DEMOGRAPHIC RESEARCH
A peer-reviewed, open-access journal of population sciences

DEMOGRAPHIC RESEARCH

VOLUME 40, ARTICLE 44, PAGES 1291–1322
PUBLISHED 16 May 2019
https://www.demographic-research.org/Volumes/Vol40/44/
DOI: 10.4054/DemRes.2019.40.44

Research Article

Distinguishing tempo and ageing effects in migration

Aude Bernard

Alina Pelikh

© 2019 Aude Bernard & Alina Pelikh.

This open-access work is published under the terms of the Creative Commons Attribution 3.0 Germany (CC BY 3.0 DE), which permits use, reproduction, and distribution in any medium, provided the original author(s) and source are given credit.
See https://creativecommons.org/licenses/by/3.0/de/legalcode.

Contents

Demographic Research: Volume 40, Article 44
Research Article

Distinguishing tempo and ageing effects in migration

Aude Bernard[1]

Alina Pelikh[2]

Abstract

BACKGROUND

Despite emerging evidence of a delay of migration to older ages, few studies have considered its impact on overall migration levels.

OBJECTIVE

This paper argues that there are two possible implications of delayed migration on overall migration levels: (1) a tempo effect leading to a temporary underestimation of the level of migration in the observed period data and (2) a migration ageing effect leading to a reduction of higher-order moves because the exposure to migration is shifted to older ages when the probability of moving is lower.

METHODS

Combining hypothetical scenarios with empirical evidence from a range of countries in Europe, North America, Australia, and China, the paper demonstrates the relevance of tempo and ageing effects to migration analysis and proposes a framework for conceptualising these processes.

RESULTS

Our analysis suggests that both tempo and ageing effects are likely to occur if the general trend is towards later ages at migration. We show, however, that all-move data such as those collected in censuses is not suitable to analyse tempo effects because changes in migration behaviour are order specific. Drawing on retrospective survey data, we show that in 25 of 26 European countries considered in this paper, individuals who are late in leaving the parental home are less likely to progress to the second move and, as a result, report a lower number of migrations in adulthood than early movers.

[1] Queensland Centre for Population Research, School of Earth and Environmental Sciences, University of Queensland, Brisbane; and Asian Demographic Research Institute, Shanghai University, Shanghai, China.
[2] Institute for Social and Economic Research, University of Essex, Colchester, UK.
Email: a.bernard@uq.edu.au.

CONTRIBUTION
The results underline the need to collect and analyse migration data by move order to understand migration trends while highlighting the paucity of such data.

1. Introduction

Since the 1980s levels of internal migration have declined continuously in many advanced economies, including the United States, which in 2013 recorded its lowest internal migration intensity since 1945 and the longest period of continuous decline since 1900 (Molloy, Smith, and Wozniak 2014). The magnitude and timing of this decrease vary by measures of migration and spatial scales, but the United States is firmly established on a long-term trajectory of internal migration decline that appears to be unrelated to economic cycles, although interstate migration seems to have levelled off in the last couple of years (Frey 2017). Falling levels of internal migration are not confined to the United States, nor are they restricted to one particular region of the world. Argentina, Australia, Brazil, Germany, Japan, the Russian Federation, and South Korea have all experienced a decline in aggregate levels of internal migration over recent decades (Bell et al. 2018a). At the same time, this downward trend is by no means universal, and some countries have recorded stable or rising levels of internal migration, particularly in Europe (Bell et al. 2018a; Kulu, Lundholm, and Malmberg 2018; Shuttleworth, Osth, and Nedomysl 2018; Bernard and Kolk 2019).

While aggregate trends in migration levels have been widely documented (Champion, Cooke, and Shuttleworth 2018), research on age-specific migration trends has attracted until recently comparatively less scholarly attention, with a few notable exceptions (Rogers and Rajbhandary 1997; Plane and Rogerson 1991). In recent years, a growing body of literature has developed that suggests a progressive shift of migration-age schedules to older ages in a number of countries, including the United Kingdom (Lomax and Stillwell 2018), the United States (Foster 2017), and Australia (Bell et al. 2018b). This delay is to be expected given that the age patterns of migration closely mirror the age structure of the life course (Bernard, Bell, and Charles-Edwards 2014) because key transitions to adulthood – including exit from education and entry into the labour force, union formation, and childbirth – often trigger a change of residence (Bernard, Bell, and Charles-Edwards 2016; Mulder 1993; Pelikh and Kulu 2018; Vidal and Lutz 2018). Ample evidence suggests that the age structure of the life course has evolved over time in a way that key transitions to adulthood have been progressively postponed to older ages and become more protracted (Billari and

Liefbroer 2010; Furstenberg 2013). It is therefore very likely that, as a result, migration has been postponed to older ages in a number of advanced economies.

As in the case of fertility (Kohler and Ortega 2002), a secular shift in the age at migration may reflect two intertwined processes that would exert quite different impacts on overall migration levels: (1) a tempo effect leading to a temporary underestimation of the quantum, or level, of migration in observed period data and (2) a migration ageing effect leading to a reduction in higher-order moves because the exposure to migration is shifted to older ages when the probability of moving is lower. In other words, the immediate effect of a delay in the age at migration is a tempo effect observable in period data, e.g., a small downward shift in the period measure of migration levels. If the age profile of migration subsequently stabilises at a new slightly older age profile, then period measures will subsequently bounce back. If, on the other hand, the delay of migration leads to a reduction in the total number of moves because the likelihood to move is lower at older ages, then period measures would register a secular downward shift. While conceptually distinct, these two effects are likely to occur concurrently. It is therefore not possible to disentangle the two simply by observing period measures; the timing of moves needs to be examined more directly. In a context of declining migration levels in a number of countries in the Organisation for Economic Co-operation and Development (OECD), understanding how tempo and ageing effects operate on migration behaviour and affect recorded period estimates of migration is of fundamental importance. Yet these processes are generally not recognised and are rarely, if ever, taken into account in the empirical analysis of migration.

This paper aims to address these deficiencies by laying out conceptual tenets for thinking about tempo and ageing effects in migration and discussing the types of data required to examine, quantify, and understand changes in migration behaviour. Drawing on the fertility literature, the first half of the paper focuses on tempo effects. It illustrates tempo versus quantum effects in migration and demonstrates the conditions under which changes in the timing of migration affect period measures of migration to cause tempo distortions. Using these principles, the paper reviews trends in migration age patterns using census data dating back to the 1970s in six OECD countries. Drawing on retrospective survey data from England and China, the paper then shows that changes in migration behaviour are order specific and that all-move data can conceal the extent of change in the timing of migration, which can lead in turn to misleading conclusions about tempo effects. The second half of the paper examines the migration ageing effect by analysing the association between age at leaving the parental home, progression to the second move, and adult completed migration rates in 26 European countries. It shows that in all countries except Cyprus, age at leaving the parental home exerts a major impact on completed migration by influencing the progression to higher-order moves. This indicates that when migration is delayed to older ages, this shift is not made up by moves later in life and that period measures are likely to record a secular downward trend. The paper concludes that the analysis of migration data by move order offers a new perspective on migration behaviour that can shed light on well-established demographic problems such as tempo effects while highlighting the paucity of adequate migration data and the need to change migration data collection practices.

2. Tempo versus quantum effects

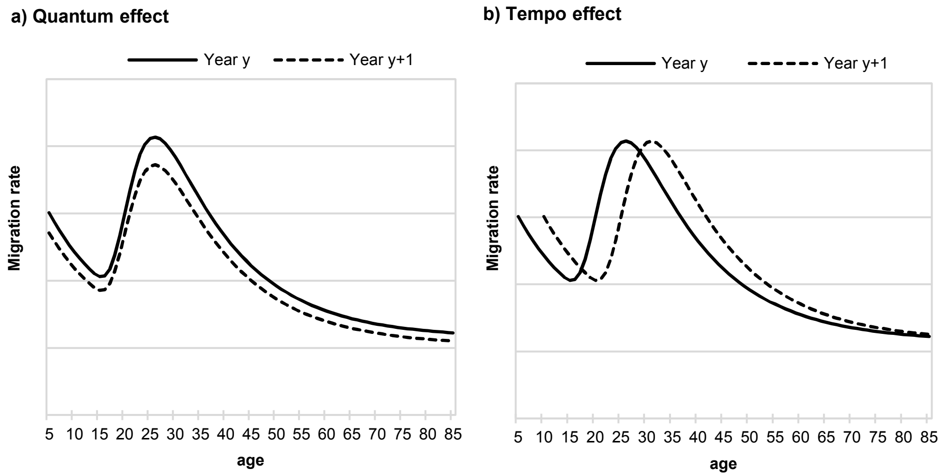
Ryder (1956, 1964) is credited with introducing the notion of tempo effects into the demographic literature. He demonstrated that changes in the timing of childbearing of cohorts resulted in a discrepancy between period (total fertility rate) and cohort (completed fertility rate) measures of fertility. More recently, Bongaarts and Feeney (1998) introduced an approach to estimating tempo effects that requires only period age-specific fertility rates by birth order. Drawing on this method, subsequent studies demonstrated that tempo effects cause an underestimation of quantum fertility in observed period data (Kohler and Ortega 2002; Sobotka 2003). Bongaarts and Feeney (2008) then broadened the notion of tempo effects to life-course events in general, including marriage and death, followed by a large body of literature that has demonstrated and quantified tempo effects in period measures of nuptiality (Winkler-Dworak and Engelhardt 2004) and death (Goldstein 2008; Luy 2006; Luy and Wegner 2009). Bongaarts and Feeney (2008) defined a tempo effect as a temporary, artificial inflation or deflation of the period measure of a demographic event because of a rise or fall in the mean age at which the event occurs. While the authors did not directly consider migration, their reasoning can apply equally to population movement.

Period measures of migration, such as crude migration intensity and migration expectancy, represent the compound experience of different cohorts. Consequently, it is reasonable to assume on conceptual grounds that period measures of migration can also be distorted by tempo effects. Although evidence is limited, it suggests a progressive shift of the migration-age schedule to older ages in a number of countries, including the United Kingdom (Lomax and Stillwell 2018), the United States (Foster 2017), and Australia (Bell et al. 2018b). The age patterns of migration have been shown to closely mirror the age structure of life-course transitions, in particular exit from education, entry to the labour market, and union and family formation (Bernard, Bell, and Charles-Edwards 2014), and there is ample evidence that the timing of the transitions to adulthood have been delayed over the last few decades (Billari and Liefbroer 2010). A postponement of first union formation has been seen in all European and North

American countries since the 1960s (Mulder 2009). In OECD countries, the average mean age at first birth now stands at 30 and above as a result of a two-to-five-year delay over the last two decades (Frejka and Sardon 2006; OECD 2018). If the delay in the age at migration simply shifts the age profile of migration to later ages, whereby delayed moves are later made up, the effect would be an underestimation of migration in observed period data (tempo effect) and period measures will subsequently bounce back. If, on the other hand, this shift leads to moves being foregone (ageing effect), period data would accurately reflect a downward shift in aggregate migration levels, with period measures registering a secular downward shift that would not be made up.

Tempo effects can be distinguished from quantum effects, the latter being defined as an increase or decrease in a period measure of a demographic event that is independent of age or period (Bongaarts and Sobotka 2012): in other words, what a period measure would be without tempo effects (Bongaarts and Feeney 2008; Kohler and Ortega 2002). Cohort measures of migration are free of this interpretative difficulty. If the cohort completed migration rate falls, it is a pure quantum effect: Individuals are moving less (Bernard 2017b). Figure 1 illustrates tempo and quantum effects by representing a schematic age profile of migration at two points in time. On the one hand, a quantum change occurs when there is an increase or decrease from one period to the next. This is conceived most simply when all age groups are affected equally, although in reality the extent of the change may vary from one age group to another (Figure 1a). On the other hand, a tempo change corresponds to a shift in the migration-age schedule along the x-axis because of a change in the mean age at migration. As shown in Figure 1b, the shape of the age profile is invariant; all moves are equally delayed to older ages. Changes in the real world are obviously more complex. Some moves may be delayed to a greater extent than others and quantum and tempo effects may occur concurrently, as it has been shown for fertility (Bongaarts and Sobotka 2012). If individuals are delaying migrating, the next step is to assess the extent to which this shift affects period measures of migration, which is achieved by comparing period and cohort measures of migration.

Figure 1: Hypothetical illustration of quantum and tempo effects



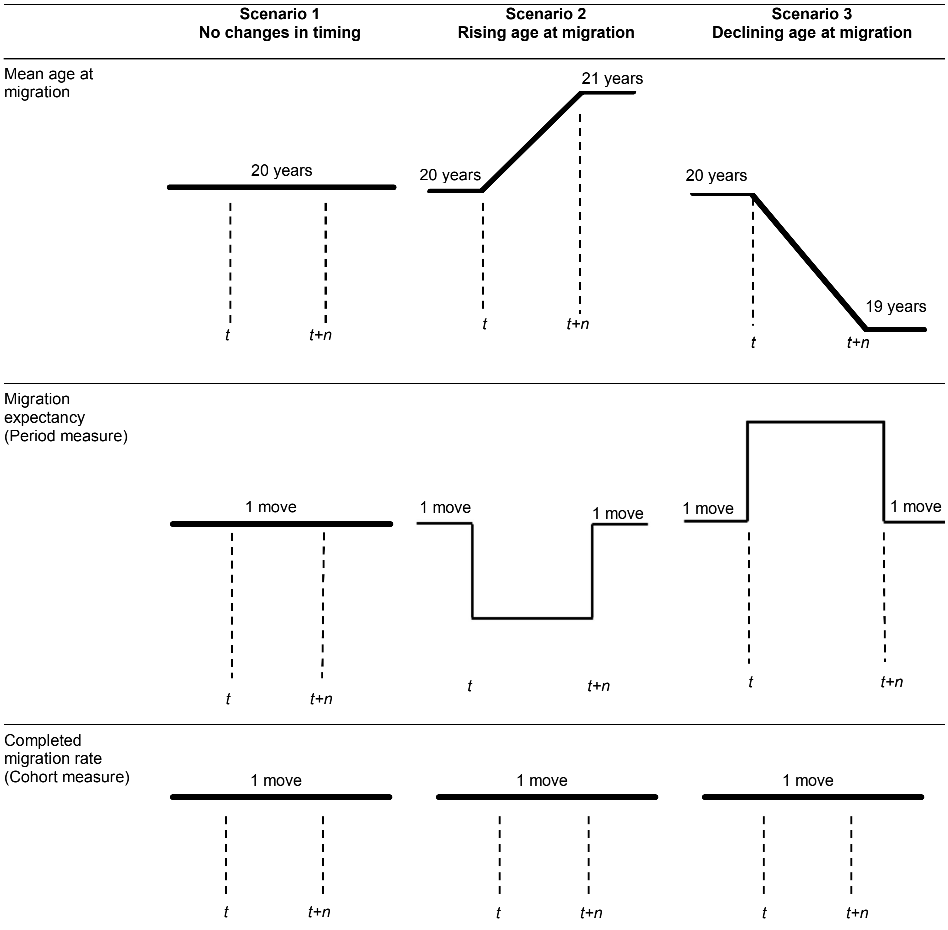
3. Impact of tempo effect on migration indicators

In this section, we seek to demonstrate the conditions under which changes in the timing of migration affect period measures of migration. Table 1 represents in a schematic form the impact of a rise and a fall in the mean age at migration on the migration expectancy (ME), which is defined as the average number of times individuals are expected to move during their lifetime if they conform to the age-specific migration and mortality rates of a given year (Bell et al. 2002; Long 1973). Table 1 compares the ME with the corresponding cohort indicator, the completed migration rate (CMR), which is the average number of moves among individuals of a given birth cohort (Bernard 2017b; Kolk 2016). Adapting Bongaarts's (1999) example to migration, we assume a simple, hypothetical situation where every individual in each cohort moves once and all individuals move at the same age within each cohort. In scenario 1, individuals move at age 20 and there is no change between cohorts in the age at migration. Thus, period and cohort indicators are equal and remain stable at unity. In scenario 2, the age at migration is delayed from age 20 at time *t* to age 21 at time *t+n*. In this circumstance, the migration expectancy temporarily falls to 0.90 (negative tempo effect) before bouncing back to one, whereas the CMR remains stable at 1. Conversely, in scenario 3, the mean age at migration declines by one year to age

19 at time $t+n$, leading to a temporary rise in migration expectancy to 1.1 moves (positive tempo effect) before returning to 1.

When considering tempo change and its impact on period indicators, it is important to recognise that change in the timing of migration may take different forms, with delays being either temporary, permanent, or continuous, each exerting a different impact on period indicators (Bongaarts and Feeney 2010). Migration has been shown to be procyclical; it increases during expansionary phases of the business cycle and declines in recessionary periods (Pandit 1997a; Saks and Wozniak 2007). Thus, migration can be delayed temporarily in response to economic conditions and housing market cycles (Cameron and Muellbauer 1998; Molloy, Smith, and Wozniak 2011). Migration can also be pushed to older ages temporarily in response to a relative change in cohort size (Easterlin 1974). Members of small cohorts tend to move earlier in their life course (Pandit 1997b; Plane and Rogerson 1991) and more often (Cooke 2018; Rogerson 1987) than members of large cohorts. In the case of adverse economic conditions or large cohorts, period indicators of migration will fall temporarily before rising again. It is also possible to envisage a permanent shift whereby the mean age at migration stabilises at older ages due to structural changes, such as increased levels of educational attainment resulting in a delayed entry into in the labour force. In that situation, period indicators will fall and remain stable at that level thereafter. Finally, if the mean age at migration continuously increases, then period indicators will fall year after year as long as migration is progressively delayed. Such a situation would occur if the mean age at key life-course transitions keeps on rising. In the next paragraph, we further examine how a continuous delay of migration can impact period indicators.

Table 1: Hypothetical illustration of the impact of changes in the timing of moves on migration levels



Source: Adapted from Bongaarts (1999).
Note: Migration expectancy is defined as the average number of times individuals are expected to migrate during their lifetime if they conform to the age-specific migration and mortality rates of a given year. The completed migration rate is the average number of moves undertaken by members of a given cohort over the course of their lives.

Table 2 provides an illustration of tempo distortions caused by a continuous delay by showing hypothetical age-specific migration rates based on one-year migration data over a 35-year period reported over 5-year intervals. All periods display a typical age profile in which migration peaks at young adult ages and declines thereafter. However, over successive periods there is a progressive delay of the modal age at migration from 20–24 years to 35–39 years and the migration intensity at peak progressively diminishes. The sum of mortality-adjusted age-specific migration rates down the columns, multiplied by five, gives the migration expectancy. By summing migration rates diagonally and multiplying them by five, one obtains the completed migration rate. Cohort data provides, however, a smaller number of observations, three versus eight for cross-section data. As Bongaarts and Feeney (2010) note, period and cohort measures are not necessarily equal even if they remain stable over a sustained period. Period and cohort indicators can be constant for a long period while not being equal if the mean age at migration is changing. In this particular example, over the 35-year period, the ME declined from 13 to 11 moves, while the CMR remained constant at 14.75 moves. In this situation, depressed period migration measures are therefore partly due to a delay of migration to older ages, while the quantum of migration remained stable. In other words, as individuals delay migrating, the observed period migration level is lower than it would have been without a tempo change. As in the case of fertility, the size of a tempo effect depends on the rate of change (and not the absolute value) of the mean age at migration (Bongaarts and Sobotka 2012; Sobotka 2003). Thus, the first step in identifying and gauging tempo effects is the reliable measurement of changes in the timing of migration.

Table 2: Hypothetical illustration of tempo effect: hypothetical mortality-adjusted age-specific single-year migration rates by age group, period, and cohort migration indicators

		Observation year							
		y	y+5	y+10	y+15	y+20	y+25	y+30	y+35
Age group	15–19	0.50	0.45	0.35	0.30	0.30	0.25	0.20	0.15
	20–24	0.85	0.80	0.70	0.50	0.45	0.40	0.35	0.25
	25–29	0.55	0.60	0.60	0.65	0.50	0.45	0.40	0.40
	30–34	0.35	0.35	0.40	0.45	0.60	0.65	0.55	0.45
	35–39	0.25	0.25	0.30	0.35	0.40	0.40	0.65	0.65
	40–45	0.10	0.10	0.10	0.20	0.15	0.20	0.15	0.30
Period migration expectancy		13.00	12.75	12.25	12.25	12.00	11.75	11.50	11.00
						Cohort completed migration rate	14.75	14.75	14.75

Source: Adapted from migration (Sobotka 2003).

4. Measuring changes in the timing of migration

Having defined tempo effects, outlined conditions under which they may occur, and illustrated how they manifest on period measures of migration, this section aims to empirically investigate how the timing of migration has changed over the last few decades in a number of advanced economies. The most common summary measure of the age profile is the modal age at migration, or the age at which migration peaks (Bell et al. 2002; Bernard, Bell, and Charles-Edwards 2014; Rogers and Castro 1981). In the absence of population registers in many countries, population censuses remain the main source of migration data, measuring the proportion of individuals who changed residence in the previous one or five years (Bell et al. 2015b). While some countries measure migration over one-year intervals, migration is more commonly measured over five-year intervals (Bell et al. 2015b). Since age at migration is reported at the end of the interval, and assuming that moves are equally distributed over the five-year interval, moves took place on average at an age 2.5 years younger than the age that is reported. It is important to note that such data is for all moves, irrespective of their order.

Table 3 reports the modal age at migration for all moves in six OECD countries, which have consistently collected migration data by single years of age for at least four decades and have made it publicly available (IPUMS 2017). While the age profile of migration is largely scale independent (Muhidin and Bell 2009), it is the best practice to analyse trends by using migration data collected over temporally consistent spatial units. We therefore report long-distance migration by using data for movements between major administrative units (i.e., states in the United States and Australia), which are typically subject to little or no changes in boundaries. Whenever possible we also report all changes of address in order to capture local moves, and we disaggregate migration intensities by single years of age. To avoid imposing an expected age distribution on the observed data, we used kernel regression, a non-parametric method (Bernard and Bell 2015), to smooth observed age-specific migration intensities rather than parametric approaches, such as exponential model migration schedules (Rogers and Castro 1981).

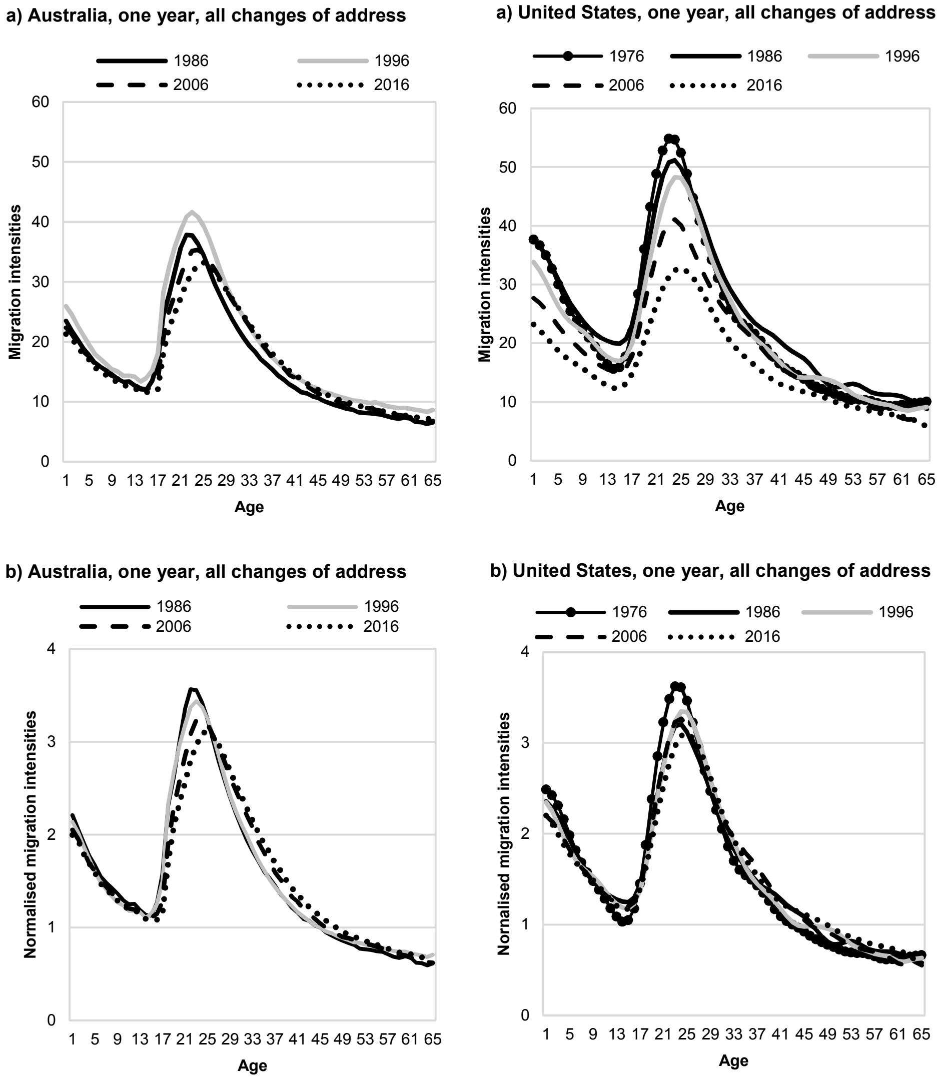
Table 3 shows that in all countries except Romania, the modal age at migration has been gradually delayed to older ages, resulting in a two-to-three-year shift from the 1970s to the 2010s, relocating the migration peak from the mid-twenties to the late twenties. Although small, this delay in the age at peak migration is consistent with the existing evidence of a postponement of transitions to adulthood in advanced economies and suggests a possible tempo effect. To comprehensively capture changes in migration age patterns, it is useful to examine shifts in the full age schedule. Using Australia and the United States by way of example, Figure 2a represents age-specific migration intensities, while Figure 2b represents age-specific migration intensities standardised to unity so that changes in the timing of migration can be identified independently from changes in its level. Results show that the ageing of the migration peak has been accompanied by a decrease in migration intensities, particularly at young adult ages. This decrease is especially pronounced in the United States, where the migration intensity at the peak has dropped by 45% over four decades from 55% in 1976 to 33% in 2016. Standardised migration intensities in Figure 2b clearly show that in both countries, the group of young adults moving in their twenties has fallen proportionally more than in other age groups. In Australia, the decrease has been less severe and there seems to have been a process of recuperation by which the ageing of the migration peak has been partially compensated by a rise in migration intensities in the thirties. In the United States, there is no evidence that this decline in mobility among young adults has been being made up at later ages: Thus the progressive decline in migration intensities at all ages is indicative of a quantum effect rather than a tempo effect.

Table 3: Modal age at migration, selected countries

	UN Census round				
	1970	**1980**	**1990**	**2000**	**2010**
Australia (5 years, states)	26	26	26	27	28
Australia (5 years, all changes of address)	na	26	27	27	28
Canada (five years, provinces)	25	26	26	26	27
Canada (five years, all changes of address moves)	26	26	27	28	na
United states (one year, states)	23	24	25	25	26
United states (one year, all changes of address)	23	23	23	24	25
Portugal (one year, subregions)	na	24	24	25	27
Romania (5 year, counties)	24	na	25	25	24
Switzerland (5 year, cantons)	24	24	26	26	na

Source: Data are from the Current Population Survey for the United States and censuses for the other countries. All data is from IPUMS, with the exception of Australia, for which data was obtained from the Australian Bureau of Statistics. The data refer to the following years: Australia: 1976, 1986, 1996, 2006, 2016; Canada: 1971, 1981, 1991, 2001, 2011; United States: 1976, 1986, 1996, 2006, 2016; Portugal: 1981, 1991, 2001, 2011; Romania: 1977, 1992, 2002, 2011; and Switzerland: 1970, 1980, 1990, 2000.

Figure 2: Age-specific migration intensities by year, Australia and the United States



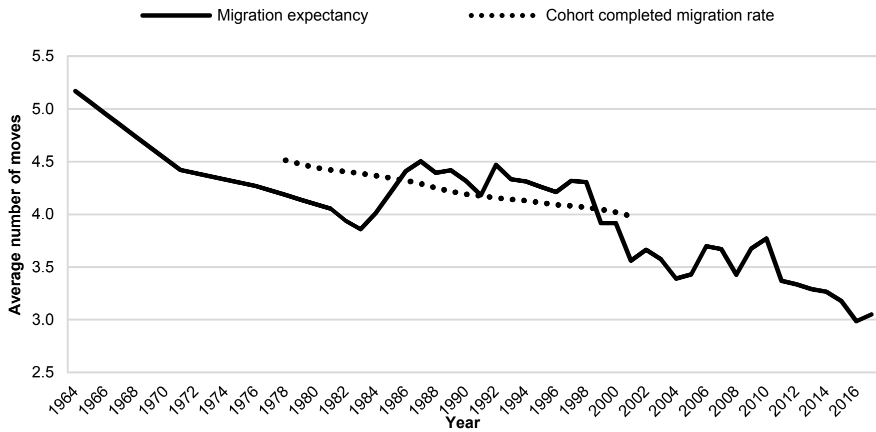
Note: Migration data by single years of age, data smoothed using kernel regressions. In Figure 2b, migration intensities have been normalised to unity.
Source: As per Table 2.

A long-time series of cohort and period measures can permit the detection of tempo effects (Bongaarts 1999), so we further investigate trends in migration in the United States by comparing period and cohort measures of migration. We use period life tables from the Human Mortality Database (Human Mortality Database 2018) to calculate survival ratios for each year and each age and draw migration data from the Current Population Survey, which represents the longest annual collection of internal migration data in the United States.[3] Figure 3 reports the migration expectancy (ME) and the completed migration rate (CMR) estimated for ages 15 to 45, which are the ages at which most moves occur. Using intra-county moves by way of example, Figure 3 shows that both measures have decreased over the study period, although the cohort measure shows less variation than the period measure. The regularity of cohort time series compared with the often substantial fluctuations in period series is a well-established pattern in fertility studies (Ní Bhrolcháin 1992). With regard to migration, this can be readily explained by the fact that over the course of their lives, individuals pass through periods of high and low migration that are linked to cycles in the economy and housing markets (Cameron and Muellbauer 1998). Figure 3 shows a rebound in the migration expectancy in the mid-1980s through to the early 2000s, but the overall trend is downward, with migration expectancy dropping from a maximum of 5.2 moves in 1964 down to 3.5 and below since 2011. While the completed migration rate fluctuates less than the migration expectancy, it also exhibits a downward trend from an average of 4.5 down to 4.0 over the period. The latter confirms the presence of a quantum effect: Individuals are moving at progressively lower intensities. We observe similar trends for moves between counties and between states (not shown). While a visual inspection is useful to detect possible tempo and quantum effects, it does not permit their quantification.

As noted earlier, the data reported here is for all moves, irrespective of their order. Very few migration studies have, however, considered the order of moves and examined whether changes in migration behaviour are order specific (Kulu, Lundholm, and Malmberg 2018; Pelikh and Kulu 2018; Bernard and Kolk 2019), and this is because of the limited availability of adequate data (Bernard 2017b). It is therefore unclear whether changes in migration behaviour are order specific and consequently whether all-move data is suitable for the analysis of changes in the timing of migration and tempo effects.

[3] Refer to DeWaard, Johnson, and Whitaker (2018) for a discussion on the strengths and limitations of migration data in the United States.

Figure 3: Migration expectancy versus cohort completed migration rate, intra-county moves, the United States

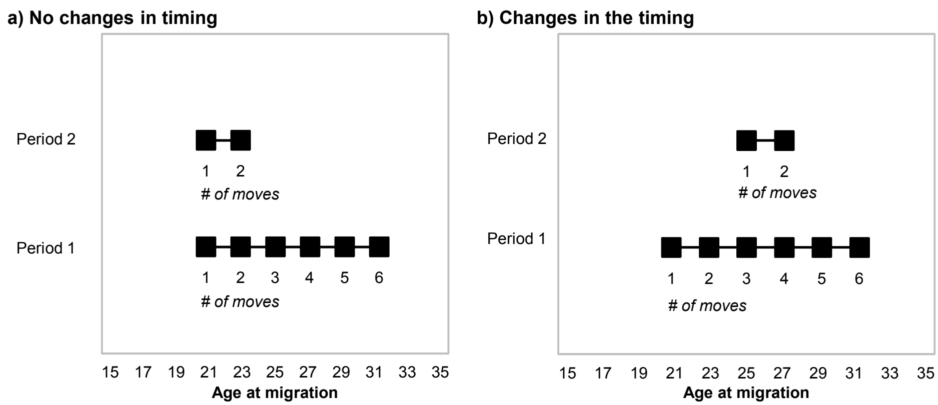


Source: The Current Population Survey (1964–2017) and the Human Mortality Database (2018), authors' calculations. CPS did not collect migration data for the following years: 1965–1970, 1972–1975, 1977–1980, 1985, and 1995. The data was linearly interpolated for missing years, which contributes to smaller variations in the first 15 years.
Note: Migration between the ages of 15 and 45 years. Migration expectancy is defined as the average number of times individuals are expected to migrate during their lifetime if they conform to the age-specific migration and mortality rates of a given year. The completed migration rate is the average number of moves undertaken by members of a given cohort over the course of their lives.

5. Order-specific changes in the timing of migration

In this section, we argue that all-move data, such as those used in Section 4, is not suitable for the analysis of tempo effects because it conceals the extent of change in the timing of moves. We demonstrate this proposition with a simple hypothetical illustration from Bongaarts (1999) adapted to migration. We then validate it empirically by comparing trends in mean ages by move order in England and China. Figure 4 represents highly stylised patterns of migration at two points in time. In period 1, all individuals move six times, all at the exact same age, first time at age 21 and then every two years until age 31. The mean age at migration for all moves in that case is 26 years. In the second period, the average number of moves declines to two. In Figure 4a, the timing of the first and second moves remains constant at 21 and 23 years, respectively, but all individuals cease to migrate after two moves. In that case, the mean age at migration for all moves is 22 years. Using this indicator, one would assume that the timing of moves has been brought forward significantly, which is indicative of a large tempo effect. This is, however, an erroneous conclusion. The mean ages at first and second moves have not changed between the two periods. It is the disappearance of higher-order moves in period 2 that has led to an inaccurate assessment of changes in the timing of migration and ultimately to the incorrect identification of a tempo change. In Figure 4b, the onset of adult migration is delayed in period 2 by four years, with the mean age at first move progressing from 21 to 25. The mean age at migration for all moves is, however, the same for both periods, remaining stable at 26 years. This finding would lead to the incorrect conclusion that the age at migration has been stable in the absence of any tempo effects. In reality, the first and second moves have been substantially delayed, but when considering mean age at all moves, this effect is offset by the elimination of higher-order moves. Both scenarios illustrate how relying on all-move data can lead to erroneous conclusions about the evolution of the timing of migration, which in turn can result in the inaccurate identification of tempo effects.

Figure 4: Hypothetical changes in migration patterns



Source: Adapted from Bongaarts (1999).

These effects are clearly evident when we examine changes in the timing of migration by move order for cohorts born between 1918 and 1957 in England and between 1935 and 1969 in China. The first data set is drawn from the English Longitudinal Study of Ageing (ELSA), a longitudinal survey of the English population aged 50 and over (Marmot et al. 2016). Conducted in 2007, wave 3 retrospectively collected the complete residential mobility histories of individuals born between 1918 and 1957.[4] These cohorts experienced important changes in migration behaviour among females but stable patterns for males. Among adult females, migration was

[4] Refer to Bernard (2017b) for a discussion on the strengths and limitations of retrospective survey data for migration analysis.

progressively brought forward to earlier ages and the average number of moves increased (Falkingham et al. 2016), underpinned by a rise in the incidence of higher-order moves (Bernard 2017b). This period is therefore characterised by patterns of change opposite to current trends in most advanced economies where migration levels are trending down and mean ages at migration are rising.

Table 3 reports female mean ages at migration for all moves and by move order in England. Order-specific mean ages show that migration was brought forward by about three years for moves of all orders, whereas the mean age at migration for all moves was brought forward by only 1.8 years between the first and the last cohort. In that case, relying on all-move data would understate the extent of change in the timing of migration. As shown previously in Figure 4, this is likely to be caused by the inclusion of higher-order moves when considering mean ages for all moves. To understand order-specific changes in migration behaviour, Figure 5 displays for each cohort the proportion of females who moved at least *i* times for moves up to the 10^{th} move. Figure 5 reveals changes in the relative weights of moves of different orders. It shows that the proportion of females who moved at least three times increased from 30% for cohort 1 to 73% for cohort 4 and the proportion of those who moved at least seven times increased from 11% to 23%. Thus, females from cohort 4 started moving on average 2.6 years earlier than members of cohort 1 and a larger proportion moved multiple times and thus remained mobile later in life compared to cohort 1 members. Therefore, younger mean ages for lower-order moves are in part offset by the increase in higher-order moves, which take place at older ages, thereby moderating the apparent fall in the mean age at migration. This example shows that because changes in migration behaviour are order specific, all-move data can obscure the complexity of underlying changes and thus conceal the extent of changes in the timing of migration, which in turn may lead to misleading conclusions about tempo effects.

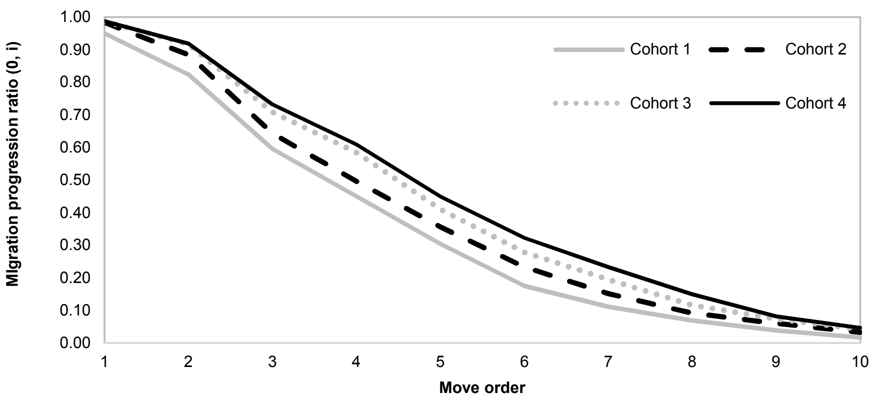
Table 3: Female mean age at migration by move order and for all moves by birth cohort, England

	Cohort 1 (1918–1927)	Cohort 2 (1928–1937)	Cohort 3 (1938–1947)	Cohort 4 (1948–1957)	Difference between cohort 1 and 4 (years)
Move 1	22.9	22.0	20.8	20.3	–2.6
Move 2	27.3	26.3	24.5	24.0	–3.3
Move 3	30.2	29.7	27.9	27.1	–3.1
Move 4	32.6	32.0	30.7	29.9	–2.7
Move 5	34.8	34.7	33.2	31.8	–3.0
All moves	29.4	29.3	28.1	27.6	–1.8

Source: English Longitudinal Study of Ageing (ELSA), authors' calculations, amended from Bernard (2017b), moves between the ages of 17 and 50.

The analysis for England relates to a period where migration advanced to younger ages, but the same mechanisms apply to a delay in the age at migration. Table 4 reports male mean age at migration by move order and for all moves for cohorts born between 1935 and 1969 in China. The data was obtained from the Chinese Health and Retirement Longitudinal Study (CHARLS), which in 2014 retrospectively collected the lifetime migration histories of about 20,000 individuals over the age of 40. Order-specific mean ages show that migration has been pushed back to older ages. The first move was delayed by 2.7 years between the first and the last cohort, compared with 2.4 years for the second move and 1.7 years for the third move. Thus, the extent of changes in the timing of migration is order specific. These variations are hidden when considering the mean age at all moves, which indicates a 2.6 year delay. This is because repeated movement is rare in China and most migrants move only once or twice (Bernard, Bell, and Zhu 2019), thus the mean age at all moves is skewed in favour of the first and second moves. In this particular instance, the mean age at all moves is broadly similar to the mean age at the first move; nevertheless it conceals the extent of change in the timing of migration by obscuring the more modest shift in the age at moves of third order and higher.

Figure 5: Migration progression ratio by birth cohort, females



Source: ELSA, authors' calculations, moves between the ages of 17 and 50.

Similar problems are likely to affect census data, such as those reported in Table 2, which accounts for moves of all orders and remains the main source of migration data in countries around the world (Bell et al. 2015b). As in the case of fertility, the solution to this problem is relatively simple. Instead of examining changes in the ages of all moves, it is necessary to examine changes in migration age patterns by move order. Our results also suggest that tempo effects should also be analysed separately for each move order because the rate of change in mean ages can differ by move order. While the solution is relatively straightforward conceptually, its practical application is more challenging because, as noted earlier, migration data is rarely collected by move order. However, population registers and administrative records permit the analysis of migration by move order from both a cohort and period perspective (Bernard and Kolk 2019; Kulu, Lundholm, and Malmberg 2018) and should therefore allow identifying tempo effects and assessing whether some delayed moves are made up later in life or are simply missed.

Table 4: Male mean age at migration by move order and for all moves by birth cohort, China

	1935–1939	1940–1944	1945–1949	1950–1954	1955–1959	1960–1964	1965–1969	Difference between first and last cohort (yrs)
Move 1	22.4	21.5	22.7	23.3	24.3	24.7	25.1	2.7
Move 2	24.5	23.6	24.7	25.8	26.5	26.6	26.9	2.4
Move 3	26.8	25.1	26.1	26.7	28.6	29.1	28.5	1.7
All moves	24.9	24.0	25.0	25.2	26.3	26.9	27.5	2.6

Source: China Health and Retirement Longitudinal Study (CHARLS), authors' calculations, amended from Bernard, Bell, and Zhu (2019), moves between the ages of 17 and 40.

6. Migration ageing effect

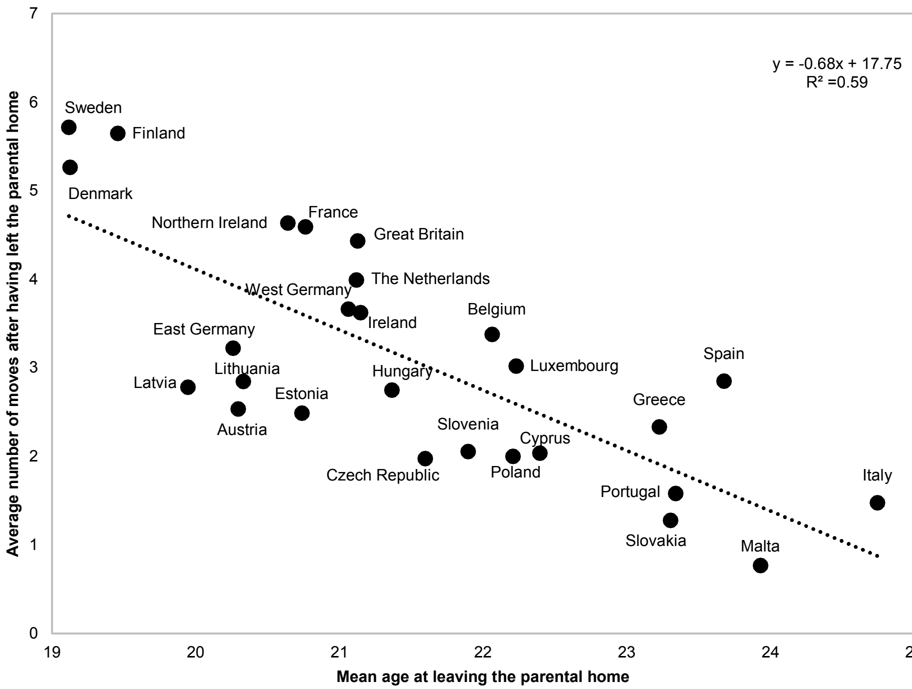
We argued in the introduction that there is another mechanism, the 'migration ageing effect,' by which a delay in the age at migration may affect overall migration levels. A delay in the age at first move is likely to reduce higher-order moves because the exposure to migration is shifted to older ages when the probability of moving is lower. Conversely, if the age at migration is brought forward, the exposure to migration will be shifted to younger ages when the probability of moving is higher, which will increase the opportunities for progression to higher-order moves and, in turn, potentially lead to a higher overall migration level. Changes in the timing of migration therefore raise two key questions: (1) What is the impact of delayed age at first migration on completed lifetime migration, and (2) how much recuperation of migration is likely to occur at older ages?

The idea that later ages at first move may curtail completed migration was first raised by Taeuber (1966: 148), who asks, "Is migration an event that is likely to be postponed like a second child? Or are attitudes toward future migrations highly flexible, so that a move not undertaken is not so much postponed as irrelevant to future decisions?" (Taeuber 1966: 418). The hypothesis of a link between the onset of migration and the overall level of migration was first supported by cross-sectional evidence from 10 European countries, which shows a strong negative correlation between mean ages at leaving the parental home and overall migration intensities (Bell et al. 2015a). Taking a cohort approach, Bernard (2017a) confirms a link between the onset of migration and completed migration rate at a macro level by showing a negative association between mean age at first move and cohort completed migration rates in 14 European countries. At an individual level, Bernard (2017b) shows for England that the age at first move operates to affect completed migration by influencing progressions to moves of higher order: the younger the age at first migration, the higher the likelihood of moving a second time, and vice versa. This proposition was further tested and confirmed in 14 European countries (Bernard 2017a) and in Australia and the United States (Bernard et al. 2017). These results suggest the presence of a migration ageing effect in the way that a delay in first adult migration tends to reduce lifetime migration at a cohort level. From a period perspective, this means that if young adults delay leaving the parental home, it will have an impact on their migration as they progress through life, which is likely to result in a further decline in the aggregate level of migration. What is now needed is to measure the extent of the hypothesised migration ageing effect by examining the impact of age at first adult move on completed migration in a larger sample of countries.

We extend empirical evidence on the impact of age at first move on completed migration by expanding geographical coverage to 26 European countries and modelling migration decisions at an individual level. We draw on data from the Eurobarometer 64.1, which in 2005 retrospectively collected age at leaving the parental home and the number of subsequent moves for over 24,000 individuals. Because the number of moves was recorded in discrete groups (e.g., two to four moves) rather than as a continuous variable, we assume that the number of moves is normally distributed over the interval and take the interval mean (e.g., three) to be the number of moves. The Eurobarometer gathered partial migration histories as it did not collect the age at which subsequent moves occurred. Leaving the parental home may not be the first move undertaken by young adults. Some of those leaving home may return one or more times before their final departure, especially students but also those experiencing financial or social problems (Goldscheider and Goldscheider 1999; Stone, Berrington, and Falkingham 2014). For individuals born between 1947 and 1957 in 13 countries (Austria, Belgium, the Czech Republic, Denmark, England, France, Germany, Greece, Italy, the Netherlands, Poland, Spain, and Sweden) we obtained the mean age at first adult move from the Survey of Health, Retirement and Aging and the mean age at leaving home from the Eurobarometer. We found a strong positive association between the two measures, with a Pearson correlation coefficient of 0.81, indicating that the age at leaving home is a good proxy for the start of the migration career of young adults.

Figure 5 plots mean age at leaving home against the completed migration rate for individuals born between 1961 and 1970 in each of the 26 countries. It shows a clear negative association, indicating that later ages at leaving the parental home are associated with reduced lifetime migration. The strength of this association is supported by a correlation coefficient of –0.77. Thus, Nordic countries combine high adult migration (more than five moves on average) and early mean age at leaving the parental home, before age 20 in Denmark, Sweden, and Finland. Conversely, countries in southern and eastern Europe exhibit the opposite patterns of low mobility with less than two moves on average and late departure from the parental home particularly in Portugal, Slovakia, Malta, and Italy.

Figure 5: Mean age at leaving home against the average number of moves after departure



Source: Eurobarometer 64.1 collected in 2005. Results for individuals born between 1961 and 1970. Authors' calculations.

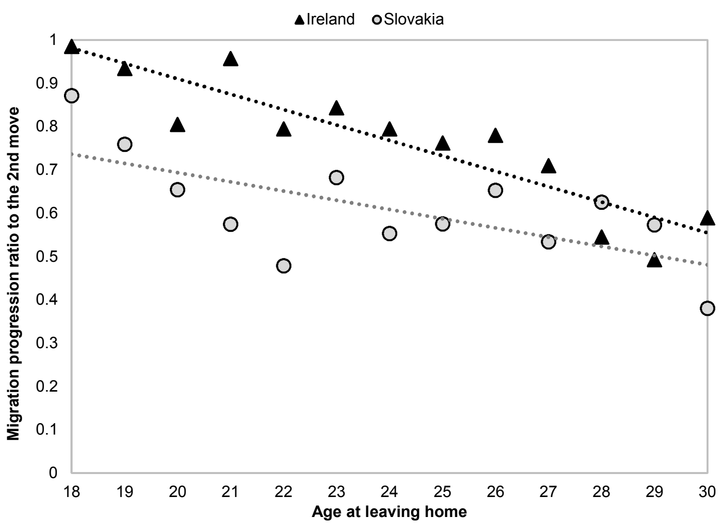
To establish whether a delay in the age at first move is negatively associated with the progression to higher-order moves, we use individual-level data to model the likelihood of progressing to the second move as a function of the age at leaving home, controlling for sex and birth cohort (born before 1941, 1941–1950, 1951–1960, and 1961–1970). We use binary logistic regression where 1 denotes at least one move after having left home and 0 indicates no moves after the home departure. Table 5 reports the odds ratios of age at leaving home and shows that in all countries except Cyprus, age at leaving home is statistically significant and is negatively related to the progression to the second move: the higher the age at leaving, the lower the probability of progressing to the second move. However, the extent to which age at leaving home shapes subsequent moves varies significantly from one country to another. The impact of age at leaving home is the lowest in Portugal and Slovakia, where the odds of moving at least one more time is about 9% lower for each additional year stayed at home, compared to about 15% in Italy, Greece, Hungary, the Czech Republic, and East Germany; approximately 20% in France and Latvia; and more than 30% in Denmark, the Netherlands, and Sweden. These results indicate that, at an individual level, the migration ageing effect differs widely in magnitude in different national settings. Later ages at leaving home have a particularly strong impact on completed migration in northern and western Europe, where migration levels are high. This can be readily explained by the fact that in high-mobility countries, such as France, Ireland, and the United Kingdom, virtually all young adults who left the parental home before the age of 20 proceeded to moving at least one more time, whereas in low-mobility countries early starters report much lower progression ratios to the second move, even if they moved by age 20. As the age at leaving home is delayed, the likelihood of moving once more decreases proportionally more in high-mobility countries and, in some instances, late starters report progression ratios to the second move similar to that of late starters in low-mobility countries. This can be seen on Figure 6 for Ireland and Slovakia.

Table 5: Odds ratios and confidence intervals of progression to the second move as a function of age at leaving home

	odds ratios	95% Confidence interval			odds ratios	95% Confidence interval	
Cyprus	0.966	0.889	1.048	Germany West	0.811***	0.738	0.891
Portugal	0.913**	0.859	0.971	Belgium	0.811***	0.748	0.879
Slovakia	0.899***	0.853	0.948	France	0.809***	0.734	0.891
Italy	0.859***	0.813	0.908	Latvia	0.801***	0.743	0.863
Greece	0.857***	0.813	0.903	Ireland	0.786***	0.726	0.851
Hungary	0.851***	0.803	0.902	Austria	0.781***	0.73	0.836
Czech Republic	0.851***	0.801	0.904	Estonia	0.781***	0.721	0.846
Germany East	0.850**	0.763	0.946	Northern Ireland	0.768***	0.656	0.898
Spain	0.842***	0.795	0.893	Luxembourg	0.763***	0.678	0.858
Malta	0.839***	0.773	0.911	United Kingdom	0.748***	0.682	0.82
Poland	0.834***	0.784	0.889	Denmark	0.709***	0.593	0.846
Lithuania	0.830***	0.768	0.897	The Netherlands	0.676***	0.61	0.749
Finland	0.830*	0.703	0.979	Sweden	0.671***	0.566	0.796
Slovenia	0.815***	0.762	0.871				

Note: * p<0.05, ** p<0.01, *** p<0.001.
Source: Eurobarometer 64.1 collected in 2005. Results for individuals born between 1961 and 1970. Authors' calculations. Note: countries ranked in decreasing order of odds ratios.

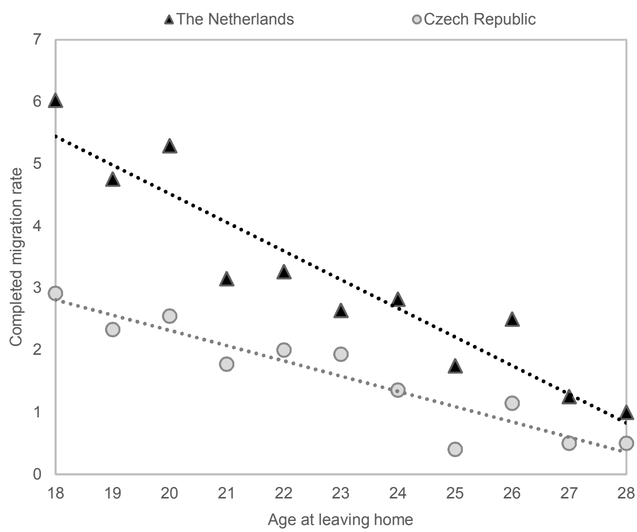
Figure 6: Age at leaving home against the progression ratio to the second move, selected countries



Source: Data from Eurobarometer 64.1 collected in 2005. Results for individuals born between 1961 and 1970.
Note: Migration progression ratio to the second move is defined as the proportion of first-time movers who went on to move at least one more time.

By influencing the progression to the second move, age at leaving home exerts an enduring effect on migration behaviour. As a result, late starters tend to exhibit lower levels of lifetime migration than those who left early. This can be seen in Figure 7, which displays age at leaving home against the completed migration rate for the Czech Republic and the Netherlands. In the latter, individuals who left home by age 20 reported on average 5 subsequent moves compared with 2.5 moves or less for individuals who left home at age 26 or later. Similarly, in the Czech Republic the completed migration rate decreases gradually with age at leaving home. The same patterns were observed in the other sample countries. These results demonstrate the presence of a migration ageing effect across Europe while revealing that the magnitude of this effect is context specific and varies from one country to the next. These findings highlight the importance of studying migration by move order and the need to pay particular attention to shifts in the timing of the first adult move to understand changes in migration levels. As late starters report lower progression to higher-order moves, they will display lower migration levels in the future as they progress through life. As a result, delays in the onset of adult migration will have an enduring effect on both period and cohort migration indicators.

Figure 7: Age at leaving home against completed migration rate, selected countries



Source: Data from Eurobarometer 64.1 collected in 2005. Results for individuals born between 1961 and 1970.
Note: The completed migration rate is the average number of migrations undertaken by members of a given corhot over the course of their lives.

7. Discussion and conclusion

Understanding changes in migration is central to demographers and population geographers interested in measuring, understanding, and projecting migration. Despite recent advances in the field, migration scholars have not explicitly considered the impact of changes in the timing of migration on migration levels. Drawing on the fertility literature, we argue there are two intertwined processes by which changes in the timing of migration can affect overall migration levels: (1) a tempo effect, arising from a secular shift in the age at migration, which leads to an underestimation of the quantum, or level, of migration in the observed period data and (2) a migration ageing effect, which reduces higher-order moves because the exposure to migration is shifted to older ages when the probability of moving is lower. This paper proposes a framework for thinking about tempo and ageing effects of migration and assesses the types of data required to empirically analyse these processes.

We show that period indicators of migration, as in the case with other demographic processes, are likely to be distorted by tempo effects if the general trend is towards later ages at migration. In other words, the observed period migration level is likely to be lower than it would have been if the timing of migration had remained unchanged. The first step in the empirical analysis of tempo effects is the measurement of changes in the timing of migration. Analysis of census and survey data for Australia, Canada, the United States, Portugal, Romania, and Switzerland reveals that in all countries expect Romania, the modal age at migration has been delayed by two to three years since the 1970s, resulting in a shift in the peak age at migration from the mid-twenties to the late twenties. Because the order of moves is typically not recorded in censuses and surveys, the modal age at migration accounts for moves of all orders (first, second, etc.). Using hypothetical scenarios, we show that all-move data is suitable for the measurement of tempo effects only if (1) the mean age at migration follows the same trend for moves of all orders and (2) the distribution of move order does not change over time. Using retrospective survey data from England and China, we empirically show that these two conditions are rarely met: Changes in migration behaviour are order specific. As a result, all-move data can obscure the complexity of underlying changes and thus conceal the extent of changes in the timing of migration, which in turn may lead to misleading conclusions about tempo effects.

These findings have two direct implications for the analysis of migration trends. First, to obtain an accurate account of changes in the timing of migration, trends in age-specific migration rates should be analysed by move order. Secondly, tempo effects should be examined separately for moves of different orders to accurately identify and measure any tempo distortions of period measures. While existing evidence points to a small delay in the modal age at migration, it is likely that first moves in adulthood have been postponed to a greater extent than what all-move data suggests. However, because census and survey data rarely collect information on move order, the current understanding of the evolution of migration age patterns remains limited.

This paper argues that there is another linked mechanism by which changes in the ages at migration affect overall migration levels. The ‘migration ageing effect’ is thought to reduce higher-order moves because when the first migration is delayed, the exposure to migration is shifted to older ages when the probability of moving is lower. We test this proposition by examining adult migration by age at leaving the parental home in 26 European countries. After controlling for sex and birth cohort, we found that in all countries except Cyprus, younger movers were more likely to move at least once more after the first migration and, as a result, reported higher completed migration than late starters. Thus, further delays in the age at leaving the parental home would limit the number of migrations among young adults, with consequences not only in reducing current period indicators of migration directly but also potentially in future periods by decreasing their likelihood of moving later in life.

In this paper, we consider tempo and ageing effects separately as a first step in the conceptualisation of these processes for migration. What is now needed is a joint analysis to disentangle and quantify the relative importance of tempo and ageing effects in driving down period measures of migration levels. Methods developed in fertility research should permit such endeavours (see Kohler and Ortega 2002), although access to adequate data remains a challenge. The increasing collection of complete retrospective residential histories in Asia (China Health and Retirement Longitudinal Study in 2015), Europe (Survey of Health, Ageing and Retirement in Europe in 2007), North America (Health and Retirement Study in 2015), and Australia (Life Histories and Health Survey 2012) have been instrumental in providing new insights into order-specific changes in migration from a cohort perspective (Bernard 2017b, 2017a; Bernard et al. 2017; Falkingham et al. 2016; Vidal and Lutz 2018). However, retrospective migration surveys need to be repeated multiple times to permit a trend analysis of migration by move order, which is not yet a common practice. Alternatively, population registers and administrative records can be used to examine order-specific components of migration change from a period perspective and there are recent examples of such data sets used to identify period trends in order-specific migration rates (Kulu, Lundholm, and Malmberg 2018). However, while population registers are an important source of demographic data in Europe (Poulain and Herm 2013), publicly available aggregate migration indicators are not disaggregated by move order, and access to individual-level data follows strict access protocols that limits its use.

If further advances are to be made in understanding migration trends, data collection practices need to evolve to allow the analysis of migration by move order. In countries with population registers, national statistical agencies could produce aggregate migration indicators by move order in the same way that they release parity-specific measures of fertility. In countries where such data is not available, repeated retrospective surveys offer the most cost-effective approach to obtain trends in period and cohort indicators of migration, although further research into recall error and survivor bias may be needed.

Access to such data in multiple countries would permit further testing of our proposition that changes in migration behaviour are order specific. This in turn would allow migration scholars to draw on important advances in the fertility literature over the last two decades to enhance understanding of migration trends. Bongaarts and Feeney's (1998) method of correcting tempo effects suggests that period age-specific migration intensities by move order are sufficient to estimate tempo effects and generate tempo-adjusted period measures of migration. Application to migration would represent an important step forward in the analysis and understanding of migration as tempo effects can lead to a distorted view of trends, which in turn can lead to misleading projections and the adoption of suboptimal policies (Bongaarts and Feeney 2008).

8. Acknowledgements

The authors thank Martin Bell for providing comments on a draft version of this article and gratefully acknowledge the support of the Australian Research Council under ARC Early Career Discovery Project (DE160101574).

References

Bell, M., Blake, M., Boyle, P., Duke-Williams, O., Rees, P., Stillwell, J., and Hugo, G. (2002). Cross-national comparison of internal migration: Issues and measures. *Journal of the Royal Statistical Society Series A: Statistics in Society* 165(3): 435–464. doi:10.1111/1467-985X.t01-1-00247.

Bell, M., Charles-Edwards, E., Bernard, A., and Ueffing, P. (2018a). Global trends in internal migration. In: Champion, T., Cooke, T.J., and Shuttleworth, I. (eds.). *Internal migration in the developed world: Are we becoming less mobile?* London: Routledge: 76–97. doi:10.4324/9781315589282-4.

Bell, M., Charles-Edwards, E., Kupiszewska, D., Kupiszewski, M., Stillwell, J., and Zhu, Y. (2015b). Internal migration data around the world: Assessing contemporary practice. *Population, Space and Place* 21(1): 1–17. doi:10.1002/psp.1848.

Bell, M., Charles-Edwards, E., Ueffing, P., Stillwell, J., Kupiszewski, M., and Kupiszewska, D. (2015a). Internal migration and development: Comparing migration intensities around the world. *Population and Development Review* 41(1): 33–58. doi:10.1111/j.1728-4457.2015.00025.x.

Bell, M., Wilson, T., Charles-Edwards, E., and Ueffing, P. (2018b). Australia: The long-run decline in internal migration intensities. In: Champion, T., Cooke, T.J., and Shuttleworth, I. (eds.). *Internal migration in the developed world: Are we becoming less mobile?* London: Routledge: 147–172. doi:10.4324/9781315589282-7.

Bernard, A. (2017a). Levels and patterns of internal migration in Europe: A cohort perspective. *Population Studies* 71(3): 293–311. doi:10.1080/00324728.2017.1360932.

Bernard, A. (2017b). Cohort measures of internal migration: Understanding long-term trends. *Demography* 54(6): 2201–2221. doi:10.1007/s13524-017-0626-7.

Bernard, A. and Bell, M. (2015). Smoothing internal migration age profiles for comparative research. *Demographic Research* 32(33): 915–948. doi:10.4054/DemRes.2015.32.33.

Bernard, A. and Kolk, M. (2019). Why are young Swedes moving more? A cohort analysis of internal migration by move order. Stockholm: Stockholm University, Demography Unit (Stockholm Research Reports in Demography 2019:11). doi:10.17045/sthlmuni.7857386.v1.

Bernard, A., Bell, M., and Charles-Edwards, E. (2014). Improved measures for the cross-national comparison of age profiles of internal migration. *Population Studies* 68(2): 179–195. doi:10.1080/00324728.2014.890243.

Bernard, A., Bell, M., and Charles-Edwards, E. (2016). Internal migration age patterns and the transition to adulthood: Australia and Great Britain compared. *Journal of Population Research* 33(2): 123–146. doi:10.1007/s12546-016-9157-0.

Bernard, A., Bell, M., and Zhu, Y. (2019). Migration in China: A cohort approach to understanding past and future trends. *Population, Space and Place*: e2234. doi:10.1002/psp.2234.

Bernard, A., Forder, P., Kendig, H., and Byles, J. (2017). Residential mobility in Australia and the United States: A retrospective study. *Australian Population Studies* 1(1): 41–54.

Billari, F.C. and Liefbroer, A.C. (2010). Towards a new pattern of transition to adulthood? *Advances in Life Course Research* 15(2): 59–75. doi:10.1016/j.alcr.2010.10.003.

Bongaarts, J. (1999). The fertility impact of changes in the timing of childbearing in the developing world. *Population Studies* 53(3): 277–289.

Bongaarts, J. and Feeney, G. (1998). On the quantum and tempo of fertility. *Population and Development Review* 24(2): 271–291. doi:10.2307/2807974.

Bongaarts, J. and Feeney, G. (2008). The quantum and tempo of life-cycle events. In: Barbi, E., Vaupel, J.W., and Bongaarts, J. (eds.). *How long do we live? Demographic models and reflections on tempo effects*. Berlin: Springer: 29–65. doi:10.1007/978-3-540-78520-0_3.

Bongaarts, J. and Feeney, G. (2010). When is a tempo effect a tempo distortion? *Genus* 66(2): 1–15. doi:10.4402/genus-188.

Bongaarts, J. and Sobotka, T. (2012). A demographic explanation for the recent rise in European fertility. *Population and Development Review* 38(1): 83–120. doi:10.1111/j.1728-4457.2012.00473.x.

Cameron, G. and Muellbauer, J. (1998). The housing market and regional commuting and migration choices. *Scottish Journal of Political Economy* 45(4): 420–446. doi:10.1111/1467-9485.00106.

Champion, T., Cooke, T., and Shuttleworth, I. (2018). *Internal migration in the developed world: Are we becoming less mobile?* London: Routledge. doi:10.4324/9781315589282.

Cooke, T. (2018). United States: Cohort effects on the long-term decline in migration rates. In: Champion, T., Cooke, T.J., and Shuttleworth, I. (eds.). *Internal migration in the developed world: Are we becoming less mobile?* London: Routledge: 101–119. doi:10.4324/9781315589282-5.

DeWaard, J., Johnson, J., and Whitaker, S. (2018). Internal migration in the United States: A comparative assessment of the utility of the consumer credit panel. Cleveland: Federal Reserve Bank of Cleveland (Working Paper 18-04). doi:10.26509/frbc-wp-201804.

Easterlin, R.A. (1974). Does economic growth improve the human lot? Some empirical evidence. In: David, P.A. and Reder, M.W. (eds.). *Nations and households in economic growth.* Cambridge: Academic Press: 89–125. doi:10.1016/B978-0-12-205050-3.50008-7.

Falkingham, J., Sage, J., Stone, J., and Vlachantoni, A. (2016). Residential mobility across the life course: Continuity and change across three cohorts in Britain. *Advances in Life Course Research* 30: 111–123. doi:10.1016/j.alcr.2016.06.001.

Foster, T.B. (2017). Decomposing American immobility: Compositional and rate components of interstate, intrastate, and intracounty migration and mobility decline. *Demographic Research* 37(47): 1515–1548. doi:10.4054/DemRes.2017.37.47.

Frejka, T. and Sardon, J.-P. (2006). First birth trends in developed countries: Persisting parenthood postponement. *Demographic Research* 15(6): 147–180. doi:10.4054/DemRes.2006.15.6.

Frey, H. (2017, November 20). US migration still at historically low levels, census shows. *Brookings, The Avenue: Rethinking Metropolitan America*. https://www.brookings.edu/blog/the-avenue/2017/11/20/u-s-migration-still-at-historically-low-levels-census-shows.

Furstenberg, F.F. (2013). Transitions to adulthood: What we can learn from the West. *The Annals of the American Academy of Political and Social Science* 646(1): 28–41. doi:10.1177/0002716212465811.

Goldscheider, F.K. and Goldscheider, C. (1999). *The changing transition to adulthood: Leaving and returning home*. Thousand Oaks: Sage.

Goldstein, J.R. (2008). Found in translation? A cohort perspective on tempo-adjusted life expectancy. In: Barbi, E., Vaupel, J.W., and Bongaarts, J. (eds.). *How long do we live?* Berlin: Springer: 247–259. doi:10.1007/978-3-540-78520-0_13.

Human Mortality Database (2018). Human Mortality Database [electronic resource]. Berkeley and Rostock: University of California and Max Planck Institute for Demographic Research. www.mortality.org.

IPUMS (2017). Integrated Public Use Microdata Series, International: Versions 6.5 [dataset]. Minneapolis: University of Minnesota. doi:10.18128/D020.V6.5.

Kohler, H.-P. and Ortega, J.A. (2002). Tempo-adjusted period parity progression measures: Assessing the implications of delayed childbearing for cohort fertility in Sweden, the Netherlands and Spain. *Demographic Research* 6(7): 145–190. doi:10.4054/DemRes.2002.6.7.

Kolk, M. (2016). Period and cohort measures of migration. Stockholm: Stockholm University, Demography Unit (Stockholm Research Reports in Demography 2016:5). doi:10.13140/RG.2.1.5171.2885.

Kulu, H., Lundholm, E., and Malmberg, G. (2018). Is spatial mobility on the rise or in decline? An order-specific analysis of the migration of young adults in Sweden. *Population Studies* 72(3): 323–337. doi:10.1080/00324728.2018.1451554.

Lomax, N. and Stillwell, J. (2018). United Kingdom: Temporal change in internal migration in the United Kingdom. In: Champion, T., Cooke, T.J., and Shuttleworth, I. (eds.). *Internal migration in the developed world: Are we becoming less mobile?* London: Routledge: 120–146. doi:10.4324/9781315589282-6.

Long, L.H. (1973). New estimates of migration expectancy in the United States. *Journal of the American Statistical Association* 68(341): 37–43.

Luy, M. (2006). Mortality tempo-adjustment: An empirical application. *Demographic Research* 15(21): 561–590. doi:10.4054/DemRes.2006.15.21.

Luy, M. and Wegner, C. (2009). Conventional versus tempo-adjusted life expectancy: Which is the more appropriate measure for period mortality? *Genus* 65(2): 1–28.

Marmot, M., Oldfield, Z., Clemes, S., Blake, M., Phelps, A., Nazroo, J., Steptoe, A., Rogers, N., Banks, J., and Oskala, A. (2016). English Longitudinal Study of Ageing: Waves 0–7, 1998–2015 [data collection]. Colchester: UK Data Service. doi:10.5255/UKDA-SN-5050-13.

Molloy, R., Smith, C.L., and Wozniak, A.K. (2011). Internal migration in the United States. Cambridge: National Bureau of Economic Research (NBER Working Paper 17307). doi:10.3386/w17307.

Molloy, R., Smith, C.L., and Wozniak, A.K. (2014). Declining migration within the US: The role of the labor market. Cambridge: National Bureau of Economic Research (NBER Working Paper 20065). doi:10.3386/w20065.

Muhidin, S. and Bell, M. (2009). *Cross national comparisons of internal migration in Asia-Pacific region*. Paper presented at the Annual Meeting of the Population Association of America (PAA), Detroit, USA, April 30–May 2, 2009.

Mulder, C.H. (1993). *Migration dynamics: A life course approach*. Amsterdam: Thesis.

Mulder, C.H. (2009). Leaving the parental home in young adulthood. In: Furlong, A. (ed.). *Handbook of youth and young adulthood: New perspectives and agendas*. London: Routledge: 203–210.

Ní Bhrolcháin, M. (1992). Period paramount? A critique of the cohort approach to fertility. *The Population and Development Review* 18(4): 599–629. doi:10.2307/1973757.

OECD (2018). Age of mothers at childbirth and age-specific fertility. Paris: OECD, Social Policy Division, Directorate of Employment, Labour and Social Affairs. https://www.oecd.org/els/soc/SF_2_3_Age_mothers_childbirth.pdf.

Pandit, K. (1997a). Cohort and period effects in US migration: How demographic and economic cycles influence the migration schedule. *Annals of the Association of American Geographers* 87(3): 439–450. doi:10.1111/1467-8306.00062.

Pandit, K. (1997b). Demographic cycle effects on migration timing and the delayed mobility phenomenon. *Geographical Analysis* 29(3): 187–199. doi:10.1111/j.1538-4632.1997.tb00956.x.

Pelikh, A. and Kulu, H. (2018). Short- and long-distance moves of young adults during the transition to adulthood in Britain. *Population, Space and Place* 24(5): e2125. doi:10.1002/psp.2125.

Plane, D.A. and Rogerson, P.A. (1991). Tracking the baby boom, the baby bust, and the echo generations: How age composition regulated US migration. *The Professional Geographer* 43(4): 416–430. doi:10.1111/j.0033-0124.1991.00416.x.

Poulain, M. and Herm, A. (2013). Central population registers as a source of demographic statistics in Europe. *Population* 68(2): 183–212. doi:10.3917/popu.1302.0215.

Rogers, A. and Castro, L.J. (1981). Model migration schedules. Laxenburg: International Institute for Applied Systems Analysis (Research Report RR-81-30).

Rogers, A. and Rajbhandary, S. (1997). Period and cohort age patterns of US migration, 1948–1993: Are American males migrating less? *Population Research and Policy Review* 16(6): 513–530. doi:10.1023/A:1005824219973.

Rogerson, P.A. (1987). Changes in US national mobility levels. *The Professional Geographer* 39(3): 344–351. doi:10.1111/j.0033-0124.1987.00344.x.

Ryder, N.B. (1956). Problems of trend determination during a transition in fertility. *The Milbank Memorial Fund Quarterly* 34(1): 5–21. doi:10.2307/3348329.

Ryder, N.B. (1964). The process of demographic translation. *Demography* 1(1): 74–82. doi:10.2307/2060032.

Saks, R.E. and Wozniak, A. (2007). Labor reallocation over the business cycle: New evidence from internal migration. Bonn: IZA (IZA Discussion Paper No. 2766).

Shuttleworth, I., Osth, J., and Niedomysl, T. (2018). Sweden: Internal migration in a high-migration Nordic country. In: Champion, T., Cooke, T.J., and Shuttleworth, I. (eds.). *Internal migration in the developed world: Are we becoming less mobile?* London: Routledge: 203–225. doi:10.4324/9781315589282-9.

Sobotka, T. (2003). Tempo-quantum and period-cohort interplay in fertility changes in Europe: Evidence from the Czech Republic, Italy, the Netherlands and Sweden. *Demographic Research* 8(6): 151–214. doi:10.4054/DemRes.2003.8.6.

Stone, J., Berrington, A., and Falkingham, J. (2014). Gender, turning points, and boomerangs: Returning home in young adulthood in Great Britain. *Demography* 51(1): 257–276. doi:10.1007/s13524-013-0247-8.

Taeuber, K.E. (1966). Cohort migration. *Demography* 3(2): 416–422. doi:10.2307/2060167.

Vidal, S. and Lutz, K. (2018). Internal migration over young adult life courses: Continuities and changes across cohorts in West Germany. *Advances in Life Course Research* 36: 45–56. doi:10.1016/j.alcr.2018.03.003.

Winkler-Dworak, M. and Engelhardt, H. (2004). On the tempo and quantum of first marriages in Austria, Germany, and Switzerland: Changes in mean age and variance. *Demographic Research* 10(9): 231–264. doi:10.4054/DemRes.2004.10.9.