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Determinants of Immigration in Europe. The Relevance of Life Expectancy and Environmental Sustainability

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Abstract: This research analyzes the main variables that determine immigration in Europe and includes aspects related to the economy, population, healthcare, and environmental sustainability. The empirical analysis consists of two sets of data: one made up of all EU member states (EU-28) and the other containing countries that form a part of the Eurozone (EU-19), using the Generalized Method of Moments. The sample covers the period between 2000 and 2014, and the data are analyzed separately and comparatively in the most relevant stages during that time (economic prosperity, crisis, and recovery). The most notable results indicate that the variables related to GDP and public debt largely serve to justify the level of immigration since the crisis (2008–2014), while the life expectancy and levels of pollution are determining factors in all three stages examined here. The study concludes that countries in the Eurozone are more sensitive to variation in the variables studied compared to all the EU member states and thus the impact of immigration among the EU-19 countries is more notable.

Keywords: environmental sustainability; immigration; life expectancy; EU member states; Eurozone; finance

1. Introduction

Over the last century, and especially in recent decades, European countries have been amongst the leading recipients of migration flows, transforming the societies of these countries economically, socially, and demographically. Due to increasingly lower birth rates among the inhabitants of European host countries, immigration has become an essential source of population growth.

This phenomenon has also affected the public finances of these countries, with the subsequent squeeze on social protection policies that form a vital part of the welfare states that predominate throughout the countries in the EU [1]. Hence, the phenomenon of immigration is highly relevant to these receiving countries.

Increases in migration flows are closely related to the advance of globalization, largely due to notable developments in transport and communications. This globalization process is helping to bridge the gap between the world's richest and poorest countries [2].

These migration inflows have come about fundamentally during periods of economic boom, and have brought with them an abundance of flexible, cheap labor in sectors such as construction, agriculture, and services. However, this situation changed with the arrival of the economic crisis from 2008 onwards, due to the increase in unemployment rates, a lack of economic growth, and cuts in social spending. Such circumstances can engender feelings of rejection or xenophobia towards the immigrant population and new political parties emerge that foster this rejection [3]. On occasions, it is the workers of the host countries that show a greater propensity towards such rejection, commonly in individuals with lower levels of labor-related skills, who are more openly opposed to the arrival

of immigrants, possibly because they feel that their jobs are threatened [4]. Thus, immigration has implications that are not only economic, but also social and political.

In addition, migration flows have been affected by an increase in life expectancy in European countries, while the fertility rate has dropped, leading to an aging population. At the same time, we are also witnessing changes in our environment, such as climate change, and its subsequent effects, such as desertification, drought, rising sea levels, etc. Such effects on the environment have brought about the appearance of environmental refugees and immigrants [5].

Enforced migration for reasons of climate change are difficult to distinguish from numbers that emigrate for economic reasons, given that they have many aspects in common. However, it would be true to say that that environmental migration has increased during the first decade of the XXI century, and it has become a source of concern for politicians, as well as for social and environmental scientists.

The objective of this study is firstly to analyze whether a series of variables related to the economy, population, healthcare, and environmental protection might serve to explain the levels of immigration in Europe. Secondly, it examines whether the relevance of these variables differs for all European Union countries (EU-28) compared to those that have adopted the single currency (EU-19). It also takes a closer look at whether these effects vary according to the period of time in which they occur and the various stages of economic growth or decline (economic prosperity, financial crisis, and economic recovery).

The more notable results from the study indicate that the control of pollution levels and promoting a healthier environment are relevant in justifying the migration flow towards Europe. In addition, the longer life expectancy is also an attractive factor for those migrating to Europe. Moreover, these variables are significant in each of the three periods analyzed, and the impact is greater among countries in the Eurozone.

In Section 2, we discuss migration flows in Europe, examine the variables that might determine them, and set out the hypotheses that we propose as a result. Section 3 contains the empirical analysis, while the most important results appear in Section 4. Section 5 presents the main conclusions that can be taken from the study.

2. Immigration in Europe

2.1. European Migration Flows

Changes in the phenomenon of migration have meant that, in recent decades, countries such as Spain, Ireland, Portugal, and Italy have gone from being typically emigrant flow countries to being a destination for immigrants and a country of residence for foreign inflows.

This change occurs fundamentally during periods of economic growth, where the immigrant intake has implied an injection of cheap, abundant labor, most of whom are employed mainly in sectors such as construction, agriculture, and services, as we have observed.

However, since the crisis in 2008, this situation has changed due to a lack of economic growth, an increase in unemployment, and cuts to budgets and social spending.

As a result of these circumstances, and given the relevance of the immigration phenomenon, we analyze in greater depth which variables might influence the final decision to emigrate to European countries.

The first descriptive results on the size of migrant flows (INMIG) into Europe (see Table 2 and Table 3) indicate that they are relatively higher (roughly 1.49%) for countries that adopted the Euro (EU-19) compared to member states as a whole (EU-28). On average, the highest immigration figures were recorded during the period of economic recovery (2013–2014) for the EU-28, whilst the economic boom (2000–2007) shows the highest levels for the EU-19. In absolute terms, both subgroupings of countries coincide on the fact that the highest levels of immigration, representing a total 958,266 individuals, occurred during the period of economic prosperity.

2.2. Variables

2.2.1. Immigration, Economy, and Finance

In this section, we analyze variables (see Table 1) of an economic and financial nature: GDP (Gross Domestic Product) per capita (GDPERCAP), percentage growth in GDP (GDPGROW), the unemployment rate (UNEMP), public debt in absolute terms (GOVDEBT), and public deficit (GOVDEF).

We consider the percentage growth in GDP (GDPGROW) to be a key factor as, if the GDP rises, it is because the host country is undergoing a period of expansion and is therefore generating employment and wealth, which in part, is what immigrants are looking for when they move to another country.

The effects of the financial and economic crisis reduced the global performance of the economies of EU member states when analyzed over the last decade. The average growth rate between 2005 and 2015 was 0.9% per year [6].

On another note, GDP growth, among other things, allows countries to maintain and promote the welfare state. Some studies find an important link between social welfare and immigration. For example, the study by [7] indicates a positive correlation between the two concepts. Conversely, a study on OCDE countries carried out by [8], indicates that immigration is not the cause of the economic conditions of a host country.

It can be expected that, at least in principle, the first two variables, GDP per capita (GDPERCAP) and percentage growth in GDP (GDPGROW), will be positive in the analysis of factors that attract immigration. Conversely, the last three; the unemployment rate (UNEMP), public debt in absolute terms (GOVDEBT), and public deficit (GOVDEF), are expected to be negative.

In Tables 2 and 3, we can observe that, for all EU countries (EU-28), GDP per capita (GDPERCAP) in the total sample is higher (8.71%) in comparison with countries that have adopted the single currency (EU-19). Growth in GDP (GDPGRO) is generally slightly higher (7.52%) for the EU-19; however, if we examine the sub-periods, we find a sharp drop from the boom period to the financial crisis (-79.73% and -81.97% for the EU-28 and EU-19, respectively). However, when entering the period of financial recovery, both groups record only moderate growth. Finally, unemployment rates (UNEM) present a similar behavior for both groupings, where a drop in employment rates can be observed throughout the sub-periods.

The amount of governmental debt (GOVDEBT) for the EU-19 is 9.14% higher in comparison with the EU-28. When we analyze the sub-periods for the two groups, the behavior pattern is similar, and therefore, in light of the fact that the level of debt has increased, the recovery period might be regarded as a cause for concern. At the same time, the percentage of debt to GDP (GOVDEF) indicates that EU-19 countries have borrowed 1.87% more than all of the EU-28 countries as a whole. However, the trend by sub-periods indicates that, in a boom period followed by a crisis, the debt demand triples, but undergoes a slight downward trend (approximately 30%) during the period of economic recovery.

Table 1. Description of the variables.

Variables			Description
Independent Variable			
Immigration (number of individuals)		LIMMIG	Logarithm (Person establishes his or her usual residence in the territory of a Member State for a period that is, or is expected to be, of at least 12 months, having previously been usually resident in another Member State or a third country).
Explanatory Variables			
Economy Variables	GDP per capita (millions)	LGDPERCAP	Logarithm (GDP at market prices (final result of the production activity of resident producer units)/numbers of citizens).
	GDP growth (%)	GDPGROW	$(GDP_j - GDP_{j-1})/GDP_j$, $\forall$ j = country 1, . . . , country J.
	Unemployment (%)	UNEMP	Percentage of the unemployed over the active population.
Finance Variables	Government Gross Debt (millions)	LGOVDEBT	Logarithm (The indicator is defined (in the Maastricht Treaty) as consolidated general government gross debt at nominal (face) value, outstanding at the end of the year in the following categories of government liabilities: currency and deposits, debt securities and loans. The general government sector comprises the subsectors: central government, state government, local government and social security funds).
	Government déficit-surplus (%)	GOVDEF	Percentage of gross domestic product (GDP). Net lending (+) or net borrowing (−).
Population Variables	Population Growth (%)	POPGRO	Eurostat aims at collecting from the Member States data on population on 31 December, which is further published as 1 January of the following year. The recommended definition is the 'usual resident population' and represents the number of inhabitants of a given area on 31 December. However, the population transmitted by the countries can also be either based on data from the most recent census adjusted by the components of population change produced since the last census, either based on population registers.
	Natural Change Population (number of individuals)	LNATPOP	Logarithm (The difference between the number of live births and the number of deaths during the year. A positive natural change, also known as natural increase, occurs when live births outnumber deaths. A negative natural change, also named as natural decrease, occurs when live births are less numerous than deaths).
Health Variables	Fertility Indicator (number of individuals)	LFERTIL	Logarithm (The different breakdowns of data on live births and on legally induced abortions received).
	Life Expectancy Absolute Value Birth (years)	LLIFEXP	Logarithm (The number of years that a person is expected to continue to live in a healthy condition. It is compiled separately for males and females, at birth and at age 65. It is based on age-specific prevalence (proportions) of the population in healthy and unhealthy conditions and age-specific mortality information. A healthy condition is defined by the absence of limitations in functioning/disability. The indicator is also called disability-free life expectancy).
Environment Variables	Environmental protection expenditures (millions)	LPROTE	Logarithm (All activities directly aimed at the prevention, reduction and elimination of pollution or any other degradation of the environment).
	Pollution Emissions (tonnes)	LPOLLEM	Logarithm (Includes data on 6 air pollutants: sulphur oxides (SO_x), ammonia (NH_3), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOCs), particulate matters (PM_{10}, $PM_{2.5}$), as reported to the European Environment Agency (EEA)).

Table 2. Descriptive statistics for the EU-28 variables.

Panel A. Overall (2000–2014)												
		Economy Variables			**Finance Variables**		**Population Variables**		**Health Variables**		**Environment Variables**	
N = 420	**INMIG**	**GDPERCAP**	**GDPGROW**	**UNEMP**	**GOVDEBT**	**GOVDEF**	**POPGRO**	**NATPROP**	**FERTIL**	**LIFEXP**	**PROTE**	**POLLEM**
Mean	126,680.8	23,110.95	0.051634	0.090036	54.49665	−2.884928	0.002265	11,605.63	1.525442	77.90036	38.99665	380,870.4
Maximum	958,266	73,000	0.313668	0.275	179.7	6.9	0.031359	303,252	2.06	83.3	83.73	1,923,700
Minimum	35	5000	−0.23016	0.019	3.7	−32.1	−0.044985	−211,756	1.15	70.35	0	3834
SD	191,661.3	10,568.78	0.067373	0.043250	31.4882	3.757779	0.008799	72,254.98	0.225557	3.196445	18.41291	473,145.6
J-B	578.7952 **	627.8792 **	98.33769 **	234.7727 **	67.28021 **	1406.296 **	236.9374 **	819.4219 **	32.87014 **	** 34.94481	4.500946	199.7107 **
Panel B. Sub-Period 2000–2007												
N = 224	**INMIG**	**GDPERCAP**	**GDPGROW**	**UNEMP**	**GOVDEBT**	**GOVDEF**	**POPGRO**	**NATPROP**	**FERTIL**	**LIFEXP**	**PROTE**	**POLLEM**
Mean	126,124.6	21,098.21	0.081491	0.083799	46.91757	−1.685586	0.002257	10,680.08	1.484664	76.95826	38.22657	433,928.7
Maximum	958,266	67,100	0.313668	0.2	108.8	6.9	0.031359	303,252	2.01	81.5	78.72	1,923,700
Minimum	35	5000	−0.085044	0.019	3.7	−12	−0.044985	−148,903	1.15	70.35	0	8653
SD	208,232.9	10,066.04	0.058325	0.03948	26.33434	3.142206	0.008704	65,113.04	0.225492	3.100535	16.20561	533,052.3
J-B	322.8031 **	173.1928 **	93.87142 **	56.89913 **	11.71886 **	0.967747	291.4717 **	751.1093 **	21.16173 **	24.43949 **	1.843809	82.93403 **
Panel C. Sub-Period 2008–2012												
N = 140	**INMIG**	**GDPERCAP**	**GDPGROW**	**UNEMP**	**GOVDEBT**	**GOVDEF**	**POPGRO**	**NATPROP**	**FERTIL**	**LIFEXP**	**PROTE**	**POLLEM**
Mean	126,872.2	24,988.57	0.016521	0.092779	59.145	−4.648571	0.002668	15,780.33	1.584929	78.68152	39.57344	333,836
Maximum	682,146	68,600	0.191805	0.248000	172.1	4.2	0.027869	286,577	2.06	82.7	81.74	1,411,614
Minimum	2639	11,200	−0.23016	0.034000	4.5	−32.1	−0.02845	−196,038	1.23	71.75	1.7	3834
SD	168,636.3	10,485.17	0.069051	0.042238	32.57194	4.181003	0.009491	81,197.11	0.219975	2.961807	21.08225	400,051.9
J-B	76.09539 **	290.0315 **	16.20044 **	59.01844 **	15.69381 **	946.3818 **	17.18962 **	156.25 **	13.93443 **	16.64977 **	3.877545	45.74231 **
Panel D. Sub-Period 2013–2014												
N = 56	**INMIG**	**GDPERCAP**	**GDPGROW**	**UNEMP**	**GOVDEBT**	**GOVDEF**	**POPGRO**	**NATPROP**	**FERTIL**	**LIFEXP**	**PROTE**	**POLLEM**
Mean	128,169.8	26,467.86	0.019985	0.108125	72.92143	−3.230357	0.001291	4871.054	1.539107	79.67455	44.82333	286,223.6
Maximum	884,893	73,000	0.103732	0.275000	179.7	1.5	0.023538	259,893	2.01	83.3	83.73	1,272,410
Minimum	3904	12,200	−0.069286	0.050000	10.2	−15	−0.011047	−211756	1.21	74.05	11.74	4872
SD	185,202.7	11,194.85	0.030788	0.053956	37.64382	3.060239	0.007319	76,331.57	0.207822	2.887904	21.14199	350,276.4
J-B	116.7506 **	172.2435 **	2.753423	36.82398 **	4.96164 ^	59.39364 **	11.7564 **	60.79337 **	3.915637	6.575868 *	0.166918	21.42939 **
VIF	–––	4.568741	2.690145	3.603471	6.976412	6.126804	1.069745	2.057487	3.666875	1.556824	4.906042	4.763254

This table presents the typical descriptive statistics for the variables: mean, maximum and minimum values, standard deviation (SD), the Jarque-Bera test (J-B) for contrasting normality, and the Variance Inflation Factor (VIF) to diagnose the presence/absence of multicollinearity. ** $p < 0.1$, * $p < 0.05$, ^ $p < 0.01$.

Table 3. Descriptive statistics for the EU-19 variables.

Panel A. Overall (2000–2014)												
		Economy Variables		**Finance Variables**		**Population Variables**			**Health Variables**		**Environment Variables**	
N = 285	**INMIG**	**GDPERCAP**	**GDPGROW**	**UNEMP**	**GOVDEBT**	**GOVDEF**	**POPGRO**	**NATPROP**	**FERTIL**	**LIFEXP**	**PROTE**	**POLLEM**
Mean	128,569.8	25,123.51	0.047749	0.090849	59.47614	−2.938947	0.003702	13,738.63	1.526	78.57847	40.28925	375,580
Maximum	958,266	73,000	0.313668	0.275000	179.7	6.9	0.031359	303,252	2.06	83.3	83.73	1,923,700
Minimum	35	7100	−0.23016	0.019000	3.7	−32.1	−0.02845	−211,756	1.19	70.35	0	3834
SD	202,087.6	10,910.95	0.060917	0.045352	35.00633	4.012295	0.00903	75,154.83	0.225877	3.077082	18.86578	492,495.8
J-B	418.522 **	516.0964 **	169.0808 **	171.0457 **	16.32584 **	1196.209 **	19.25343 **	527.263 **	26.13884 **	57.65717 **	2.874345	113.0777 **
Panel B. Sub-Period 2000–2007												
N = 152	**INMIG**	**GDPERCAP**	**GDPGROW**	**UNEMP**	**GOVDEBT**	**GOVDEF**	**POPGRO**	**NATPROP**	**FERTIL**	**LIFEXP**	**PROTE**	**POLLEM**
Mean	136,091.1	23,067.76	0.075993	0.080625	50.35855	−1.553289	0.004195	16,155.31	1.494671	77.59533	39.544	429,894.7
Maximum	958,266	67,100	0.313668	0.195000	108.8	6.9	0.031359	303,252	2.01	81.5	78.72	1,923,700
Minimum	35	7100	0.004884	0.019000	3.7	−12	−0.019488	−148,903	1.19	70.35	0	8653
SD	225,555.6	10,193.8	0.052476	0.035655	29.88539	3.103703	0.00821	70,933.1	0.228003	2.963901	15.84822	555,392.2
J-B	191.7067 **	169.0151 **	145.2355 **	37.14768 **	5.538987 ^	2.943811	6.571765 *	415.1537 **	15.19215 **	38.76155 **	0.582827	46.32409 **
Panel C. Sub-Period 2008–2012												
N = 95	**INMIG**	**GDPERCAP**	**GDPGROW**	**UNEMP**	**GOVDEBT**	**GOVDEF**	**POPGRO**	**NATPROP**	**FERTIL**	**LIFEXP**	**PROTE**	**POLLEM**
Mean	119,206.8	27,053.68	0.013698	0.097326	65.23474	−4.941053	0.003709	14,122.05	1.574211	79.42234	40.74525	326,955.6
Maximum	682,146	68,600	0.173558	0.248000	172.1	4.2	0.027869	286,577	2.06	82.7	81.74	1,411,614
Minimum	2639	12,800	−0.23016	0.037000	4.5	−32.1	−0.02845	−196,038	1.28	71.75	1.7	3834
SD	166,920.1	10,996.78	0.060444	0.047955	35.43065	4.617047	0.010451	81,039.98	0.219494	2.811436	22.48947	416,611.6
J-B	49.73584 **	204.0887 **	47.45518 **	20.31349 **	4.301137	567.7781 **	5.98054 *	114.8771 **	12.90376 **	30.58608 **	3.181964	29.9789 **
Panel D. Sub-Period 2013–2014												
N = 38	**INMIG**	**GDPERCAP**	**GDPGROW**	**UNEMP**	**GOVDEBT**	**GOVDEF**	**POPGRO**	**NATPROP**	**FERTIL**	**LIFEXP**	**PROTE**	**POLLEM**
Mean	123,576.9	28,521.05	0.0199	0.116079	81.55	−3.476316	0.001709	3113.368	1.530789	80.42027	54.61667	279,882
Maximum	884,893	73,000	0.071863	0.275000	179.7	1.5	0.023538	259,893	2.01	83.3	83.73	1,272,410
Minimum	3904	16,600	−0.069286	0.049000	10.2	−15	−0.011047	−211,756	1.21	74.05	27.29	4872
SD	192,038.4	11,987.2	0.030215	0.05989	40.55673	3.408926	0.008262	77,426.65	0.216887	2.737179	28.26239	366,543.7
J-B	99.57739 **	106.8624 **	6.868972 *	10.64451 **	0.925469	30.70216 **	4.611322 ^	47.32679 **	2.861169	11.04541 **	0.28794	15.23838 **
VIF	−−−	4.179687	3.168742	3.636977	5.896357	6.334921	1.150793	1.646874	4.367955	1.463571	5.756966	4.843298

This table presents the typical descriptive statistics for the variables: mean, maximum and minimum values, standard deviation (SD), Jarque-Bera test (J-B) for contrasting normality, and the Variance Inflation Factor (VIF) to diagnose the presence/absence of multicollinearity. ** $p < 0.1$, * $p < 0.05$, ^ $p < 0.01$.

The hypotheses formulated to analyze the effects of the economic-financial variables are as follows:

Hypothesis 1 (**1a**). *GDP per capita positively affects the levels of immigration and has a much more notable effect in the Eurozone countries (EU-19) than among all EU member states (EU-28).*

Hypothesis 1 (**1b**). *GDP growth positively affects the levels of immigration and has a more notable effect in the EU-19 countries compared to the EU-28 countries.*

Hypothesis 1 (**1c**). *The level of unemployment negatively affects immigrant inflows, and to a greater extent among EU-28 countries.*

Hypothesis 1 (**1d**). *Public debt can negatively affect the level of immigration, and to a greater extent in EU-28 countries.*

Hypothesis 1 (**1e**). *The proportion of debt to GDP can negatively affect the level of immigration, and to a greater extent in EU-28 countries.*

2.2.2. Immigration and Population

In this section, we include variables such the population growth (POPGRO) and natural population change (NATPOP). As previously observed, the population growth in European countries is fundamentally due to immigrant inflows. We also analyze whether this growth in population, partly brought about by the arrival of new immigrants, might also be a determining factor when choosing a particular host country.

The current demographic situation in the EU-28 is characterized by continuous population growth. Since 1992, net migration has been the principle determining factor in population growth among the EU-28, reaching 0.95 million people in 2014. This is indicative that the general population growth or decline among EU-28 countries largely depends on the contribution of migration inflows [9].

In many countries on different continents, it can be seen that an uncontrolled population growth largely stems from the recent waves of immigration and by subsequent generations [10–12].

A descriptive study of the population (see Tables 2 and 3) shows that population growth (POPGRO) has been considerably higher for the EU-19 compared to the EU-28, by 63.44%. For the EU-19, this growth has not been interrupted, while the EU-28 experienced a decline during the period of economic recovery. The natural population change (NATPOP) shows higher values for the EU-19 (18.38%) compared to the EU-28, despite the fact that the rate did not drop until the third sub-period for EU-28 countries. For the EU-19, they decreased considerably from the first sub-period until the end of the sample.

The hypotheses proposed to study the effects of the population variables are:

Hypothesis 2 (**2a**). *Population growth has a positive effect on the level of immigration, and to a greater extent on EU-19 countries.*

Hypothesis 2 (**2b**). *Natural population change has a positive effect on the levels of immigration, and to a greater extent on the EU-19 countries.*

2.2.3. Immigration and Public Health

It is logical to believe that, a priori, there is a high life expectancy in countries with high standards of food, hygiene, and general welfare conditions. Economic development and changes in certain environmental conditions, improvements in lifestyle, and advances in health and medicine have led to

a continuous improvement in the life expectancy in Europe. This situation places the 28 countries of the European Union among the world leaders in terms of life expectancy [13].

According to the working paper produced by the European Commission "Investing in Health" (COM, 2013, 83), health is the one prior condition for a country to be able to prosper economically. Consequently, health influences the economic results of a country, and what is more, the capacity of governments to intervene in the public sector and adopt effective initiatives aimed at improving the quality and availability of services such as healthcare fundamentally depends on the available economic resources [14,15]. Refs. [16–18] analyze the effect of life expectancy on immigration in the US, Spain, and the European Union, respectively. In light of the arguments found in the literature, we propose that the variable of absolute life expectancy (LIFEXP) is a determining factor in migration flows.

Another related variable that we propose to be potentially relevant to migration flows is the fertility rate (FERTIL) and we thus analyze whether this variable affects immigration in the host country. Patterns of fertility have not followed a linear pattern over time. Before 2008, the birth rate had been growing (0.15 births per adult female) until the crisis started and the trend became negative.

Changes in the fertility rate partially follow changes in the state of the economy, with an average delay of less than two years. The uncertainty produced by the economic crisis can influence fertility. The length of a financial crisis also plays an important role and, in some countries, the length and depth of the current recession has had a long-lasting impact. Changes in GDP are largely positively correlated to variations in the fertility rate for up to 19 months [19].

Within the European context, several studies address the effects of fertility on migration flows. Some of them analyze the relationship between fertility trends and the integration of the immigrant population [20]. Other research indicates that immigration plays a fundamental role in sustaining the economic system, given that the fertility rate in Europe has been decreasing in recent years [17]. On the other hand, other research analyzes the influence of immigration on European fertility trends and concludes that they are mostly due to the influence of the immigrant population [21].

The first results shown in Tables 2 and 3 with regard to the fertility rate (FERTIL) show reasonably homogeneous behaviors for the EU-28 and EU-19 groupings. In the period where the economy passes from the boom period to the economic crisis, it can be observed that the fertility rate rises for both groups (5.32% and 6.75%, respectively). On moving into the period of economic recovery, both groups undergo a decrease in the rate (approximately −2.8%). On another note, the life expectancy (LIFEXP) for EU-19 countries is almost one year longer in comparison to EU-28 countries. The behavior for the two sub-periods is similar as life expectancy grows slightly when moving from one period into another.

In order to analyze the effects of these variables, we propose the following hypotheses:

Hypothesis 3 (**3a**). *Fertility has a positive effect on immigration, and this effect is greater on EU-19 countries.*

Hypothesis 3 (**3b**). *Life expectancy positively affects the number of immigrants, and this effect is greater on EU-19 countries.*

2.2.4. Immigration and Sustainability

In this section, we analyze two variables. On the one hand, we examine the amount of investment that has been devoted to protecting the environment (PROTE); in principle, the effect of this variable on the arrival of new immigrants can be expected to be positive. On the other hand, we analyze the effects of the level of pollution emissions (POLLEM) on the influx of new immigrants.

Tables 2 and 3 show that the volume of investments made to prevent and mitigate damage caused to the environment (PROTE) indicate that, for both groups of countries, the costs inherent to this activity have increased, although they have been slightly higher in EU-19 countries (3.32%) compared to the whole EU-28 group. During the boom period, Europe spent more than 38 and 39 million euros and rose to 44 and 55 million euros for EU-28 and EU-19 countries, respectively. Additionally, the

levels of pollution emissions (POLLEM) show that EU-28 countries are slightly less pollutant that the EU-19 countries, by 1.39%. The evolution of these levels by sub-period shows that these values descend and undergo variations in similar ways for the two groupings.

To study the effects of these variables related to protecting the environment, we propose the following hypotheses:

Hypothesis 4 (4a). *The amount of money allocated by governments to protecting the environment has a positive effect on immigration, and to a greater extent in EU-19 countries.*

Hypothesis 4 (4b). *Higher levels of pollution have a negative effect on immigrant inflows, and to a greater extent for EU-19 countries.*

The use of explanatory variables in the regression process might cause problems of multicollinearity, given the high degree of interrelation that can exist between some of the variables. To detect such problems, we apply the variance inflation factor (VIF). Some research indicates that individual values for VIF of over ten indicate problems of multicollinearity, as do average values of over six [22].

3. Empirical Analysis

3.1. Sample

The sample is made up of two sets of data constructed for European countries and obtained from EUROSTAT, which span from 2000 to 2014. The first dataset consists of the 28 countries that make up the EU member states (420 data inputs), that is to say: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom. The second set is made up of the 19 countries that have adopted the single currency and form the Economic and Monetary Union of the European Union (285 data inputs), e.g., Austria, Belgium, Cyprus, Estonia, France, Finland, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia, and Spain.

The analysis is applied to the complete sample (2000–2014) which consists of a total of 15 years, divided into three sub-periods, with a view to analyzing more deeply the effects of economic cycles on the behavior patterns of immigration in Europe. The first sub-period (2000–2007) describes a period of economic prosperity; the second sub-period (2008–2012) is characterized by the global economic and financial crisis [23]; and the third sub-period (2013–2014) represents a period of gradual economic recovery [24].

3.2. Empirical Model

From a methodological point of view and based on the previous empirical evidence consulted, the determinants of the immigration of European will be analysed through a dynamic data panel. This allows us to control the existence of unobservable heterogeneity that is greater with cross-sectional data [25,26].

Thus, it could be assumed that the immigration for these European countries could be expressed through the following theoretical model:

$$IMMIG_{jt} = \alpha + \sum_{k=1} \beta_k \cdot X_{kjt} + \mu_{jt} \quad (1)$$

where X is a vector of the k explanatory variables, β_k represents the unknown estimated parameters, and μ_{jt} is the random perturbation.

We propose an econometric approach for the theoretical model described in Equation (1), which integrates the explanatory variables. Thus, the estimation and contrast of this model takes the following structure:

$$\begin{aligned} \text{LIMMIG}_{jt} = {} & \delta_0 + \delta_1 \text{LGDPERCAP}_{jt} + \delta_2 \text{GDPGROW}_{jt} + \delta_3 \text{UNEMP}_{jt} \\ & + \delta_4 \text{LGOVDEBT}_{jt} + \delta_5 \text{GOVDEF}_{jt} + \delta_6 \text{POPGRO}_{jt} \\ & + \delta_7 \text{LNATPROP}_{jt} + \delta_8 \text{LFERTIL}_{jt} + \delta_9 \text{LLIFEXP}_{jt} \\ & + \delta_{10} \text{LPROTE}_{jt} + \delta_{11} \text{LPOLLEN}_{jt} + \varepsilon_{jt} \end{aligned} \quad (2)$$

where LIMMIG_{jt} represents the logarithm of the volume of immigration for the country j (j = 1, . . . , J) in the time period t (t = 1, . . . , T). δ_0 represents the intercept (constant term) of the regression. δj represents the estimated values of the regression coefficients in a cross-section of the explanatory variables: $\forall$j = LGDPERCAP, GDPGROW, UNEMP, LGOVDEBT, GOVDEF, POPGRO, LNATPROP, LFERTIL, LLIFEXP, PROTE y LPOLLEN. Finally, ε_{jt} represents the random perturbations.

The parameters have been estimated by incorporating instrumental variables through the Generalized Method of Moments (GMM) to the equation in first differences. This methodology has been chosen because it allows us to control the possible problems of endogeneity that may arise, since the random disturbances that affect decisions about the levels of economic profitability can also affect other characteristics of the countries.

This procedure was developed by [27] and presents two levels of application depending on the nature of the random disturbance. If the residues are homoscedastic, the one-stage GMM estimate would be the most appropriate. If, on the other hand, there is heteroskedasticity, the estimator of instrumental variables at one stage will remain consistent, but the two-step estimate increases the efficiency.

In addition, to test the consistency of the estimates, the second-order serial correlation test (*m2* test) proposed by [27] is employed. In turn, we use the [24] test of the over-identification of constraints (under the null hypothesis that the instruments used are valid) to verify the absence of correlation between the instruments and the error term.

The results of the *m2* test indicate the absence of second-order serial correlation since the instruments used in the GMM estimates are not correlated with the error term, neither for the entire European sample, nor for the subperiods. Additionally, the Sargan test [28] cannot be rejected and, consequently, the instruments incorporated in the GMM regression are valid (see the bottom of Tables 4 and 5).

Table 4. Determinants of immigration in EU-28.

Panel A. Overall (2000–2014) (N = 420)												
		Economy Variables			**Finance Variables**		**Population Variables**		**Health Variables**		**Environment Variables**	
	C	**LGDPERCAP**	**GDPGROW**	**UNEM**	**LGOVDEBT**	**GOVDEF**	**POPGRO**	**LNATPOP**	**FERTIL**	**LLIFEXP**	**LPROTE**	**LPOLLEM**
Coefficient	7.16116 **	2.34279 *	1.23146 *	−0.95529 **	−0.0202 *	−3.01740	−0.06675 *	0.03719	1.85899 *	4.9237 **	3.02045	−0.05585 ^
t-Statistic	(6.15767)	(7.60583)	(12.843)	(−4.4001)	(−3.77546)	(−0.54375)	(−2.9655)	(1.33836)	(3.2774)	(20.726)	(0.4403)	(−2.78413)
Sargan Test	63.28(59)											
m2 Test	0.95											
R^2 adjusted	0.41366											
Panel B. Sub-Period 2000–2007 (N = 224)												
Coefficient	9.55621 *	1.93061 *	2.15831	−0.44358	−1.35479	−6.47185	−0.03497 *	3.66667	3.36925 *	5.79360 **	4.66314	−0.09964 ^
t−Statistic	(4.00397)	(8.14268)	(1.4576)	(−0.39741)	(−0.55541)	(−0.66631)	(−2.86751)	(1.49317)	(3.6293)	(22.015)	(0.7756)	(−3.00643)
Sargan Test	61.43(50)											
m2 Test	0.97											
R^2 adjusted	0.39002											
Panel C. Sub-Period 2008–2012 (N = 140)												
Coefficient	3.06744 *	5.06784 **	2.63597	−1.39764 **	−3.00667 *	6.11134	−0.66502 ^	−1.68714	4.12075	4.9234 **	3.47574	−0.00974 ^
t-Statistic	(4.37106)	(15.6674)	(1.6482)	(−6.43674)	(−4.16354)	(0.33474)	(−1.84047)	(−0.88764)	(0.2786)	(20.756)	(0.3679)	(−1.78132)
Sargan Test	68.89(58)											
m2 Test	0.92											
R^2 adjusted	0.41267											
Panel D. Sub-period 2013−2014 (N = 56)												
Coefficient	4.97574 **	2.36547 **	2.67166 *	−1.67418 **	−2.14204 *	−5.36877	−0.08741	0.79657	1.63574	3.97341 **	2.49347	−0.08964 *
t-Statistic	(4.97848)	(10.9741)	(11.637)	(−7.69746)	(−3.06324)	(−0.33674)	(−0.69341)	(1.64744)	(1.0143)	(17.605)	(0.5681)	(−2.95254)
Sargan Test	68.56(58)											
m2 Test	0.92											
R^2 adjusted	0.31029											

The data in this table correspond to two-steps regression results of GMM model in first differences, described in the Equation (2), where the dependent variable is the logarithm of immigration (LINMIG) for UE-28 countries. The variables are: logarithm of GDP per capita (LGDPERCAP), GDP growth (GDPGROW), unemployment (UNEM), logarithm of government grow debt (LGOVDEBT), government deficit-surplus (GOVDEF), population growth (POPGRO), logarithm of natural change population (LNATPOP), logarithm fertility indicator (FERTIL), logarithm life expectancy (LLIFEXP), logarithm environmental protection expenditures (LPROTE) and logarithm population emissions (LPOLLEN). *t*-Statistic in brackets. *m2* is a test for second-order serial autocorrelation in residuals in first differences, distributed asymptotically as N(0,1) under the null hypothesis of no serial correlation. The Sargan Test is a test of over-identifying restrictions distributed asymptotically under the null hypothesis of validity of instruments as Chi-squared: degrees of freedom in brackets. ** $p < 0.1$, * $p < 0.05$, ^ $p < 0.01$.

Table 5. Determinants of immigration in EU-19.

Panel A. Overall (2000–2014) (N = 420)												
		Economy Variables			**Finance Variables**		**Population Variables**		**Health Variables**		**Environment Variables**	
	C	**LGDPERCAP**	**GDPGROW**	**UNEM**	**LGOVDEBT**	**GOVDEF**	**POPGRO**	**LNATPOP**	**FERTIL**	**LLIFEXP**	**LPROTE**	**LPOLLEM**
Coefficient	4.17029 **	5.36617 *	4.23166 **	−0.73145 *	−4.07874 *	−6.12475	1.05714	0.05571	2.45841 *	6.9741 **	−8.05874	−0.36741 *
t-Statistic	(4.22947)	(10.3157)	(6.8573)	(−6.11278)	(−8.90031)	(−0.63744)	(1.05744)	(0.58764)	(3.86741)	(23.974)	(−0.3741)	(−5.66412)
Sargan Test	79.61(72)											
m2 Test	0.79											
R^2 adjusted	0.39605											
Panel B. Sub-Period 2000–2007 (N = 224)												
Coefficient	3.00841 ^	1.95714 **	4.65471 **	−0.72974 **	−1.67547 *	−7.63644	5.66348	0.44621	4.00677 *	7.6544 **	2.00647 ^	−0.45874 *
t-Statistic	(6.66641)	(8.79541)	(9.4374)	(−5.96478)	(−6.54231)	(−0.36874)	(0.83336)	(0.40641)	(3.9654)	(22.648)	(1.3208)	(−4.11647)
Sargan Test	77.11(71)											
m2 Test	0.86											
R^2 adjusted	0.41394											
Panel C. Sub-Period 2008–2012 (N = 140)												
Coefficient	2.11411 ^	9.66774 **	4.1185 **	−1.49647 **	−8.3338 **	−14.5414	−0.57521 ^	4.36741	6.66254	4.9636 **	3.30541	−0.06874 *
t-Statistic	(5.49355)	(19.6552)	(6.5424)	(−7.14621)	(−12.5641)	(−0.8747)	(−1.63542)	(0.06847)	(0.3065)	(21.494)	(0.3546)	(−3.63674)
Sargan Test	83.25(79)											
m2 Test	0.75											
R^2 adjusted	0.42694											
Panel D. Sub-Period 2013–2014 (N = 56)												
Coefficient	1.69751 *	4.66665 **	4.7414 **	−1.9674 **	−5.71852 *	−9.46001	−0.46754	−0.00687	1.03974	4.3128 **	3.69751	−0.02674 *
t-Statistic	(3.14058)	(12.6878)	(12.452)	(−9.32165)	(−7.10235)	(−0.26741)	(−0.66666)	(−0.36714)	(1.1851)	(19.066)	(0.3365)	(−2.96654)
Sargan Test	84.53(79)											
m2 Test	0.75											
R^2 adjusted	0.32374											

The data in this table correspond to two-steps regression results of GMM model in first differences, described in the Equation (2), where the dependent variable is the logarithm of immigration (LINMIG) for UE-19 countries. The variables are: logarithm of GDP per capita (LGDPERCAP), GDP growth (GDPGROW), unemployment (UNEM), logarithm of government grow debt (LGOVDEBT), government deficit-surplus (GOVDEF), population growth (POPGRO), logarithm of natural change population (LNATPOP), logarithm fertility indicator (FERTIL), logarithm life expectancy (LLIFEXP), logarithm environmental protection expenditures (LPROTE) and logarithm population emissions (LPOLLEN). *t*-Statistic in brackets. *m2* is a test for second-order serial autocorrelation in residuals in first differences, distributed asymptotically as N(0,1) under the null hypothesis of no serial correlation. The Sargan Test is a test of over-identifying restrictions distributed asymptotically under the null hypothesis of validity of instruments as Chi-squared: degrees of freedom in brackets. ** $p < 0.1$, * $p < 0.05$, ^ $p < 0.01$.

4. Results

The results of the estimation and contrast of the model (2) reveal differentiating aspects between the countries that make up the EU member states (see Table 4) and those that adopted the Euro (see Table 5) with regard to the behavioral patterns of immigration in Europe.

Growth in GDP and its value per capita is important for the economy as a whole, as it determines its expansion to a large extent and hence the general levels of wealth that allow its citizens to enjoy a good standard of living. The results from the regression indicate that GDP behavior per capita (LGDPERCAP) and GDP growth (GDPGROW) behave similarly, with reasonably high significance levels (5%). The positive nature and size of the coefficients indicate, on the one hand, that they are decisive for migration flow and positively affect growth in the numbers of immigrants entering Europe, while also indicating that this effect is much greater for those countries that have adopted the single currency. In recent years, unemployment figures (UNEM) have risen; which has been one of the causes that might justify a drop in immigration rates. The results indicate that unemployment drives a decrease in immigration to a greater extent in the EU-28 countries, to a very high significance level (1%). In light of these first results, we can verify that the proposed hypotheses for the economic variables can be entirely confirmed (Hypothese 1a–c). However, these results would be more relevant for the period of the financial crisis and, although it is true that unemployment was a determining factor for this period, it was even more so for the period of economic recovery to a very high level of significance (1%).

We observe that the levels of debt among European countries have risen throughout the 14-year period studied here, both in absolute terms and with regard to the percentage of GDP (see the descriptive statistics in Tables 2 and 3). The results of the regression indicate that the level of debt (LGOVDEBT) incurred in Europe reduces the amount and permanence of immigration to a significance level of 5%. This reducing effect of debt on immigration is almost double for countries that make up the Eurozone, and it is therefore the EU member states as a whole who soften the impact on the decrease of levels of immigration. These findings confirm the partial validity of the proposed hypotheses for the financial variables. The first of these (Hypothesis 1d is confirmed in terms of being negative, but cannot be confirmed for the group proposed in the hypothesis, i.e., the EU-28 countries). With regard to Hypothesis 1e (GOVDEF), despite confirming the negative effect, it does not turn out to be significant, and therefore, the percentage of debt to GDP is not a determining factor for migration flow. When we analyze the study by sub-period, we see that debt is only significant in absolute terms for the periods of crisis and economic recovery. The only difference between the sub-periods is that, during the crisis, it reached its highest level of significance (1%) for EU-19 countries.

The aspects related to the demographic situation affect immigration in different ways. On the one hand, variations in population size are due to the difference between the numbers of births and deaths of citizens and, on the other, fluctuations in the migration flow. The hypotheses set out for the population variables establish that the effect they have on immigration is positive and even more so for the countries that adopted the single currency. For population growth (POPGRO), we can see that it is only significant (5%) for the EU-28 countries, but that, in contrast to our hypotheses (Hypothesis 2a), it has a totally opposite effect. In fact, population growth for the member states grouping brings about a decrease in immigration figures, though the effect is not sizeable given the value of the coefficient. Hypothesis 2b, which refers to the effect brought about in terms of a natural change in the population (LNATPOP), is not significant, and is only a determining factor for population growth itself. If we look in more detail at these aspects by sub-period, we observe that population growth is only relevant for the period of the economic boom and for the EU-28 countries, and it has a downward effect on the numbers of immigrants.

Variables related to health have always been factors that have attracted migration flow. Europe is one of the continents where welfare states are designed to guarantee free, universal healthcare for their citizens. Equally, Europe is among the leading areas for life expectancy. All of these arguments are supported by the descriptive results presented in the second section of this study. The moderate

rates of fertility registered by Europe and the regression results establish that fertility (FERTIL) is a significant parameter (to 5%) for both groupings; the EU-19 countries show a much greater effect and, hence, fertility rates for countries that adopted the Euro are more likely to attract higher levels of immigration in comparison to all member states. At the same time, life expectancy (LLIFEXP) is also significant (to 1%), whose positive outcome indicates that the higher the life expectancy of a country, the more immigration it attracts. This hypothesis is confirmed to a larger extent for the EU-19 countries. Indeed, the coefficients for these two variables have the highest values and, therefore, the number of immigrants increases considerably in accordance with the variations for these parameters. These results confirm the proposed hypotheses that address the relevance of the variables related to public health, and even more so for the countries in the Eurozone (Hypotheses 3a,b). We can observe that life expectancy is relevant for all the sub-periods and reaches the highest possible level of significance (1%). However, fertility is only relevant to the period of economic prosperity. Consequently, regardless of the period of the economic cycle, life expectancy is vital for attracting and consolidating the flow of migration.

In recent decades, measures put into place by countries to protect the environment as far as possible have received particular attention from analysts. Individuals are showing an increasing tendency to reside in countries that adopt policies that favor healthy lifestyles. This fact leads us to believe that the measures aimed at safeguarding and promoting the environment can have a positive impact on immigration. However, according to the results of the regression, all of the costs allocated to protecting the environment (LPROTE) by European countries, both for EU-28 and the EU-19 group, are not influential for immigration. In other words, the migration flow does not consider investment in protecting and promoting a healthy environment to be relevant in its decision to emigrate to Europe, and thus, Hypothesis 4a is rejected. Conversely, the levels of pollution (LPOLLEN) do turn out to be relevant for both country groupings, though with different levels of significance. For the EU-19 grouping, pollution in the host country is an element that makes it less attractive to reside in, given its negative and significant effect (5%). For the EU-28 group of countries, this effect is reduced, as the coefficient is somewhat lower and its level of significance is borderline (10%). If we observe the behavior of these variables over the course of the periods considered in this study, we can see that the levels of pollution behave in a similar fashion throughout the entire period studied, that is to say, with significance levels of 5% for the EU-19 countries and only significant to 10% for the EU-28. For both groupings, it can be observed that the downward effect on immigration is much higher during the period of economic prosperity. These effects are reduced during the periods of crisis and economic recovery, which thus indicates that pollution negatively affects immigration flow at times when the economy is at its strongest.

To sum up, the most important variables are, on the one hand, those related to the healthcare system, especially life expectancy (LIFEXP), and on the other, one of the variables related to sustainability, which is the level of pollution (LPOLLEM). Both of these variables are determining factors for all the periods studied.

Other variables, which are also explanatory though slightly less relevant, are those related to the economy (LGDPERC, GDPGR, and UNEM) and finance (LGOVDEB). These variables are only relevant to the periods of financial crisis and economic recovery.

5. Conclusions

The objective of this study was firstly to analyze whether a series of variables related to the economy, population, and health, in addition to those related to environmental protection, can explain the differing levels of immigration into Europe. The second objective was to study whether the relevance of these variables is different for the entire group of EU-28 member states compared to the countries that adopted the single currency (EU-19). We also analyzed whether these effects are different according to the period of the European economic cycle in which they occur.

The main conclusions to be drawn from this study are as follows:

- The economic variables examined here have an enormous explanatory capacity for migration flow (GDP per capita, GDP growth, and unemployment rate), fundamentally in the periods of economic crisis and recovery. According to the regression coefficients, the variables related to GDP attract immigration to a high degree; however, the rate of unemployment is a decreasing factor for immigration, but has a much smaller impact. We can observe that, only in the case of the economic variables is the effect greater for the group of EU-28 countries and, therefore, the EU-19 countries are less sensitive to variations in these variables.
- From among the financial variables, only the level of public debt influences the influx of new immigrants, though this variable has significantly high values. Indeed, the debt incurred by Europe's nations is a demotivation factor for the arrival of new immigrants. Moreover, debt among countries that have adopted the single currency doubled the demotivating effect compared to the EU-28 countries. As with the economic variables, this effect becomes extremely notable in times of economic crisis and recovery.
- Immigration during the economic boom indicates that the variables directly related to Europe's economic and financial evolution are not determining factors when making the decision to emigrate.
- With regard to the population-related variables, only population growth affects immigration and, in this case, only marginally.
- According to the regression coefficients, immigration established itself naturally in European countries where population numbers are in decline. This inverse effect only comes about during a period of economic crisis, but loses its explanatory capacity during the other periods. Population growth is much more sensitive in the EU-19 countries compared to all the EU-28 member states.
- The variables related to healthcare (fertility rate and life expectancy of the host country) are vitally relevant in the justification of the decision to emigrate to Europe. Life expectancy is much more of a determining factor, as it is significant for all the periods in this study, while the fertility rate only has an impact during the period economic prosperity. Good management of the European health services has meant that life expectancy is increasing all the time and thus has a greater positive influence on migration flow. This effect is much more notable in countries in the EU-19 group.
- With regard to the measures put in place to protect the environment (level of pollution emissions and costs allocated to protecting the environment), only the level of pollution serves to explain levels of immigration. In accordance with these results, it can be deduced that immigration is less likely to occur in countries with high levels of pollution and consequently low levels of sustainability. This effect is present in all the periods analyzed here and is more relevant for the EU-19 countries.
- Generally speaking, the influence of the proposed variables is higher in the group of countries that adopted the single currency. Thus, variation is less notable for EU member states as a whole.

As the study shows, the Eurozone (EU-19) is particularly sensitive to variations in the factors analyzed in this research. For this reason, and to avoid the risk of it becoming an uncontrolled phenomenon, government policies to manage the flow of migration should aim to address and achieve the following objectives:

- Prevention of the entry of false tourists, by ensuring that they are required to obtain a visa.
- Signing readmission agreements with the countries concerned to control immigration.
- Foster and regulate recruitment in the countries of origin through bilateral migration agreements.
- Strengthen border surveillance.

As suggestions to extend and improve upon this study, as pollution levels are highly explanatory in terms of migration flow as one of the sustainability variables, we firstly believe that further studies should incorporate a greater number of environment-related variables, e.g., employment in the environmental goods and services sector, waste generation, number of recovery and disposal facilities, etc.

Secondly, further research should investigate other random causes that might also influence migration flow. Such causes sometimes do not depend on rational decisions and can include factors like specific entry barriers among host countries. On other occasions, they do depend on the individual decisions of immigrants, but are based on affective reasoning, such as the fact that many compatriots or relatives have previously emigrated to that country.

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