The role of migration on long-term European population trends.

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Abstract

We estimate the impact of migration on population size in 11 European countries from the middle of the 19th century to the present. We derive estimates under the assumption of zero net migration from various points during this period using information from the Human Mortality Database (HMD). We find heterogeneity between countries: net positive inflows for Switzerland and France, with the largest net outflows for Norway and Scotland. We develop methods to decompose population growth into estimates of net migration that include the contribution of descendants of migrants and natural increase. Migration has a substantial effect of population growth across these countries and tends to reduce disparities in growth rates. For most of the countries considered, population sizes would be smaller in 2000 if there had been no migration over the past 150 years, but more recent trends suggest a qualitatively different future.

Introduction

In recent decades, levels of international migration have increased substantially. Migration has become an increasingly important factor in population change in European countries; 85% of population increase in the European Community in 2014 was due to net migration (Eurostat, 2015). This has led to greater interest in the implications of migration for population change in contemporary Europe. Much of the recent discussion in Europe has centred on the possibility of increasing fertility as a response to low growth (Sleebos, 2003). Although often included as one potential additional policy instrument, immigration has attracted less support, in part since migration is difficult to control by an individual country and politically unpopular.

The labour market implications of migration levels have been widely discussed, but less attention has been given to the long-term impact of population movements. The most common approach is to produce future scenarios that compare population sizes and structures from projections that include assumptions with and without net migration (United Nations Population Division, 2000; Holzmann, 2005; Lutz and Scherbov, 2007). Such no-migration scenarios are often included in regular official projections. However, such projections must be treated with caution since long-term trends are often formulated in terms of continuation of current patterns, but experience suggests that migration is volatile and the constant or gentle trends drifting towards zero in most scenarios are clearly unrealistic. It is therefore instructive to look at how migration has affected long-term population trends in practice as well as in theory. We require analysis of the experiences of real populations to assess the impact of migration on population size and structure. To our knowledge, few studies have done so; Le Bras (1991), Philipov and Schuster (2010) and Pew Research Center (2015) are exceptions, but they started in the post-WWII period so did not undertake analysis over the extended historical periods necessary to identify the full effects of migration.

The paper is organised as follows: we discuss the data used and develop models to estimate the total impact on population size of net migration including not only emigrants and immigrants, but their descendants as well. We present the results of analysis that compare trends in 11 European countries from the mid-19th century to show the heterogeneity of trends. We consider the relative contribution of net migration and natural change to long-term population growth. Finally, we consider whether recent trends are a continuation of long-term patterns or suggest an emerging qualitatively different European migration regime.

Data and methods

Data are taken from the Human Mortality Database (HMD) that includes estimates of mortality rates and population size by single year of age and sex for each calendar year together with information on total annual numbers of births and deaths. These estimates are constructed using a uniform method applied to information from validated official statistics such as censuses, vital registration and population estimates. Further details about the database and the construction of these data are available (Wilmoth, et al., 2007; Human Mortality Database, 2015). Since we are interested in long-term trends, we confine attention to countries with at least 100 years of continuous data, 11 countries in total: five Nordic countries, Denmark, Finland, Iceland, Norway and Sweden; five from Western Europe, England & Wales, France, the Netherlands, Scotland and Switzerland; and Italy from

Southern Europe. All of these are in Europe, but no Eastern European countries are included. They account for just over half of the total population size of Northern, Western and Southern Europe as defined by the United Nations.

Our principal interest is in comparing national patterns from 1850, or the first available year (FAY) if this is later, to the last available year (LAY) around 2011. Only limited data are available before in the first half of the 19th century when transatlantic migration was described as just a trickle compared with later flows (Ferrie and Hatton, 2015, p. 56) and intra-European migration in North-Western Europe was at historically low levels (van Lottum, 2007, Table 5.1).

We estimate the effect of migration in a given period by comparing a later actual population with the same one that experienced no net migration over that period. We calculate the survivors of cohorts without migration from various time points starting from the later of the first available year and 1850. If the start year is later than 1850, we start calculations at that year.

Cohort life tables from age zero to the age reached by the last available year (or age 110 if reached earlier) are available for some cohorts in HMD. For other cohorts, we derived our own life tables.

The no net migration population is assumed to have the same fertility and mortality patterns as the actual population as discussed later. Annual information on age-specific fertility is not available over the extended period for which mortality data are available, therefore we estimate the expected number of births as described in Murphy (2016a; 2016b).

Fertility assumptions for no migration scenarios

We have assumed that the fertility rates of the no migration population are the same as those of the actual population since differences in number of births depend only on populations at risk. Over the extended period of this study, there is no evidence that emigrants were likely to achieve either higher or lower fertility abroad than if they had remained in their original country.

The overall long-term impact of migration on population includes the contribution of both migrants and their offspring. Population gain (or loss) through migration increasingly depends on the descendants of migrants rather than first-generation migrants. Since we are concerned not only – or even principally – with the fertility of migrants but also with that of their descendants, who tend to adapt to prevailing levels, this further supports the case for assuming the same fertility for all population groups in this study. We cannot conclude that emigrants would have had the same fertility that they achieved abroad if they had remained in their original country but there appears to be no strong reason for our initial counterfactual scenarios to assume that fertility of migrants differed from that of the populations we are concerned with. The assumption is that an individual of a given age at a particular time point will have the same average flow of population numbers in years to come (in the case of an emigrant, this flow will be negative) irrespective of migration status is reasonable, but this could be amended if appropriate.

These models are concerned with net migration rather than gross flows. With assimilation, these descendants will increasingly be born to parents with different migrant backgrounds and any distinction between 'migrant' and 'non-migrant' becomes meaningless at the individual level – in some sense, we are all migrants. While there is no such person as a 'net migrant', net migration is a meaningful macro-level determinant of population size and the contribution of net migration occurring in a particular period to population numbers at any time point can be identified uniquely with the assumptions discussed above. We now consider these results in detail.

Results

We repeat this exercise for each country with net migration being set to zero from a series of start years 5 years apart between 1850 (or the first available year if the start date is later than 1850) and 2000. Values before the date from which migration is set to zero remain unaltered. This makes it possible to assess the long-term effects of migration on population at various time periods up to the latest available year.

We start by presenting some descriptive results. Six countries had clearly negative values for the net migration rate averaged over the whole period: the Nordic countries apart from Denmark, together with Italy and Scotland; three had values close to zero, Denmark, England & Wales and the Netherlands; and two, France and Switzerland, had positive values (Table 1). Scotland had a negative value twice as large as the next country, Norway. Switzerland had the largest positive value, followed by France. The average net migration rate value over all observations for these populations was zero to the accuracy shown. However, there was a shift over time; in the 19th century, all 11 countries had a net outflow, but over the 20th century, this moved towards positive inflows, so that by the 21st century, all values were positive. The patterns were heterogeneous across both time and space, so we now consider how these affect population sizes over this extended period after discussing validation of the method.

[Insert Table 1 about here]

Le Bras (1991) estimated population sizes for seven countries around 1981-84 if there had been no migration from around 1946-51, three of which are also included here, France (1946-83), Italy (1951-81) and Sweden (1950-84). He was able to include differential fertility of immigrants in calculations, but we argue that this is unnecessary over the extended period covered here. The 1946 baseline population used for France in the immediate post-WWII period was substantially different from the one used here, so comparisons are not possible. French territorial boundaries were changed due to annexation in periods 1870, 1914-18 and 1939-45. In our analysis, the populations concerned would be treated as emigrants on annexation and as immigrants on re-unification, which should be borne in mind when interpreting French trends later, although no other country appears to have been similarly affected. The baseline Italian population in 1951 was 0.6 million larger than the one used here, but the difference between the no-migration and actual populations in 1981 estimated by Le Bras, 2.9 million, was very similar to the value of 3.0 million here. Swedish 1950 baseline and 1984 actual and no-migration values were identical in both analyses to the accuracy shown by Le Bras (1991, p. 19). We therefore conclude that results are reliable where we have been able to cross-check them with an approach using more detailed data.

Population change is the sum of natural increase and net migration according to the balancing equation, so this provides an estimate of how much each contributes to population change in a short time interval. However, if the impact of migration is measured by the difference in population sizes with and without migration, the balancing equation approach does not provide an estimate of the relative contributions of natural change and net migration either within an extended period or to population change in the longer term, since the offspring of immigrants will contribute to natural increase and – possibly less intuitively but more importantly for long-term European experience – the 'missing' offspring of emigrants will have the reverse effect.

We now show how these migration differences translate into differences in population sizes with and without migration since 1850 (or first available year), Table 2. Since fertility and mortality rates are the same in both cases over the period, the only difference is their experience of migration. Therefore we use the ratio of actual to no migration populations in the final year as the estimate of the total impact of migration – not just migrants – on population size from a specific date. The ranking of countries on this ratio is similar to that of the overall net migration rate of Table 1 and the correlation coefficient between these two variables is 0.98. As expected, countries with smaller population sizes than would be the case without migration mainly have negative net migration rates, and those with larger sizes have positive values.

[Insert Table 2 about here]

The observed total population size was about 2.4 times as large at the end as at the start of the period, slightly less than the value of 2.5 in the no-migration case. However values varied across countries, observed growth ratios ranged between 1.8 for France and 5.5 for the Netherlands. The impact of migration also differed substantially. The shortfall in population size between the no-migration and actual populations is particularly marked in the case of Italy, which has about 16 million people fewer, or about 20% smaller, in 2009 than if it had experienced no migration throughout the late 19th and whole of 20th centuries. Norway is about 30% smaller and Scotland over 50% smaller than if there had been no migration. In contrast, France shows a population with 14 million more people, about 30% larger in 2012 and Switzerland has 2.5 million more people, nearly 50% larger, than if migration had been zero over the past century and a half. Broadly similar net migration rates are seen in the Nordic countries of Norway, Sweden and Iceland, but Denmark, England & Wales and the Netherlands have broadly similar population sizes with and without migration. In two of these three countries, the population with migration only overtook the no migration population very recently and the same is likely to happen to the Netherlands during this decade. It is not, of course, the case that there was no migration but rather that the impact of emigration on population change was largely offset by the gain in numbers from immigration.

The levels of net migration experienced were sufficient to have population sizes between about 50% lower and 50% higher than would have been the case without migration. However, the values were correlated with population growth and the effect of migration was to reduce differences in growth rates over the period. In the absence of migration, at the tails of the distribution, we estimate that the population of France would have increased by only 40% rather than 80% over the period 1850-2011, whereas Iceland would have increased by 580% rather than the actual value of 440%. Switzerland and France, the two countries with no-migration population growth ratios below the average value of 2.49 over the period (based on the combined total population), had positive contributions to growth from migration, whereas eight out of the nine with above-average values had negative values (if England & Wales and Scotland were combined and shown as Great Britain, all values would be negative). The standard deviation of the ratio of initial to final actual population size is smaller, 1.21, than the value of 1.52 for the ratio of the initial to final no migration population sizes (Table 2). This suggests that migration has tended to reduce long-term variability in growth rates over what they might otherwise have been, reinforcing the suggestion of a positive impact of population growth on gross transatlantic flows over period (Easterlin, 1961, Hatton and Williamson, 1994).

Migration patterns have varied across time between countries. Figure 1(a) shows values for four large exemplar countries, England & Wales, France, Italy and Switzerland that have different patterns. Values for the other countries included are shown in Figure 1(b). We present the expected population size if migration was set to zero from selected start years (for clarity, only a subset of values are shown, full results are available from the author). Since estimates for two different start years have the same fertility and mortality rates in all years and migration rates in years outside this range, the difference between the two final year population estimates is due to different net migration in the intervening period between the start dates. The overall difference between the final observed population and the no migration population from the first available year can therefore be allocated to migration occurring in the intervening time periods.

[Insert Figure 1 about here]

While there have been some changes in migration over time (Table 1), the net effect of migration in England & Wales was small over this period, even though there were considerable outflows to countries such as USA and Australia. The actual value is located within a narrow envelope of estimates based on no migration starting at various time points, only moving above these in the very recent period. In contrast, Italy had substantial net outflows especially in the late 19th and early 20th centuries as measured by changes in final year population values in the final year from different start dates. Net migration in the 1880-1910 period accounted for well over half of the total impact of migration since 1873 on the contemporary population. Net migration continued to be negative until the late 20th century when the situation was reversed. Note that information for Italy, like Switzerland, is not available for 1850. France exhibited a different time pattern. Although considerable attention has been given to Italian trans-Atlantic migration, about half of Italian emigration was within Europe and especially to France in this period (Castles and Miller, 2009, p.87). France experienced high rates of in-migration from the early 20th century, but with a sharp temporary increase around 1960 related to major inflows of French settlers following independence of former French colonies in North Africa that contributed to the substantial impact of the 1940-1970 period in Figure 1 (the re-integration of Alsace-Lorraine following War-time annexation also had some influence). Switzerland was the other country with substantial inflows although with a later start to mass immigration. There was little impact until the mid-

20th century but migration accelerated sharply in the immediate post-WWII period, which increased current population size by about one quarter, and high levels have continued until the present.

Although this selection of 11 countries mainly from Northern and Western Europe is not random, they cover the majority of people in these regions and they show that patterns over the late 19th and 20th centuries are heterogeneous. In general, there is a tendency for net migration to move from being largely negative to be largely positive over the period. However, in some cases, the major net flows were in the 19th century and in some in the 20th century; some countries had relatively constant patterns over time, such as Finland; others switched for high outflow to high inflow, such as Sweden (Table 1 and Figure 1(b)). This provided the opportunity to assess how population growth was affected by migration in a variety of contexts.

Conclusions

While European societies such as those analysed here may appear to have had broadly similar patterns over the late 19th and 20th centuries, with similar levels of fertility and mortality levels at each end of the period, growth has been heterogeneous, such that France increased in size by 80% over the period 1850 to 2010, whereas the Netherlands, increased by 450% over the same period. Mass inter-continental migration had started in the early decades of the 19th century, but the volume became much greater from about 1850 and especially after 1880 when many of these countries – but not all – started irreversible fertility decline. International migration has had only a marginal role in debates about the reasons for fertility transition. A number of studies have attempted to incorporate aspects of migration into demographic transition theory (Fargues, 2011) or use demographic transition as a possible driver of migration trends (Hatton and Williamson, 1994, pp. 549-50), but international migration is largely ignored or treated as little more than a variable that needs to be controlled for in estimating fertility and mortality trends rather than being a topic of interest in its own right (although internal migration and urbanisation have attracted more attention). While net migrant numbers may appear small, they have had a substantial impact on long-term population developments, altering population sizes by plus or minus 50% across Europe with the models presented here.

European migration patterns have been variable in the late 19th and 20th centuries but they appear to be linked to other demographic changes. While the emphasis in this paper is on long-term trends, these data also highlight the major change in international migration from around the end of the 20th and start of the 21st centuries. For the first time, net migration has been positive in virtually all cases, in contrast to earlier periods. The levels are also much higher than usual. In some cases, such as England & Wales, net migration in this period is considerably greater than the cumulative value over the previous 150 years or so. It may be too early to identify migration as the defining characteristic of this century especially since international migrants still only make up 3% of the world's population (United Nations Department of Economic and Social Affairs Population Division, 2013) and experience suggests that regular long-term continuing trends in migration are unlikely scenario in future. However, comparison of recent trends with the longer term values presented here does suggest that a major change in the nature of international migration in Europe is occurring and it is possible that the regularities identified here will not persist.

References

Castles, S., and M.J. Miller. 2009. *The Age of Migration: International Population Movements in the Modern World (4th edition)*. Basingstoke: Palgrave MacMillan

Easterlin, R.A. 1961. Influences in European Overseas Emigration before World War I. *Economic Development and Cultural Change* 9(3):331-351.

Eurostat. 2015. *Population and population change statistics*, available at http://ec.europa.eu/eurostat/statistics-explained/index.php/Population_and_population_change_statistics.

Fargues, P. 2011. International Migration and the Demographic Transition: A Two-Way Interaction. *International Migration Review* 45(3):588–614.

Ferrie, J.P., and T.J. Hatton. 2015. Two Centuries of International Migration, pp. 53-88 in B.R. Chiswick and P.W. Miller (eds.) *Handbook of the Economics of International Migration, 1A: The Immigrants*. Amsterdam: Elsevier North Holland.

Hatton, T.J., and J.G. Williamson. 1994. What Drove the Mass Migrations from Europe in the Late Nineteenth Century? *Population & Development Review* 20(3):533-559.

Holzmann, R. 2005. *Demographic alternatives for aging industrial countries: increased total fertility rate, labor force participation, or immigration*. IZA Discussion Paper No. 1885. Institute for the Study of Labor, Bonn, Germany, available at http://ftp.iza.org/dp1885.pdf.

Human Mortality Database. University of California, Berkeley (USA), and Max Planck Institute for Demographic Research (Germany), available at www.mortality.org or www.humanmortality.de. .

Le Bras, H. 1991. Demographic impact of post-war migration in selected OECD countries, pp. 15-26 in *Migration: The Demographic Aspects*. Paris: Organisation for Economic Cooperation and Development.

Lutz, W. and S. Scherbov. 2007. *The contribution of migration to Europe's demographic future: projections for the EU-25 to 2050. Interim Report IR-07-024.* International Institute for Applied Systems Analysis, available at http://www.iiasa.ac.at/publication/more_IR-07-024.php.

Murphy, M. 2016a. The Impact of Migration on Long-Term European Population Trends, 1850 to Present. *Population and Development Review* 42(2): 225-244

Murphy, M. 2016b.The effect of long-term migration dynamics on population structure in England & Wales and Scotland. *Population Studies*. ISSN: 0032-4728 (Print) 1477-4747 (Online), DOI:10.1080/00324728.2016.1185140. Published online: 13 Jun 2016

Pew Research Center, 2015. *Modern Immigration Wave Brings 59 Million to U.S., Driving Population Growth and Change Through 2065: Views of Immigration's Impact on U.S. Society Mixed*. Washington, D.C.: September. Available at http://www.pewhispanic.org/2015/09/28/modern-immigration-wave-brings-59-million-to-u-s-driving-population-growth-and-change-through-2065/.

Philipov, D, and J. Schuster. 2010. *Effect of Migration on Population Size and Age Composition in Europe. European Demographic Research Papers 2/2010*, available at http://www.oeaw.ac.at/vid/download/edrp_2_10.pdf.

Sleebos, J. 2003. *Low Fertility Rates in OECD Countries: Facts and Policy Responses. OECD Social, Employment and Migration Working Papers No. 15*, available at http://www.oecd.org/els/emp/16587241.pdf.

Teitelbaum, M.S., and J.M. Winter, 1985. *The Fear of Population Decline*. London: Academic Press.

United Nations Department of Economic and Social Affairs. 2015. 2015 Revision of World Population Prospects, available at http://esa.un.org/unpd/wpp/.

van Lottum, J-J. 2007. *Across the North Sea. The impact of the Dutch Republic on international labour migration, c. 1550-1850*. Amsterdam: Aksant Academic Publishers, available at http://dspace.library.uu.nl/bitstream/1874/24027/15/full.pdf.

Wachter, K.W. 2014. *Essential Demographic Methods*. Harvard, Mass.: Harvard University Press.

Williamson, J.G., and T.J. Hatton. 2005. *Global Migration and the World Economy: Two Centuries of Policy and Performance*. Cambridge, Massachusetts: MIT Press.

Wilmoth, J.R., K. Andreev, D. Jdanov, and D.A. Glei with the assistance of C. Boe, M. Bubenheim, D. Philipov, V. Shkolnikov, and P. Vachon. 2007. *Methods Protocol for the Human Mortality Database*, available at http://www.mortality.org/Public/Docs/MethodsProtocol.pdf.

Table 1 Average net migration rate (per 1,000 population) for selected periods to latest available year

Country	Initial Year	Final Year	Net migration rate (average of annual net migration rates over period per 1,000) Initial-Final	Initial-1900	1900-1950	1950-2000	2000-Final
Denmark	1850	2011	0.1	-1.2	0.4	0.6	2.3
England & Wales	1850	2011	0.1	-0.7	-0.3	0.6	4.1
Finland	1878	2012	-0.5	-0.4	-1.0	-0.7	1.9
France	1850	2013	1.5	-0.4	3.0	1.8	2.0
Iceland	1850	2013	-1.3	-3.3	-0.9	-0.7	2.6
Italy	1874	2009	-0.9	-2.9	-1.7	-0.4	6.0
Netherlands	1850	2012	0.0	-1.2	-0.2	1.2	1.1
Norway	1850	2009	-1.6	-4.6	-2.0	0.8	4.4
Scotland	1855	2011	-3.3	-2.8	-5.0	-3.2	3.2
Sweden	1850	2011	-0.5	-3.7	-0.7	1.9	4.4
Switzerland	1876	2011	1.7	-0.6	0.2	3.4	6.8
Total*	1850	2013	0.0	-1.2	-0.2	0.7	3.2

Source: Human Mortality Database
Notes: based on average of annual net migration rates over the period.
*Total value based on countries available in year
Year refers to 1 January

Table 2 Relationship between population sizes with and without migration

Country	Population (000s) Initial	Final	Final no migration	Ratio Final to Initial	Final no migration to Initial	Final to Final no migration	Net reproduction rate
Denmark	1,407	5,561	5,812	3.95	4.13	0.96	1.22
England & Wales	17,579	55,932	53,614	3.18	3.05	1.04	1.14
Finland	1,971	5,401	5,858	2.74	2.97	0.92	1.17
France	35,673	63,651	49,087	1.78	1.38	1.30	1.00
Iceland	60	322	404	5.40	6.77	0.80	1.37
Italy	27,121	60,045	75,907	2.21	2.80	0.79	1.14
Netherlands	3,056	16,730	17,042	5.48	5.58	0.98	1.28
Norway	1,386	4,799	6,976	3.46	5.03	0.69	1.28
Scotland	2,812	5,238	11,379	1.86	4.05	0.46	1.21
Sweden	3,441	9,416	10,685	2.74	3.11	0.88	1.15
Switzerland	2,748	7,870	5,443	2.86	1.98	1.45	1.04
Total*	97,254	234,964	242,208	2.42	2.49	0.97	-
S.d. (unweighted)	-	-	-	1.21	1.52	0.26	0.10

Source: Human Mortality Database.
Note: Years covered are shown in Table 1.

*Total row is based on aggregate of initial and final country values, therefore reference start and finish dates vary.

Figure 1(a). Population by Year Migration becomes zero, exemplar countries

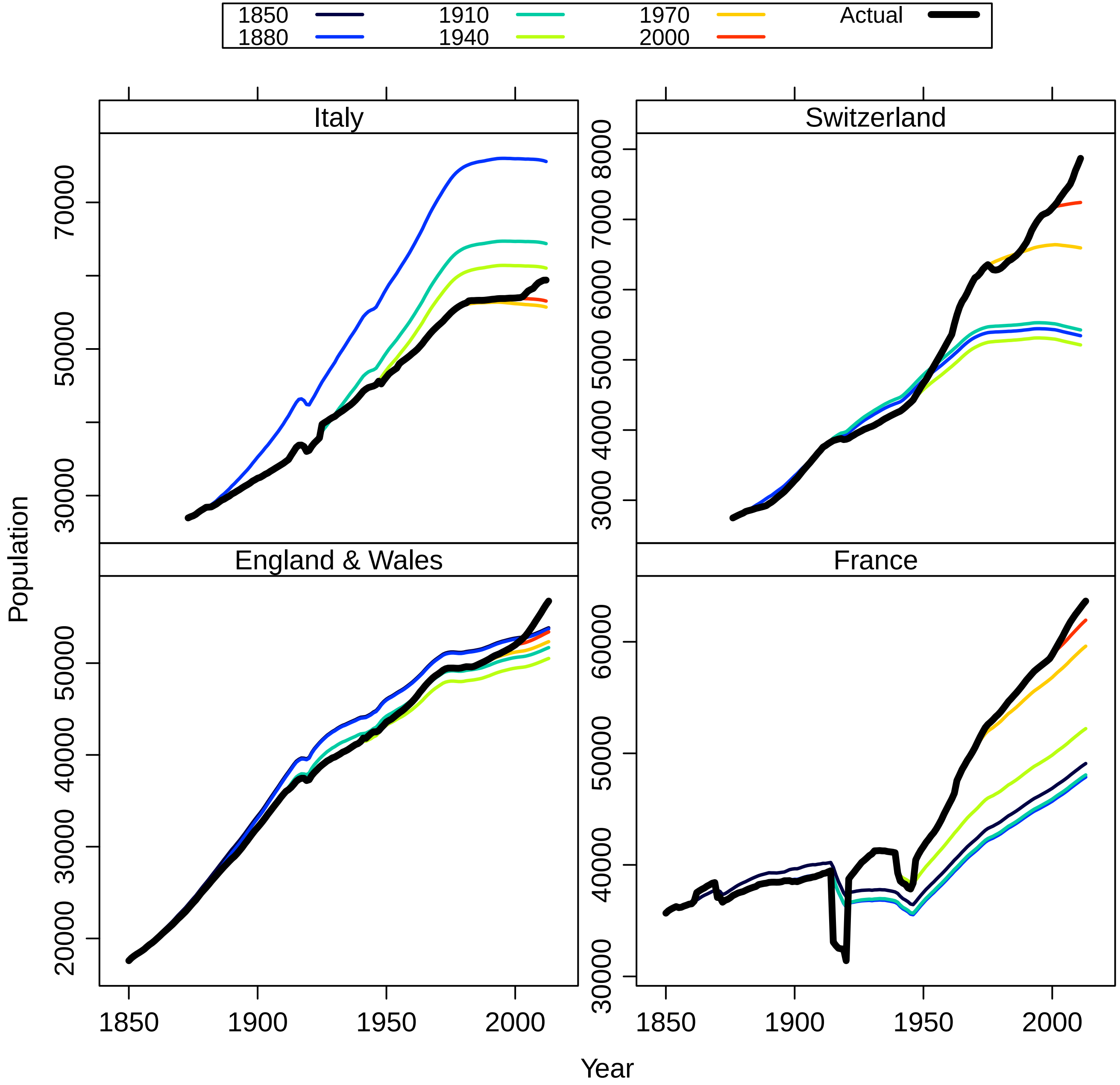

Figure 1(b). Population by Year Migration becomes zero, additional countries