Australia in the nineteenth century and the first half of the twentieth century. There is also a consensus that the migratory flows had a positive impact on the economic growth of France, Germany, Switzerland, and the United Kingdom between 1950 and 1973. Based on

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[2] See for instance "Valuing Diversity – Fostering Cohesion" Speech by Christian Wulff, President of the Federal Republic of Germany, to mark the twentieth anniversary of German Unity on 3 October 2010 in Bremen (http://www.bundespraesident.de/Anlage/original_667212/Speech-in-English.pdf); "Fachkräfte aus dem Ausland. Zuwanderer dringend gesucht" http://www. sueddeutsche.de/karriere/fachkraefte-aus-dem-ausland-zuwanderer-dringend-gesucht-1.1011769 and *ZKB(2010)*.

studies carried out in the United States, Canada, Australia, and Europe, Tapinos (1993) affirmed that immigration contributed to the growth of the receiving countries after the oil crisis in 1973. In the literature, there are a number of theories explaining how immigrants benefit receiving countries: immigration generates more consumption and economies of scale; immigrants avoid production bottlenecks; foreign workers contribute to technological development; and migrant workers improve the demographic structure.

However, disagreements persist in the empirical literature regarding the relationship between immigration and economic growth. Morley (2006) investigated the causal relationship between both variables for Canada, Australia and the United States from 1930-2002. He found evidence that in the long run, economic growth caused migration in the three countries. Morley's results appear to offer little support for the view that immigration has an important effect on economic growth. The author emphasised that he considered a long period of time (1930-2002), so more research is required to differentiate the successive waves of immigration that have involved people with different levels of skills.

Moreover, according to Tapinos (1993), experts who have studied the economic repercussions of migration agree on only two things: first, there is no conclusive evidence on the issue and that all the studies contain weaknesses; and second aside from whether it is negative or positive, the aggregate effect of migration on the economy is marginal.

To the authors' knowledge, no empirical study has analysed the relationship between immigration and economic growth in Germany and Switzerland using a cointegration approach (Johansen and Juselius, 1990, or the the autoregressive distributed lag ARDL, suggested by Pesaran *et al.*, 2001). Researchers and others have debated the migrants' performance (Liebig, 2002). There are studies for both countries that analyse the impact in macroeconomic terms of immigration on employment and wages on consumption, productivity, economic efficiency, and the social security system. German researchers found that the influx of newcomers increased real GDP and employment and generated a fiscal benefit (see Martin *et al.*, 2002). On the contrary, research on Swiss immigration suggests that the rising supply of low-skilled workers resulting from immigration has contributed to the slow growth of the Swiss economy, which has been much lower than the OECD average (see Golder, 1999). The authors argue that the presence of immigrants inhibits technological development because employers can use cheap labour to remain competitive.

Consequently, the main objective of this paper is to examine the statistical relationship between the migration streams (per capita number of foreign citizens) and economic growth (per capita Gross Domestic Product, or GDP).

This paper studies the relationship for Germany and Switzerland for 1970-2005, using cointegration analysis.

The remainder of this paper is structured as follows. Section II discusses III describes the data and performance of the approaches to cointegration. Section IV presents the empirical results. The paper concludes with some implications of the results.

II MIGRATION POLICIES IN GERMANY AND SWITZERLAND[3]

Germany has actively recruited foreign nationals for labour purposes. The focus of foreign employment shifted from agriculture in the Prussian era to the industrial sector during World War II. Immigration flow was interrupted only during the economic crisis at the end of the 1920s and by the end of World War II. In the post-war period, about 14 million refugees and ethnic Germans who had been expelled from Central Europe arrived in West Germany. Until the 1950s, the increasing labour demand was covered with the post-war migration stream. Labour shortages led to the recruitment of foreign labour force (Gastarbeiter "guest workers") by agreements with several European countries (Italy, Greece, Spain, Turkey, Portugal, Morocco, former Yugoslavia, Tunisia).

Although the employment of "guest workers" was intended to be temporary, there was no enforcement of the rotation scheme. In fact, since migrants were employed in unattractive sectors (mining, construction, metal, and textile industries), German employers were interested in keeping their trained labourers. As a consequence of the economic crisis, Germany stopped its well-known "guest worker" programmes in 1973. Simultaneous with the official halt on recruitment, supply-driven immigration via family reunion and via asylum became relevant, and as a consequence, over 3 million foreigners settled in Germany.

The introduction of two schemes at the beginning of the 1990s ended the policy opposing immigration that had been in force since 1973. The country began allowing the migration of Jewish people from the former Soviet Union. The second scheme was the "Anwerbestoppausnahmeverordnung" (Decree on exceptions from the halt on recruitment) to fill vacancies in agriculture, construction, and health services. This decree allowed "Werkvertrags-arbeitsnehmer" (contract labourers) and "Saisonarbeitnehmer" (seasonal workers) to be admitted for a limited period of time. Furthermore, other "guest

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[3] For more information see Straubhaar (1991), Martin *et al*. (2002), Liebig (2002), and Von Loffelholz (2001).

workers" were programmes launched in the 1990s to manage inevitable migration and to fill job vacancies. Since 1991, guest employees from Central Europe have been granted entry for a maximum stay of 18 months for language and acquisition of special professional skills, and qualified labourers in certain professions (hospital and geriatric nurses, language teachers, speciality cooks, scientists, managers) were accepted without explicit limitations on numbers and length of stay. The Green Card Programme, enacted in 2000, allowed German employers to hire foreigners who receive at least €50,000 a year.

The new immigration law of 2005 offered the option of permanent residency for highly qualified people if they invested at least €1 million and created at least 10 jobs. The ban on recruitment of unqualified labour and low-skilled persons was maintained, and it also covered highly skilled workers but allowed exemptions in individual cases in which there is public interest in their employment.

Switzerland depends heavily on foreign labour and has a foreigner share in its workforce of more than 20 per cent. This share was already 15 per cent before World War I. This substantial number is due to the use of permits to control the total number of foreigners. Although many changes have been introduced, the fundamental feature of "Inländervorrang" (priority of domestic persons) dates to 1931. In 1970, the government introduced quotas that for the first time put an annual upper limit on the number of foreigners allowed to enter the country. Unskilled workers originally recruited on a temporary basis could apply for annual permits after 36 months of seasonal work in four consecutive years. About 35 per cent of seasonal workers obtained an annual permit.

Stalder *et al*. (1994) found evidence that the rising supply of these workers resulting from immigration led to lower wages for all people doing unskilled or semiskilled work. Such low wages are the reason for lower production costs and prices in sectors like the construction industry, hotels and restaurants, and agriculture and forestry. In turn, this leads to a substitution of capital and qualified labour through low-skilled workers and hampers structural change.

People from outside the European Union (EU) and the European Free Trade Association (EFTA) enjoy full freedom of movement only if they have a settlement permit. Even for holders of annual permit changes in the job or canton of work or residence are subject to a special permission procedure. This has hindered the efficient allocation of labour within Switzerland. Pressure for reform has arisen due to the treaty on the freedom of movement of persons within the EU/EFTA, which implied that a large portion of immigrants would no longer be subject to control. The new policy treats EU/EFTA nationals

favourably, according them the same benefits as Swiss workers. Employers who wanted to recruit people from outside the EU/EFTA not only needed to prove they could not find domestic workers to fill a vacancy but also that they could not recruit anyone from EU/EFTA countries.

III DATA AND METHODOLOGY

In Germany and Switzerland, the crucial variable considered for immigration is citizenship. Changes in foreign population over time depend on several factors, including the number of births and deaths, the level of immigration and emigration, and the number of people acquiring citizenship by naturalisation or by other means such as marriage or adoption.[4] Germany has over 7 million foreign residents, representing 8.8 per cent of the total population. More than 2.5 million of them are citizens of another member state of the EU. Switzerland has one of the highest shares of foreign residents. Its 1.7 million foreigners make up 21.7 per cent of the total population and 0.6 per cent of them (1.7 million) are citizens of a member state of the EU. In 1970 the number of foreign residents was 1 million in Switzerland and 2.7 million in Germany, representing 4.5 per cent and 19.3 per cent of the total population, respectively.

Based on data disaggregated by national and foreign nationals several differences can be drawn in terms of age structure, employment, occupation, skill mix and income.

Looking at the age structure of nationals and foreigners separately shows that the foreign population is younger than the national population. The share of the population aged under 20 is similar for foreigners and national citizens in Switzerland (about 21 per cent). There is a difference of 2 per cent in Germany (17.2 per cent foreigners and 19.2 per cent national citizens). The share of 20–39 year olds shows the greatest differences between foreign and national citizens. This group comprises 40.1 per cent and 32.0 per cent of all foreign nationals living in Germany and Switzerland, respectively. Nationals in this age group represent 23.1 per cent in Germany and 18 per cent in Switzerland of all national citizens. The participation of people over 40 years of age is higher for national citizens than for foreigners. In both countries the difference is slightly higher for the 40-64 year age group and increases with age.

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[4] Since 1990 approximately half a million foreign residents in Switzerland and 1.7 million people in Germany have acquired Swiss and German citizenship, respectively. It represents a yearly 1-2 per cent in the foreign population in the country.

Table 1: *Age Structure, Occupation and Skills*

	Germany		Switzerland	
	Nationals	Foreigners	Nationals	Foreigners
Age Structure of National and Foreign Population (% of total national and foreign population)				
0-19 Years	19.2	17.3	21	21
19-39 Years	23.1	40.1	18	32
40-64 Years	36.1	33.7	36	33
>65 Years	21.3	8.9	19	7
Employment and Unemployment (%)				
Participation rate [a]	50.7	54.5	66.5	75.3
Unemployment [b]	7.0	14.8	3.2	7.2
Employment [b]	93.0	85.2	96.9	92.8
Self-employment [c]	10.8	12.1		
(Public servants [c]) Beamte/-innen	5.9	0.0		
(Employees [c]) <u>Angestellte</u>	58.5	46.8		
(Workers [c]) <u>Arbeiter/-innen</u>	24.9	40.6		
Occupational Distribution of Employment (%)				
Legislators, Senior Officials and Managers [c]	5.9	5.9	3.8	3.0
Professionals [c]	13.4	6.8	11.6	11.1
Technicians, Associate Professionals and Clerks [c]	33.7	17.9	38.4	23.3
Service Workers and Shop and Market Sales Workers. Skilled Agricultural and Fishery Workers. Craft and Related Trades Workers [c]	30.9	37.7	31.1	33.6
Plant and Machine Operators and Assemblers [c]	7.3	13.8	4.6	7.5
Elementary occupations [c]	8.0	18.0	6.1	16.9
Armed forces and Unknown [c]	0.6	0.0	4.3	4.6
Vocational Education (%)				
With vocational qualifications [d]	64.7	41.8	69	64.4
Vocational training year	1.0	1.7		
Apprenticeship	42.7	23.3		
University/Foreman/Master/Technician/ Technical School	18.4	15	26.8	28.7
No Vocational Education [d]	35.3	58.2	31.0	45.6
Still in Education	18.2	17.5		
Without Qualifications	17.0	40.7		

Note: (a) Percentage of the total population ages 15 and more.
　　　 (b) Percentage of the total labour force.
　　　 (c) Percentage of total employment.
　　　 (d) Percentage of total population.
Source: Statistiches Bundesamt*, Mikrozensus and Ausländerzentralregister (AZR)*; Bundesamt für Statistik, Schweizerische *Arbeitskräfteerhebung (SAKE) Wohnbevölkerung (PETRA)* and Eurostat*, Active Population.*

The share of individuals with a university, polytechnic degree or high vocational training in Switzerland is slightly higher for foreigners than national citizens. In Germany the proportion of national citizens with a university, polytechnic degree or high vocational training (18.4 per cent) is higher than for the foreign population. The share of individuals with vocational qualifications passing a final examination is far lower for foreign citizens. On the contrary, the share of people without qualification or only primary education attainment is large and higher for non-nationals.

In Switzerland, the proportion of working people is higher than in Germany, explained by the relatively high share of active and employed population. The percentage of the total foreign population in the labour force is larger than the percentage of nationals but the proportion of them that become employed is higher for nationals.

Comparing the occupation of employed persons aged 15 and over by citizenship (Table 1), national workers are concentrated in highly skilled jobs and foreigners are in more manual positions. More than half of the employed citizens aged over 15 are occupied in the three highest qualification levels in Switzerland and Germany. The share of foreign citizens is one-third of the employed population in Germany and 40 per cent in Switzerland.

The first three columns of Table 2 give the proportions of foreign and national population in the income groups. Since highly qualified jobs pay higher wages, and since foreigners tend to have lower educational levels than nationals, they tend to earn less. Table 2 shows that even if the foreigners in

Table 2: *Income Differences*

The Share of Income Groups Among Foreign and Nationals Households in Germany (Percentage of Total Households)			*Gross Wage Percentage of Foreigners Compared with Nationals at Various Economic Sectors in Switzerland*	
	Nationals	*Foreigners*	Total	87.3
< 900	13.22	21.71	Production	89.7
901-2000	38.43	39.06	Industry	88.5
2001-3200	23.79	20.94	Services	83.5
3201-4500	10.65	6.30	Wholesale and Retail	93.3
>4500	6.52	3.5	Transport	85.3
			Banking and Insurance	109.0
			IT and Business Services	94.0
			Other	80.4

Source: Statistiches Bundesamt and Bundesamt für Statistik. Schweizerische *Arbeitskräfteerhebung (SAKE).*

Switzerland hold the same jobs as nationals, they tend to be paid less. The exception is for abstract-complex tasks (banking and insurance), where foreigners tend to earn more than nationals.

The data on immigrants used in the empirical work is obtained by dividing the stock of immigrants accumulated by that point in time divided by population (denoted as IMM).[5] The other variable, economic growth, is expressed by the real gross domestic product per capita (denoted as GDP).[6] The sample period for both time series is 1970 to 2005.

The main goal of the paper is to analyse the relationship between GDP and immigration applying two cointegration approaches. We use the Johansen and Juselius (1990) approach, when the variables (GDP and IMM) are integrated of the same order, and the bound testing approach suggested ARDL by Pesaran *et al.* (2001), in presence of the mixture of both I(0) and I(1) variables.[7]

3.1 *Johansen and Juselius (1990) Approach*

We used two likelihood ratio tests for testing the number of cointegrating vectors in the system, the maximum eigenvalue (λ_{max}) and trace (λ_{trace}) statistics:

$$\lambda_{max} = -T \ln(1 - \lambda_{r+1}) \tag{1}$$

$$\lambda_{trace} = -T \sum_{i=r+1}^{\mathbf{p}} \ln(\mathbf{1} - \lambda_i) \tag{2}$$

where T is the sample size; λ_i is the ith largest estimated eigenvalue; and $r = 0,1,2,......p-1$ are the number of cointegration vectors. Johansen's cointegration test follows a sequential process for getting the number of cointegration vectors. We stopped at the first r where we could not reject the null hypothesis.

To determine the unidirectional or bidirectional causality between variables, we follow Granger's theorem.[8] The error correction model (ECM) collects long-run information using an error-correction term (u_{t-1}) and also

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[5] The data were posted by the Federal Statistical Offices of Germany and Switzerland on their websites.
[6] The real GDP data are available on the website of the International Monetary Fund (IMF). 1995 is used as the base year for Germany and 1980 for Switzerland.
[7] The order of integration for a series is determined by the number of times the series must be differenced to achieve a stationary process.
[8] Engle and Granger (1987).

collects short-run information among variables when working with variables in first differences. The error-correction term corrects the deviations from the equilibrium in the short-run but will adjust towards the equilibrium in the long run. Error-correction models are expressed in the following equations:

$$\Delta x_{it} = \gamma_1 u_{t-1} + \text{lags}\ (\Delta x_{it}, \Delta y_{it}) + \varepsilon_{1t} \qquad (3)$$

$$\Delta y_{it} = \gamma_2 u_{t-1} + \text{lags}\ (\Delta x_{it}, \Delta y_{it}) + \varepsilon_{2t} \qquad (4)$$

where Δ is the first difference operator, x and y are the variables of interest, and ε is a stationary random error.

Granger (1988) demonstrated that if two economic variables are cointegrated, causality must exist in at least one direction. The presence of causality can be deduced by testing the significance of the error-correction term (Tano, 1993; Owoye, 1997).

3.2 *The ARDL Bounds Testing Approach*

In recent years, considerable attention has been paid to testing for the existence of short and long-run relationships between variables based on the use of different cointegration techniques (Engle and Granger, 1987; Johansen and Juselius, 1990). However, these methods can be applied only when the variables of the same order are integrated. This technical requirement puts a severe limitation on the traditional cointegration techniques. In order to overcome this restriction, Pesaran *et al.* (2001) suggested the ARDL testing bounds approach to test for the existence of a long-run relationship between variables, which is applicable regardless of whether the underlying variables are I(0), I(1) or both. The ARDL approach to cointegration entails estimating the conditional error correction model (ECM):

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{p-1} \alpha_i \Delta y_{t-i} + \sum_{j=0}^{p-1} \mu_j \Delta \mathrm{x}_{t-j} + \delta t + \phi y_{t-1} + \vartheta x_{t-1} + \varepsilon_t \qquad (5)$$

where the symbol Δ represents the first-difference operator, t is the tendency, the parameters ϕ and ϑ are the long-run coefficients, α_i and μ_j the short-run coefficients and ε_t represents the residuals. The optimal number of lags of the ECM is determined using a specific criterion of selection.

Following Pesaran *et al.* (2001), our testing procedure of a long-run relationship between the variables is based on the *F-test*. It is a test on the joint null hypothesis that the coefficients on the level variables lagged are jointly equal to zero (H_0: $\phi = \vartheta = 0$). It has a non-standard distribution under the null hypothesis that no relationship exists between y_t and x_t, regardless of whether these variables are purely I(0), purely I(1), or a mixture of both.

However, Pesaran *et al*. (2001) derived their asymptotic distributions under the null and proposed critical value bounds, which allow us to accept or reject the null hypothesis. Therefore, if the statistics fall outside of their respective critical upper bound, then we reject the null hypothesis and we have evidence of a long-run relationship (indicating cointegration). If the statistics are below their respective critical lower bound, then we cannot reject the null hypothesis of no cointegration. Finally, if the statistic lies between the upper and lower critical bounds, then the inference is inconclusive.

IV EMPIRICAL EVIDENCE

The methodology used to analyse the relationship between immigration and the economic growth in Germany and Switzerland is cointegration. Since the Johansen and Juselius (1990) approach requires variables of the same order to be integrated in the cointegration regression, we need to test for the integration order of each individual time series in the long-run equilibrium model before the cointegration test can be carried out. The tests used for identifying the order of integration are the conventional non-parametric Phillips-Perron test (PP) to test the integration level (see Phillips and Perron, 1988). Table 3 shows that IMM is integrated of order one for Germany and it is integrated of order two for Switzerland. On the other hand, GDP is integrated of order one for both countries.

Once the order of integration of a time series has been identified, we can test for cointegration. For Germany, both variables (GDP and IMM) are I(1), therefore it is possible to apply the Johansen and Juselius (1990) procedure and the bound testing approach (Pesaran *et al*., 2001).

The Johansen and Juselius approach uses two likelihood ratio tests for testing the number of cointegration vectors, and as can be observed in Table 4, the trace test (λ_{trace}) and max-eigenvalue test (λ_{max}) indicate one cointegration vector for Germany.

The fact that the variables are cointegrated in the German case indicates a long-run relationship between immigration and economic growth. In order to study the direction of the causal relationship between the variables, it is necessary to observe the statistical significance of the estimated coefficients of the error-correction term (see Table 5). Therefore, the results indicate a bidirectional relationship.

Using the bound testing approach suggested by Pesaran *et al*. (2001), we confirm the long-run nature of the relationship between variables. Table 6 shows that the F-statistics lie above the upper bound of the critical values and so the null hypothesis of "no cointegration" is rejected.

The results indicate that for Germany there is a bidirectional long-run relationship between per capita economic growth and the number of foreigners per head (IMM). On the one hand it suggests that the instruments introduced in the 1970s in order to control the recruitment of foreign labour force have

Table 3: *Results of the Phillips – Perron Test*

Ho: Variable has a Unit Root	t-statistic Models with Constant and Trend	t-statistic Models with Constant
Germany		
GDP	−3.564 (3)	−1.292 (2)
IMM	−3.384 (3)	−2.791 (3)
Switzerland		
GDP	−2.591 (3)	−0.715 (6)
IMM	−1.526 (3)	−0.059 (4)
Germany		
Δ GDP	−9.321* (4)	−9.028* (3)
Δ IMM	−5.694* (1)	−5.566* (1)
Switzerland		
Δ GDP	−4.921* (16)	−5.019* (15)
Δ IMM	−2.192 (1)	−2.010 (1)
Δ^2 IMM	−5.033* (2)	−5.100* (2)

Note: Δ is the first difference operator. Δ^2 is the second difference operator. Values in parenthesis specify the truncation lag for the Newey-West correction length used.
* indicates significance at 1 per cent level. Critical values are based on MacKinnon (1996).

Table 4: *Johansen Cointegration Test Statistic Results*

Null Hypothesis	λ_{trace}	λ_{max}
Germany		
H_0: r = 0	37.322*	30.420*
H_0: r < = 1	6.902	6.902
Switzerland		
H_0: r = 0	14.767	8.954
H_0: r < = 1	5.813	5.813

Note: (*) denotes rejection of the hypothesis at the 5 per cent level. The critical values for the tests are taken from Mackinnon-Haug-Michelis (1999). The model has an intercept (no trend) in cointegration equation and no intercept in autoregressive vector. The lag lengths are four and one for Germany and Switzerland, respectively. These models are based on the Schwarz Information criterion.

Table 5: *Causality Test Results Based on (ECM) for Germany*

Dependant Variable	Error Correction Term
Δ (GDP)	−0.492 (−5.843)
Δ (IMM)	−6.43E-05 (−2.557)

Note: t-test in parenthesis.

Table 6: *Critical Values and Bounds Test for ARDL Modelling Approach*

Scenario	Models with Constant and Trend	Critical Values for ARDL Modelling Approach I(0) I(1)
Germany		
F_{IV}	5.42*	(4.68, 5.15)
F_{V}	7.76*	(6.56, 7.30)
Switzerland		
F_{IV}	2.19	(4.68, 5.15)
F_{V}	3.28	(6.56, 7.30)

Note: *indicates that the statistic lies above the upper level of the band. F_{IV} represents the F statistic of the model with unrestricted intercept and restricted trend. F_{V} represents the F statistic of the model with unrestricted intercept and trend. This model is based on the Schwarz Information criterion.

contributed to the public acceptance of migration policy but were not proven to be effective for controlling the number of foreigners. Originally the "guest workers" were supposed to stay only temporarily, but firms were interested in keeping their trained workers. As a consequence, temporary and seasonal workers became permanent immigrants. In addition, in the 1970s the German government stopped the "guest-worker" programmes but foreign workers continued to enter Germany despite constraints on immigration.

Although most foreigners are low-skilled workers, our results have proven that the per capita number of foreigners causes economic growth. Low-skilled foreign workers seem to have improved domestic productivity without reducing technological progress. In addition, the proportion of the labour force is higher among foreigners due to the younger age structure of the foreign population.

Given the different degrees of integration found in Switzerland, two tests are used for both variables. We start testing the short-run Granger causalities between the stationary variables (two differences for immigration and one difference for GDP). We performed a simple Granger causality test (Granger,

1969) by estimating the autoregressive processes for GDP and IMM. The test results are given in Table 7.

Table 7: *Results of the "Granger Causality Test" for Switzerland*

Null Hypothesis	Lags	F-Statistic	p-value
Δ (GDP) does not Granger Cause ΔΔ (IMM)	4	2.43541	0.0791
ΔΔ (IMM) does not Granger Cause Δ (GDP)	1	0.11328	0.7388

Note: The lag length is based on the Schwarz Information criterion.

We cannot reject the null hypothesis that IMM does not cause GDP, but we do reject the null hypothesis that GDP does not cause IMM. Therefore, this result indicates a unidirectional causality from economic growth to immigration but not vice versa, that is, the Granger causality test verifies statistically that the per capita economic growth (GDP) has a Granger causality on the number of foreigners per head (IMM).

Second, we have found different degrees of integration for both variables: GDP is integrated of order one I(1) and IMM is integrated of order two I(2). We test for cointegration between the I(1) GDP variable and the first difference value of I(2) IMM variable.[9] This way, we apply the Johansen and Juselius (1990) procedure (Table 4) and the Pesaran *et al*. (2001) procedure (Table 6). Cointegration tests do not confirm the long-run nature of the relationship between variables.

From the statistical analysis we see that in the short term there is a Granger causal relationship from GDP per head to per capita number of foreigners but there is no long-term equilibrium due to the lack of cointegration between both variables. Consequently, the results are inconclusive. Following the Granger causality test, the results may indicate that both the recruitment of temporary workers based on a very strict rotation system, where migrants were asked to leave the country, and the upper limit to the number of foreigners allowed to enter the country, imposed in the 1970s, have contributed to the public acceptance of migration policy but were not proven effective for controlling the number of foreigners. On the contrary, following the cointegration test (Johansen and Juselius, 1990) the legislation was successful in controlling immigration besides the contribution to the acceptance of migration policy.

Although like Germany, Switzerland encouraged low-skilled migration, our results have proven that contrary to the German case the per head

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[9] If a variable is an I (2) series, then the first difference of the variable will be an I (1) series.

number of foreigners did not cause GDP per capita growth in Switzerland. It reveals that migration hindered structural change. The flexible supply of low skilled workers resulting from migration leads to relatively lower wages for this type of work. In turn, the relatively lower wages lead to the substitution of capital and qualified labour through unskilled labour. In other words, the rise in the population through immigration reduces the level of capital per worker and so the per capita productivity.

V CONCLUSIONS

In this paper we present an analysis of the causal relationship between the number of foreign citizens per head and per capita gross domestic product during the last waves of immigration to Germany and Switzerland. According to the literature, the immigration could have occurred as a result of increased demand for labour and the expectance of higher income in the host country. Both countries encouraged mostly low-skilled and temporary workers. They underwent a similar learning process with the goal of attracting high-skilled people and restricted the recruitment of low-skilled immigrants. The migration regimes in both countries share the freedom of movement of people within the EU/EFTA countries and recruitment from outside the EU/EFTA countries is permissable if it is of public interest or domestic workers could not be found. However, our empirical analysis reveals important differences for Germany and Switzerland.

Applying the cointegration approach, we found that economic growth was related to immigration in Germany. First it suggests that the pieces of legislation introduced to control the number of foreign workers in the 1970s (Germany stopped its "guest worker" programmes in 1973) have not proven to be effective instruments because the immigration flows still tend to respond to economic growth. Second, taking into account that the presence of foreign labour is very strong and migration policy has been an important issue in the political discussion, the restrictions may have contributed to the public acceptance of migration policy, that is, they have been more important as a signal than as a means of control.

Finally, there is evidence that immigrants have a sizeable impact on the economic growth, which is generally admitted and described from the macroeconomic point of view.

Considering the statistical relationship from economic growth to foreigners, the results are inconclusive for Switzerland. The Granger causality test allows us to affirm that economic growth has a causal effect in the sense of Granger on immigration. However, using both the ARDL approach to

cointegration and Johansen, we do not find evidence of a long-run relationship in Switzerland. It suggests that the response of migration to economic growth was lower in Switzerland than in Germany and it may be indicative that the Swiss immigration policy was more restrictive. In 1970, the Swiss government introduced quotas that placed an annual upper limit on the number of foreigners allowed to enter the country. It may have limited the response of immigration to economic growth.

Regarding the statistical relationship from immigration to economic growth, the results for Switzerland are in line with our expectations according to previous studies of the economic impact of immigration on indigenous population. They led to the conclusion that the immigration policy is likely to have damaged economic growth. The controls based on quotas implied discrimination in favour of less skilled workers as they tended to be concentrated in seasonal businesses. Low-skilled migrant workers accept lower wages, and the employers use the savings to remain competitive. Thanks to the presence of foreign workers, firms are not forced to invest in technology, which impeded structural change and technological development and contributed to the slow growth of the Swiss economy.

Since Germany and Switzerland are two of the most important receiving areas of migrants in the last half century, they are key European countries of migration. Other European countries such as Ireland and Spain that face similar demographic challenges and have become immigration countries could take advantage of the Swiss and German long learning processes. They have to manage the selection of immigrants wisely to compensate for labour shortages without compromising economic growth.

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