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A Bimodal Pattern in Age at First Birth in Southern Cone Countries?

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Abstract

Recent evidence confirms that the postponement transition has begun in some Latin American countries. As the mean age at first birth increases, dispersion around the mean value might also increase, reflecting a growing heterogeneity in the timing of transition to motherhood. In fact, in countries from the Southern Cone, recently available data suggest the emergence of a specific pattern that not only reflects heterogeneity, but also a polarization around two “crests;” the first one at the end of adolescence and the second one toward the end of the twenties. Using census data, vital statistics and household surveys from three countries, we study the extent to which this process consolidates a recognizable pattern in the timing of first birth in Argentina, Chile and Uruguay, visible through age-specific conditional rates of first births.

Keywords

Fertility, bimodal pattern, postponement transition, Argentina, Chile, Uruguay, age at first birth

Introduction

The aim of our study is to analyze the consolidation of a bimodal pattern in the age of first birth in the Southern Cone countries: Argentina, Chile and Uruguay. These countries, whose pioneering role at the beginning of the demographic transition in Latin America is well known, also appear to be leading changes in the timing of first births. To observe how this transition is experienced through a bimodal pattern, we revisit the cases of Uruguay and Chile and, for the first time, present data from Argentina by taking advantage of conditional age-specific first-birth rates.

Postponement has not been much addressed in fertility studies in Latin America, at least not within the field of demographic studies. This scarce attention is partly because interest has been focused on explaining the drop in TFR[1] to the level of replacement and below, an earlier process (Cabella and Pardo 2014; Cavenaghi 2009; Cepal 2011). Only recently has postponement gained some space on the fertility research agenda in the region. In the last two years, at least three studies have been published showing a particular evolution in the age at first birth in some Latin American countries (Cabella et al. 2016; Lima et al. 2017; Nathan et al. 2016; Nathan 2015). These works demonstrate that the postponement transition may have begun in Latin American countries, and interestingly, that this transition occurs with a very different pattern than in Europe, the region in which postponement has been more widely studied.

Our work focuses on the study of this process in countries in the Southern Cone and brings new knowledge in at least three areas: it includes information for Argentina for the first time, it comprehensively shows the conditional rates for all countries studied in all time periods, something which has not been done as systematically in previous studies. It also incorporates information on order 2 rates (no work on bimodality in the region has analyzed the extent to which this form is transferred to second births).

Although countries in the Southern Cone have distanced themselves from the region in several indicators of family change – leading to changes associated with the Second Demographic Transition in indicators, such as youth cohabitation and the fall of fertility at low levels (Esteve and Lesthaeghe 2016) – the Southern Cone shares with the rest of the continent the meager modification of conjugal and reproductive calendars. Several studies have shown that the limited postponement of key events of transition to adulthood as first union and the birth of the first child are the result of a growing polarization in the age at which these events occur according to the social stratum, in particular according to the educational level reached (Binstock 2010; Cabella and Pardo 2014; Cepal 2011; Ciganda 2008; Fostik 2014; Nathan et al 2016; Nathan 2015a, 2015b; Rodriguez and Cavenagui 2014; Rodriguez et al 2017; Varela et al. 2013; Videgain 2012, among others). The persistence of a high level of adolescent fertility is a key factor in explaining the scarce postponement in the age of onset of reproductive life. So far, the fall in global fertility has occurred in parallel with a very moderate reduction in adolescent fertility, which is concentrated, without exception, in the poor and poorly educated sectors of the population (ECLAC 2011; Rodríguez et al., 2017). Adolescent and early fertility will play a key role in the evolution of the age at first birth, which in turn will depend on the expansion of access to safe

[1] There is a growing interest in Latin-American medical literature in the effects of postponement on maternal and child health, see for example Fuentes et al. (2010) in Chile. In the sociological bibliography, there is more significant accumulation from works using the framework of transition to adulthood.

contraceptive methods: an extremely high proportion of births of adolescent mothers respond to unplanned births, which contributes to Latin America having the lowest planned birth rate in the world (36%) (Sedgh, Singh and Hussain 2014). In parallel, the region has made important advances in the expansion of secondary and tertiary education, one of the indicators which, through various channels, has a strong impact on reproductive behavior (Jejeebhoy 1995). Educational expansion has not, however, been accompanied by postponement in the age at first birth (Esteve and Florez-Paredes 2014, 2018) in Latin America, unlike what happened in more developed countries. However, there is evidence, at least for Chile, that women have modified their reproductive aspirations, not only in terms of wanting fewer children, but also by wanting them later (Ñopo Díaz 2017), although these aspirations do not necessarily coincide with the change of preferences towards later ages.

In this context, there is a strong uncertainty regarding the future evolution of the average age of the first child in the countries of the Southern Cone and in the entire Latin American region. Thus, the study of the bimodal pattern is key to understanding the social and demographic bases of reproductive calendars in these countries and speculating about their future trends.

Background

Postponement transition and heterogeneity in the age at first birth

In countries that pioneered the postponement transition, mean age at first birth (MAB1) increased steadily between the 1970s and the mid-2000s, reaching approximately 30 years of age. Currently, the increasing deceleration of the rate of increase in MAB1 presages the end of postponement transition in these countries (Bongaarts and Sobotka 2012; Goldstein et al. 2009), most of which are in Europe and East Asia. Thus, research has turned to related topics, such as increase in childlessness (Kreyenfeld and Konietzka 2017), transition to adulthood (Corijn and Klijzing 2013), impact of family policy regimes on fertility (Luci-Greulich and Thévenon 2013) and fertility of immigrants and their descendants (Kulu et al. 2015).

Meanwhile, increasing evidence suggests the process has begun in some Latin American countries (Esteve et al. 2012; Rosero-Bixby et al. 2009; Nathan et al. 2016; Cabella and Pardo 2014) and, interestingly, that postponement transition may have peculiar features there, particularly concerning the dispersion in the age at first birth. Unfortunately, Latin American data on the timing of first births are scarce, which makes it difficult to observe the evolution of MAB1 or other tempo indicators in most countries. The practice of publishing data by birth order has not yet been fully established, and it is not usual for household surveys to ask specific questions regarding transition to motherhood. Evidence describing postponement transition in the region comes mainly from census data and Demographic and Health Surveys (DHS). Thus, the proportion of women who exit adolescence or reach the age of 25 or 30 without children are the most common indicators (Esteve et al. 2012; Rosero-Bixby et al. 2009). Fertility estimations based on the own-children method are also used as a suitable alternative (Miranda Ribeiro et al. 2013).

The very recent availability of order-specific vital statistics in some countries (i.e., in Argentina, Costa Rica, Chile, and Uruguay) is improving the understanding of changes in the age at first birth. The evidence in these countries shows that while the magnitude of the mean age at birth for all orders did not change – because of different order-specific trends that balance one another –

the age at first birth increased, making MAB1 rise by a considerable degree in almost every one of those countries (Cabella and Pardo, 2014; CEPAL, 2011; Lima et al, 2017). This result leads to the hypothesis that postponement transition is beginning in Latin America, which has been suggested using census indicators, such as the percentage of women who are mothers at the age of 30 (Rosero-Bixby, Castro and Martín 2009).

However, the increase in MAB1 is an indicator that simply shows that postponement transition has begun and determines the pace with which it is advancing. The age profile of first births is more revealing because it demonstrates how the process is unfolding in greater detail – when possible, through the analysis of conditional age-and-order-specific birth rates. These data not only allow us to determine whether there is a trend towards increasing heterogeneity in the age at first birth – mainly through the standard deviation of the MAB1 – but also allow for a visual inspection of the shape of the age-specific first-birth rates (ASFR1) curve. This shape represents the pattern that arises as time evolves and may be different from the pattern observed in the European, North American or East Asian countries, which pioneered the process.

Indeed, we already know that a peculiar pattern has been observed, along with a very high standard deviation of MAB1 (Nathan, Pardo and Cabella 2016; Lima et al. 2017; Nathan and Pardo 2017). A recent work has even identified asymmetrical bimodal shapes in some Latin American countries resulting in two "peaks" (Lima et al 2017) in the age profile of first births, related to early and late transition to motherhood. Although it is reasonable to suppose that this finding may be a characteristic pattern in most countries in the region, data are scarce, and studies are therefore forced to take small steps towards the goal of eventually describing a Latin-American pattern. For instance, we are unaware of any studies documenting this phenomenon in Argentina until now.

This pattern is highly peculiar because the usual pattern of change during postponement transition in pioneer countries consists of an increase in MAB1 with some increase in its standard deviation, but little change in the age profile. Before the onset of postponement transition, the distribution of first-birth rates is typically unimodal and left-skewed due to the large proportion of teenage and early births. The shift to the right follows the broadening of the curve, still with a unimodal shape, although with a smaller kurtosis in its dispersion around the mean (Philipov 2017). Bimodal patterns tell quite a different story.

What do we know about bimodal patterns in the transition to motherhood?

Burkimsher (2017) interpreted non-normal shapes as a transitional stage between a left-skewed and a right-skewed normal distribution, given the evolution of the cohort of first-birth rates for 22 countries in Europe, Asia and North America. However, non-normal does not equate to bimodal.[2] A visual inspection shows that most countries in Burkimsher (2017) develop humps or temporary plateaus along with an increase in dispersion around the mean, but they do not develop a clear bimodal shape (except for a few cases, such as Estonia).

[2] We use the term *bimodal* for convenience although its literal meaning only refers to distributions with two modes. More precisely, actual curves tend to show an asymmetric distribution combining a peak and a plateau. It is possible that this shape, rather than the pure "two peaks", will become the usual case of "bimodal" curve.

Previous studies have shown a heterogeneous and non-normal pattern in the age of first birth for several developed countries, typically English-speaking Anglo-Saxon countries. Chandola et al. (2002) demonstrated this pattern for Australia, Canada, New Zealand and the United States, while Sullivan (2005) found this pattern more clearly in the case of the United States during the 1990s. Rendall et al. (2010) also found this pattern for the United Kingdom, although they focused on the heterogeneity in the age at first birth by educational composition of the population in the context of different policy regimes, and examined the regimes that were more prone to "reproductive polarization." Ravanera and Rajulton (2006) showed this heterogeneity in Canada from a cohort perspective, and McDonald and Moyle (2010) focused on the relatively higher fertility rates of English-speaking countries and emphasized the ethnic composition of many of them. To sum up, the dispersion of MAB1 is expected to increase during the postponement transition (Nathan and Pardo 2017; Philipov 2017). Meanwhile, the shape of the distribution of age-specific first birth rates is expected to be typically unimodal but has also departed from this usual pattern in some cases, whether it resembles a bimodal distribution or shows temporary humps or bulges.

In most studies, the driving forces beneath non-normal curves are suggested. In European countries, for example, the fall of state socialism in Eastern Europe (Burkimsher 2017) or the impact of immigration (Burkimsher 2017; Bongaarts and Sobotka 2012) have been mentioned as hypotheses, although they are not the most cited explanations. Chandola et al. (2002) linked heterogeneity to the proportion of births outside marriage and additionally provided some evidence of ethnic differences in the United States, and to a lesser extent in New Zealand. Sullivan (2005) also linked bimodal curves to the major differences in reproductive behavior between African-American women and white women in the United States and between women with higher and lower educational levels. This last approach appears to be suitable for Latin American countries. This debate is resumed later in the Discussion section.

On a related note, Bermudez and colleagues (2012) provided parametric models to fit fertility curves and described non-normal patterns by using mathematical functions. More recently, Mazzuco and Scarpa (2015) worked on a model based on flexible skew symmetric probability density functions that can fit symmetric and skew patterns, both bimodal and unimodal, and account for humps in distributions. Flexibility is important, because a non-normal shape is not always strictly bimodal. A mode may be followed by a plateau spanning several ages or an apparently normal shape can be disturbed by a bulge in the slope preceding or following its modal value. In any case, mathematical descriptions complement the studies based on the visual inspection of fertility curves and foster a research agenda based on non-normal fertility patterns.
Bimodal distribution is key to this article because we assume that it may describe an emerging and increasingly noticeable pattern in the Southern Cone. The first peak may reflect early maternity among women of lower socioeconomic status, while the emergence of the second peak may be linked to the postponing effect of the education system and the labor market on women in higher social strata (Cabella and Pardo 2014; CEPAL 2011; Rodriguez 2014). This phenomenon is consistent with the traditional "dual demographics" of Latin American countries which are observable through persistently differential demographic behavior, with education as the main stratification variable, but it is also noticeable through other variables, such as unsatisfied basic needs (Cavenaghi et al. 2009; Guzmán et al. 2006; Rios Neto and Rangel 2013; Zavala 1992).

Age-specific conditional first-birth rates allow for the detection of the emergence of the pattern mentioned in the first section. In this case, we work with period rates to observe all ages until a relatively recent date, although cohort rates used in other works provide a unique look at the evolution of the phenomenon. In any case, before observing the extent to which a bimodal pattern is consolidated in Southern Cone countries, the phenomenon must be reframed in the context of postponement transition using the same conditional period rates to visually inspect the two most common types of evolution discussed in the first section.

The first type is the most common pattern, visible in most countries whose data allow the construction of conditional rates by age and order; this pattern is a shift to the right accompanied by an increase in the dispersion of the curve that does not modify the unimodal form. The case of Norway (see Figure 1 in the Annex to the present document and Table 1 below) serves to illustrate this pattern. In addition to the time points used for Southern Cone countries, we added 1990 to account for the process in its first stages. The change observed between the initial point and 2005 is noticeable, whereas in 2010 the shape is maintained with a slight recovery in fertility levels; dispersion no longer increases (although a total increase can be observed if we start from 1990), and the curve keeps moving without being challenged by any change in form.

The second type of evolution is the case of some Anglo-Saxon countries, which is illustrated by the example of the United States (see Figure 2 in the Annex to the present document and Table 1 below). The shift to the right driven by the increase in MAB1 is accompanied by the emergence of a bimodal form, which in this case, seems to accompany the Burkimsher (2017) hypothesis and to constitute a stage of the postponement transition; this bimodal form fades as the rise in the average age of the first child decelerates. For the last data point, the shape of the curve resembles a normal distribution, except for a bundle near age 20, which shows much higher levels of adolescent and early fertility than in Norway, for example, but does not represent a "peak" that would allow us to identify the curve as bimodal.

Table 1. Mean age at first birth and standard deviation of the mean age at first birth (Norway and USA, selected years)

	MAB1*				**Sd MAB1****			
	1990	**2000**	**2005**	**2010**	**1990**	**2000**	**2005**	**2010**
Norway	25.6	26.9	27.7	28.0	5.0	5.2	5.1	5.2
USA	24.3	25.2	25.7	26.1	5.9	6.0	6.1	6.1

Source: Human Fertility Database

* MAB1; ** Standard deviation of MAB1

Demography of the Southern Cone

The countries of the Southern Cone have a demographic trajectory that differs from the rest of South America. Argentina and Uruguay began their demographic transition between the end of the 19th century and the beginning of the 20th century. This process occurred later in Chile, although it was still earlier than most South American countries (Chackiel and Schkolnik 1992; Chackiel 2004; Pantelides 2006; Pellegrino 1997; Torrado 2003). In the 1950s, the average TFR in Latin America was approximately 6 children per woman, whereas in the Southern Cone, this value did not exceed 4 children. The Uruguayan fertility rate was already below 3 children per woman by the middle of the century (Chackiel and Schkolnik 1992). Since the last decades of the

20th century, all three countries have had values around replacement levels, with the lowest fertility rate in Chile (1.8), followed by Uruguay (1.9) and Argentina (2.3), the only country of the three that remains above replacement level (United Nations 2017) (see Figure 3 in the Annex to the present document).

Argentina, Chile and Uruguay share several population traits. One of them is the large immigration flow the three countries received from European countries during the 19th and 20th centuries, which is usually related to its peculiar demographic evolution (Frankema 2008; Pellegrino 2010).

The early development of educational systems and systems of social protection also distinguishes the Southern Cone from the rest of Latin America (Binstock et al. 2016). The influence of the Catholic Church was important in Chilean and Argentinian cultural contexts, while Uruguay was characterized by its advanced secular vocation (e.g., divorce has been permitted since 1907). However, all three countries are currently undergoing liberalization processes in legislation on same-sex marriages, recognition of consensual unions and legalization of abortion.

The geographic and historical legacies of different regions have contributed to idiosyncrasies often marked by differences among family systems (Castro 2002; Lesthaeghe and Esteve 2016). For example, the "cohabitation boom" is peculiar in the Southern Cone and shows a very similar increase in both timing and intensity in all three countries. In this group of countries, the increase in consensual unions appeared to respond to values associated to the Second Demographic Transition (Lesthaeghe and Esteve 2016). Indeed, these countries began to show evident symptoms of change in family behavior in the 1970s, namely, increased cohabitation (especially among young people and increasingly among educated sectors), an increase in extra-marital fertility, a drop in nuptiality and an increase in divorces and separations (Binstock and Cabella 2011). The explanations of family change include the deterioration of the labor market and changes in gender roles (Kaztman 2001, 1994), as well as cultural transformations that led to a greater appreciation of individual autonomy among younger generations and changes in the situation of women, especially in the rate of female labor market participation (Binstock et al. 2016; Cabella 2009, Peri 2004). Although several Latin American countries experienced similar changes, in the Southern Cone these were more precocious and time-aligned, and reached very similar levels in several indicators in the first decade of the 21st century (Binstock et al. 2016). Cohabitation and extra-marital fertility have evolved in a somewhat similar way among all social sectors. In contrast, in all three countries, the timing of entry into union shows a growing social divergence by social sector (Binstock 2010; Cabella 2009).

Although there is a Southern Cone identity, this block of countries does not differ from the rest of the continent, at least regarding the following two relevant traits of reproductive behavior. First, strong disparities exist within the national territory and among social sectors (Cavenaghi and Alves 2009; Chackiel and Schkolnik 2004; Guzmán et al. 2006). In the three countries, fertility is substantially lower in the capital cities. Similarly, women with higher educational levels have fewer children, and have children later (Binstock et al. 2016, Esteve and Florez 2014). Second, there has been a decoupling of the evolution of adolescent fertility and global fertility. The difference in the rates of TFR decline and adolescent fertility rate is a feature of Latin America (Cabella and Pardo 2014; Cepal 2011; Rodríguez et al. 2017). In the Southern Cone countries, this phenomenon is also present. Although adolescent fertility declined in the last years of the 20th century, in all three countries, it stagnated at levels far higher than the global average

(Cabella and Pardo 2014; Rodríguez et al. 2017; Rodriguez 2014). Moreover, in Argentina adolescent fertility has increased since the mid-2000s (Unicef 2013). Social and regional differences in adolescent fertility rates are enormous; for example, in Argentina the adolescent fertility rate in the Chaco area (in the north) is 103 per 1,000, whereas it is 34 per 1,000 in the Federal District of the capital (DEIS, 2014).

These three countries have significantly better socioeconomic indicators than the Latin American average (Table 2), although Chile has remained among the countries with the highest inequality levels in the region, despite significant improvement in recent years. Economic growth in the region has been accompanied in recent years by a decrease in inequality and a very significant reduction in poverty levels in the Southern Cone, which have reached record lows in Uruguay and Chile (Cepal 2016).

Table 2: Selected social and economic indicators (around 2010)

	Argentina	**Chile**	**Uruguay**	**LAC**
Poverty	11.6	9.9	8.7	25.8
Gini coefficient	.433	.508	.433	.539
Net enrollment rates: secondary school	84.4	84.0	80.4	72.6
% with 13+ years of schooling	31.9	25.1	21.3	-.-

Source: SEDLAC (CEDLAS and the World Bank)
Notes: Poverty, FGT measures, USD-4.0-a-day poverty line (2005 PPP), individual estimates.
Gini: Distribution of household per capita income. Gini coefficient LAC 2011: World Bank
Net enrollment rates: secondary school: Share of youths in secondary school age attending secondary school.
LAC 2010: World Bank
% with 13+ years of schooling: adults aged 20 to 65.

Thus, Southern Cone countries share common characteristics and stand out among Latin American countries due to their demographic and socioeconomic profile. However, the reproductive behavior in these countries shows signs similar to the broader Latin American pattern. In this regard, a question that arises is whether the bimodal pattern observed in countries such as Argentina, Uruguay and Chile, which have adequate data and better social indicators than the Latin American average, might be more pronounced in other Latin American countries.

The aim of this article is to study the extent to which there is a recognizable and increasingly accentuated pattern in the timing of first births in the Southern Cone countries (Argentina, Chile and Uruguay) and how this pattern has evolved from the beginning of the first century to the 2010-2011 round of Censuses.

Data and methods

Data limitations are a major obstacle to the study of fertility changes in Latin America, as it is impossible to study order-specific fertility behavior without order-specific birth data, and unfortunately, this kind of detailed vital statistics data is very scarce in the region. The computation of conditional birth rates requires annual order specific birth rates and female population by parity.

Two data sources allow us to estimate the measures required for this study: 1) birth registries and vital statistics for Argentina, Chile and Uruguay, taken when possible (Chile and Uruguay)[3] from the Human Fertility Database (HFD) and Human Fertility Collection (HFC) projects, and 2) census information from the three countries. The HFD and HFC are joint projects from the Max Planck Institute for Demographic Research and the Vienna Institute of Demography. They supply data on period and cohort fertility for several countries, warranting data checking and comparability. Unlike the HFD, the HFC incorporates diverse data sources, not necessarily official.

With data from both data sources (providing data for numerator and denominator of rates, respectively), we estimated the conditional age-specific first-birth rates for orders 1 and 2 and the standard deviation of the age at first birth, to standardize the magnitude of heterogeneity in each country. Denominators for birth rates were constructed by following the "golden census" method recommended by the Human Fertility Database.[4] This method allows researchers to construct annual series of period age-parity distribution of women, taking a reliable population census or register (namely, the golden census), as starting point.

We used Argentinian (2001), Chilean (2002), and Uruguayan (1996) censuses as the "golden census" and extended the time series of data on the period age-parity distribution of women using this method. We have chosen these census years because they allow us to observe the incipient changes in MAB1. We believe that these data sources and procedures warrant data reliability and cross-country comparability.

Having gathered data for numerator and denominator of conditional fertility rates by age and birth order $m_i(x,t)$, we computed them based on the number of annual births of women of age x and order i in year t divided by the number of women of age x and parity i-1 that is estimated for mid-year t (the denominators for the most typical unconditional rates comprise the entire female population of age x for mid-year t). Results have been smoothed (3 years-of-age average)

$$m_i(x,t) = \frac{B_i\,(x,t,t-x-1) + B_i\,(x,t,t-x)}{E_{i-1}(x,t)} = \frac{B_i(x,t)}{E_{i-1}(x,t)}$$

B_i= Total live births or order 1; x= Age at childbearing; t= Calendar year; E_{i-1} = Female population exposure of parity i-1

Finally, we also computed MAB1, average age of mothers at the birth of their first child, if women were subject throughout their lives to the age-specific fertility rates observed in a given year, and dispersion measures: standard deviation of the MAB1 and interquartile range (IQR).

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[3] The data on Argentina were provided by the Dirección de Estadística e Información de Salud (DEIS).

[4] According to the Human Fertility Database, "One of the most common methods for obtaining the age-parity distribution of women, which is necessary for the computation of period fertility tables, is the reconstruction of the lifetime fertility of cohorts from the time series of fertility rates by age and birth order. In some cases, however, especially when the age- and order-specific birth data are available for a short period only, the female population distribution by age and parity from a population census or register can be used to build left-censored cohort fertility histories. This approach enables us to extend the time series of data on the period age-parity distribution of women and thus of the period fertility tables. The population census or register used for this purpose is called the "golden" census" (retrieved from https://www.humanfertility.org/cgi-bin/faq.php, April 27, 2018).

$$MAB_i(t)=\frac{\sum_{x=x_{min}}^{x_{max}}\bar{x}\cdot f_i(x,t)}{\sum_{x=x_{min}}^{x_{max}}f_i(x,t)}$$

(f_i= unconditional age specific fertility rates of order 1; x= Age at childbearing; t= Calendar year)

$$sdMAB_i(t)=\sqrt{\sum_{x=x_{min}}^{x_{max}}\left(\bar{x}^2\cdot\frac{f_i(x,t)}{\sum_{x=x_{min}}^{x_{max}}f_i(x,t)}\right)-\left[\sum_{x=x_{min}}^{x_{max}}\left(\bar{x}\cdot\frac{f_i(x,t)}{\sum_{x=x_{min}}^{x_{max}}f_i(x,t)}\right)\right]^2}$$

(f_i= unconditional age specific fertility rates of order i; x= Age at childbearing; t= Calendar year)

Results

We now examine the countries of the Southern Cone in greater detail, to observe peculiarities of Argentina, Chile and Uruguay and, above all, determine whether a common pattern exists in these three countries. Previous studies (Lima et al. 2017) support the hypothesis of similar curves for Chile and Uruguay. However, the inclusion of Argentina could promote the idea of a pattern for this sub-region that may be linked to the rest of Latin American countries, which mostly lack current data to build conditional fertility rates.

Figures 4a, 4b and 4c (in the Annex to the present document) show the evolution of the three countries over a decade. The three demonstrate strongly similar behavior, forming what can be described as a pattern for the Southern Cone. This pattern is characterized by an increase in the dispersion (Table 3) associated with a bimodal asymmetric curve, which differentiates it from countries such as Norway. However, this pattern is also characterized by the consolidation of this form as MAB1 increases[5], unlike countries such as the United States, where this type of curve transitorily emerged (in the 1980s, when the increase in MAB began, there was still a unimodal curve) and the subsequent evolution showed growing dispersion along a blurring bimodality.

Table 3. Mean Age at First Birth and Standard Deviation of the Mean Age at First Birth (Argentina, Chile and Uruguay, selected years)

	MAB1*			**sdMAB1****		
	2001-2002	**2006**	**2010-2011**	**2001-2002**	**2006**	**2010-2011**
Argentina	24.3	24.3	24.3	6.0	6.1	6.3
Chile	23.6	24.0	24.3	5.6	5.9	6.1
Uruguay	23.9	24.2	24.7	6.0	6.1	6.6

Source: Created by the authors based on census data and vital statistics
* Mean age at first birth; ** Standard deviation of the Mean Age at First Birth

[5] This occurs mainly in Uruguay and Chile; Argentina does not yet show a steady increase in MAB1.

Specifically, the curves show that Uruguay appears to have experienced increasing heterogeneity early on. There is a plateau between the mid-range of fertile ages (approximately 23 to 27 years of age) and the bulge of the curve at 29 to 30 years of age that begins in the 2000s and generates a noticeable "second peak" by 2011. Chile shows similar trends, except that the process begins later and is accompanied by a major reduction in adolescent fertility. Conversely, in Argentina, adolescent and early first-birth rates increase during the considered period, and the formation of a trough arises later. Thus, in the Southern Cone, the evolution of age-specific conditional fertility rates is peculiar because of two conditions: there is increasing dispersion, and this dispersion is associated with a shape that is increasingly like a bimodal curve. Figures 5a, 5b and 5c (see the Annex to the present document) show this by country, making it more visible the consolidation of this unusual pattern in each case.

Finally, it is useful to quantify this heterogeneity with another measure of statistical dispersion: the interquartile range (IQR) (i.e., the difference between 75th and 25th percentiles) of age at first birth. Dispersion stands out as extreme when compared to another countries. In the Southern Cone, most IQR values range from 11 to 13 years and show no sign of decline (Table 4), while research has shown that in European countries (Philipov 2017), IQR lies typically within a range of 6-8 years.[6]

Studies into the relation between the age at first and second birth in Latin America are very scarce. One exception is Colombia, analyzed by Batyra (2016), which shows a divergent pattern in the age at first and second births. Although we will not delve into that study, age-specific conditional fertility rates for second births in Southern Cone countries are presented, to complement the analysis of first order rates and show in a very general way, their effects on the pattern of age at second births.

Conditional rates of order 2 show that each Southern Cone country has its own characteristics in terms of the progression from first to second child, which further highlights the peculiarity of the pattern observed in order 1. This makes sense as the progression from parity 0 to 1 is not only the progression to having a child but also the transition to motherhood, a deeply transformative event in life, marked by specific opportunities and constraints and particularly reflecting the inequalities that operate during the years of adolescence, youth and early adulthood with regard to personal autonomy, family, love relationships, education and work.

Table 4. Interquartile range in age at first birth for selected years (Argentina, Chile and Uruguay)

	IQR (Q3-Q1)		
	Argentina	Chile	Uruguay
2001-2002	11.3	11.3	12.2
2006	11.7	12.0	13.2
2010-2011	11.6	12.1	14.1

Source: Created by the authors based on census data and vital statistics

[6] In 2010, IQR was 7.9 in Austria, 6.3 in the Netherlands, 7 in Norway, 7.7 in Portugal and 8 in Spain (Philipov 2017).

It is worth noting that in Chile, birth rates of order 2 are substantively lower in early ages than in Argentina and Uruguay for the entire period, while the displacement of second children towards later ages also appears with greater clarity in that country. Conversely, Argentina and Uruguay, with different intensities and rates of change, show patterns by age at second child more similar to those observed for first child.

Discussion

The bimodal pattern is the stylized representation which best fits the data on timing of the first child in the Southern Cone. This pattern reflects a peculiar and quite extreme timing heterogeneity. Further research should seek a rigorous definition of polarization and a mainstream index to standardize and measure the magnitude of polarization of first birth fertility, both of which are still lacking (despite efforts made by Sullivan, 2005). The link between postponement and dispersion around the mean should also be studied in greater depth. In a recent research on European populations, Philipov (2017) suggested that postponement might be increasing dispersion around the mean through a combination of period effects affecting young people, processes of "learning of new behavior" influencing new cohorts and well-known ideational changes driving diffusion effects. These factors might not be combined in a similar way in every country, and others might play a role as well, such as union instability.

But what can be expected in the region in years to come? Argentina, Chile and Uruguay already have Total Fertility Rates around replacement levels, and therefore, fertility decline is not such a relevant issue as it used to be. Instead, if the demographic trends observed in developed countries were to be replicated in the region, the MAB1 would be expected to increase. In this context, the evolution of the pattern of timing is the most uncertain dimension.

Even though we still know little about heterogeneity in age at first birth, there is increasing evidence on the evolution of dispersion around the mean. Given a higher standard deviation of the MAB1s as the MAB1 increases, the issue of what is expected to be observed towards the end of the process has sparked debate. A possible outcome is the return to a lower dispersion (i.e., rectangularization as indicated by Kohler et al. 2002), although the hypothesis of a greater dispersion even at the end of the process (Sobotka 2004, 2010) has better withstood empirical testing (Nathan and Pardo 2017; Philipov 2017).

So far, research has tended to focus less on the shape of age-specific first birth rates. Probably, because before data became available for Latin America, the non-unimodal shape had only corresponded to the historical experience of some English-speaking countries. This shape can be clearly seen in the United States, for example, although it cannot be clearly observed in other cases. However, the pattern observed in the Southern Cone is not the same, insofar as the bimodality is consolidated and deepened to extremes not recorded in any previous case. Once postponement transition is complete, bimodality might disappear, revealing to be a transitory phenomenon, but what is observed thus far reflects a particularly deeply rooted polarization, i.e. a bimodality which resembles two different normal curves in a single distribution.

To explain this pattern based on the demographic processes of the Southern Cone, it is necessary to refer to one of the most notable features of fertility in Latin America: the persistence of high rates of adolescent and early fertility in relation to the total fertility level. In fact, considering the decline in TFR, adolescent and early fertility appear to have been exempted from the evolution of general fertility. This feature is shared by all countries in Latin America, which have reduced their fertility in the last quarter of the century (Cabella and Pardo 2014; Rodriguez 2014, Rodriguez et al. 2017; CEPAL 2011), including Southern Cone countries. If adolescent fertility is increasingly unrelated to the evolution of total fertility in most Latin American countries, the consolidation of the bimodal curve may be the graphic expression of the particular reproductive behavior of the continent.

This evolution of timing, in turn, reflects the polarization of social strata in terms of their reproductive trajectory, which is a source of concern in the agenda of sexual and reproductive rights in Latin America (Cavenaghi and Cabella 2014; Rodriguez et al. 2017). Because Southern Cone countries have levels of inequality which are not-so-high in relation to the Latin American average, it is plausible that as better data become available for other Latin American countries, this phenomenon will be confirmed in the rest of the region.

Adolescent fertility and poverty (absolute and relative) are strongly associated in all Latin American countries. Although educational expansion has granted access to higher levels of education for more women, social fragmentation processes have left underprivileged young people behind (Arim 2008; Kaztman 2001; Kaztman and Retamoso 2007). Conversely, these developments have led to radical changes in the timing of transition to adulthood among young people from more affluent sectors (Videgain 2006, 2012).

Several qualitative studies have shown that for women in the poorest sectors of the population, maternity occurs early in the absence of other alternatives for social insertion (Amorín et al 2006; Binstock and Pantelides 2005; Salinas 2010; Varela et al. 2016). A lack of stimuli to encourage their persistence in the education system, coupled with a certain social and neighborhood encapsulation of the poor and the symbolism of security that accompanies motherhood for women in the most disadvantaged neighborhoods, make pregnancies, although mostly mistimed, culminate in births. Gender inequality also favors this circumstance. This inequality is reflected in male coercion regarding use of contraceptive methods (e.g., condom use rejection) (MYSU 2013) and the strong social acceptance of the role of motherhood in the identity of young people in poor strata (López et al. 2016; De Rosa et al. 2016; Binstock 2010).

On the other end of the spectrum, protagonists of the second peak may be following the models of transition to adulthood which are linked to long-term persistence in the educational system, late emancipation and the search for quality jobs. In Uruguay, a recent study (Nathan, 2015) found that among women with high educational attainment, the median age at maternity increased by almost 7 years between cohorts born in the early 1960s and cohorts born in the mid-1980s. These are very significant delays in the onset of maternity, although the relative weight of the number of these women modifies general indicators only slightly. In these same cohorts, women with low educational levels not only delayed but also advanced by one year the beginning of their reproductive life. Binstock (2010) shows a similar pattern in Argentina. The gaps in age at first birth between educational sectors also grew in Argentina and Chile, although less pronounced than in Uruguay. In a recent paper, Nathan (2017) shows that the gap in the median age of first child among women belonging to the lowest and highest educational strata in Argentina and Chile was 8 and 10 years respectively, among cohorts born between 1978 and 1982.

The strong link between inequality and the polarization of reproductive timing is key when interpreting these phenomena and speculating on their future evolution. Studies such as Wilkinson and Pikett (2010) show that adolescent fertility is one of the indicators most strongly associated with inequality. In this regard, the decline in adolescent and early fertility is related to both the supply of contraception and structural social inequality. In the long term, the evolution of the phenomenon could lead to a normal distribution, although it is difficult to determine how long the bimodal distribution will persist, as this distribution depends on the deeply rooted factors mentioned earlier.

Further research appears fruitful, as the emergence of the bimodal pattern is giving rise to a multifaceted research agenda. On one hand, several dispersion measures – standard deviation, but also the coefficient of variation or the interquartile range – are being used to better describe this pattern (Lima et al. 2017, Nathan and Pardo 2017, Philipov 2017). On the other hand, the phenomenon is being observed through a cohort approach (Nathan 2017; Philipov 2017), which is key for a comprehensive demographic explanation. Additionally, qualitative research will allow researchers to explore in greater depth the mechanisms involved in calendar decision-making.

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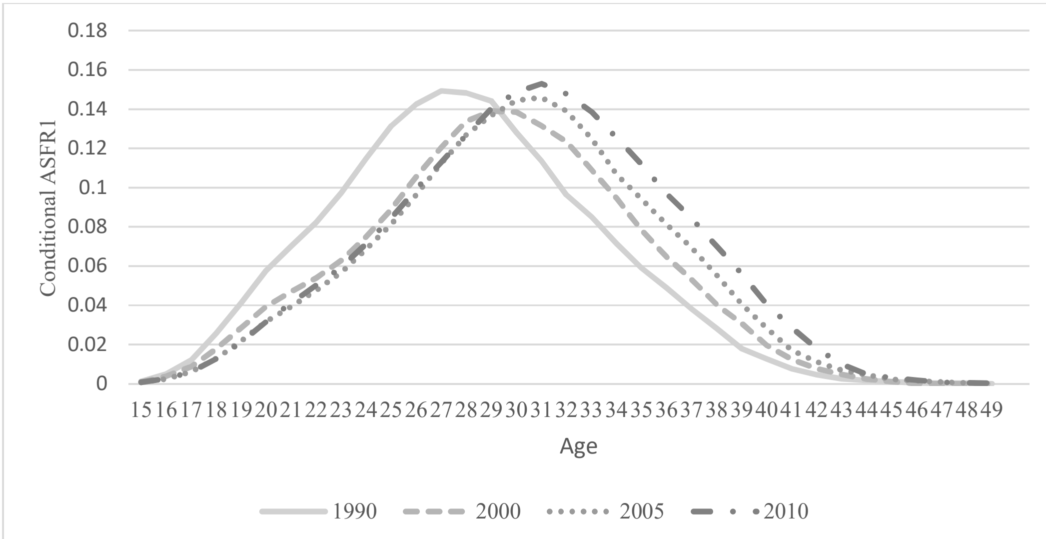
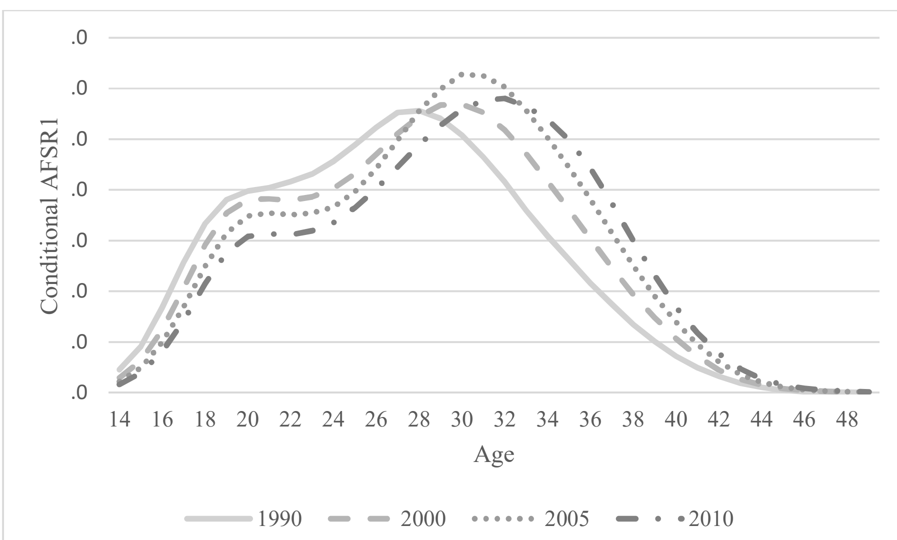
Annex

Figure 1. Age-specific conditional fertility rates for first births in Norway in 1990, 2000, 2005 and 2010



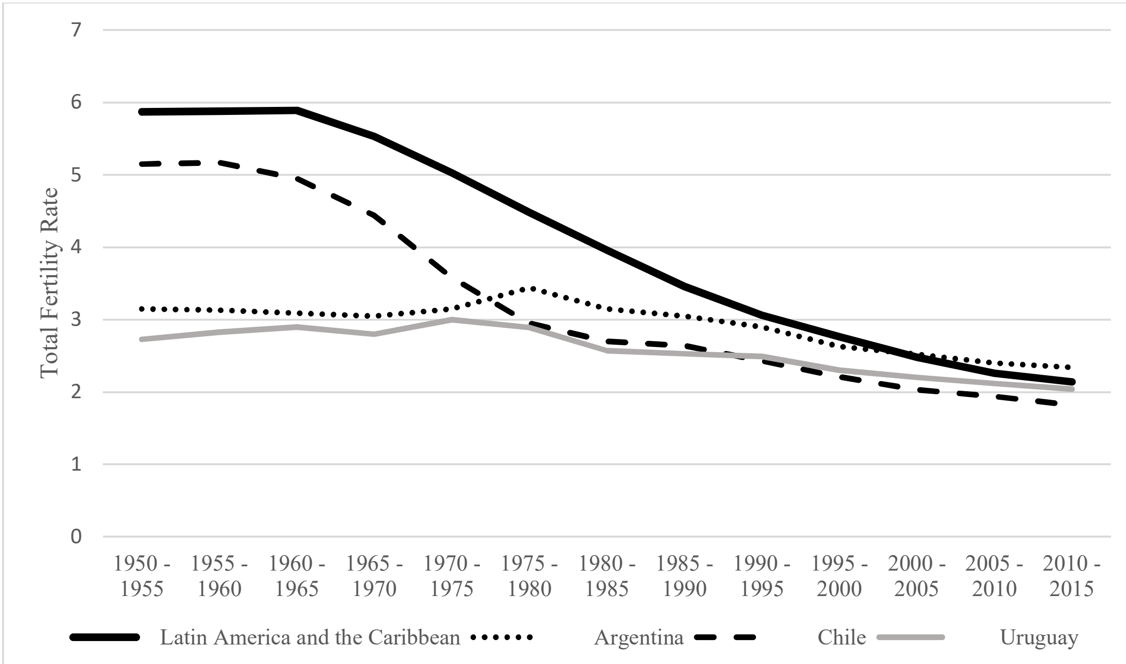
Source: Created by the authors based on the Human Fertility Database (age smoothed)

Figure 2. Age-specific conditional fertility rates for first births in the United States in 1990, 2000, 2005 and 2010



Source: Created by the authors based on the Human Fertility Database (age smoothed)

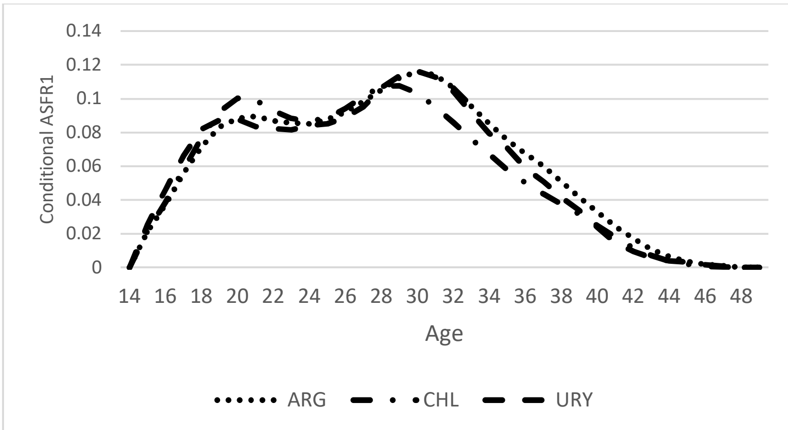
Figure 3. Total Fertility Rate evolution in Southern Cone countries and Latin American and the Caribbean



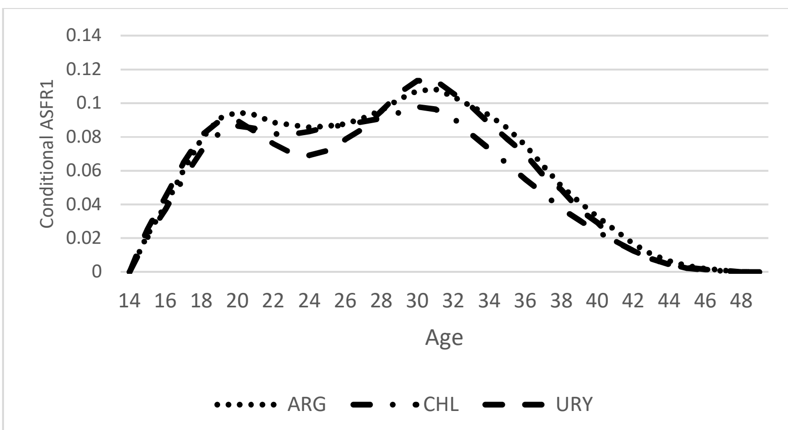
Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, custom data acquired via website.

Figures 4a, 4b and 4c. Age-specific conditional fertility rates for first births in Uruguay, Argentina, and Chile, 2000-2001, 2005-2006 and 2010-2011

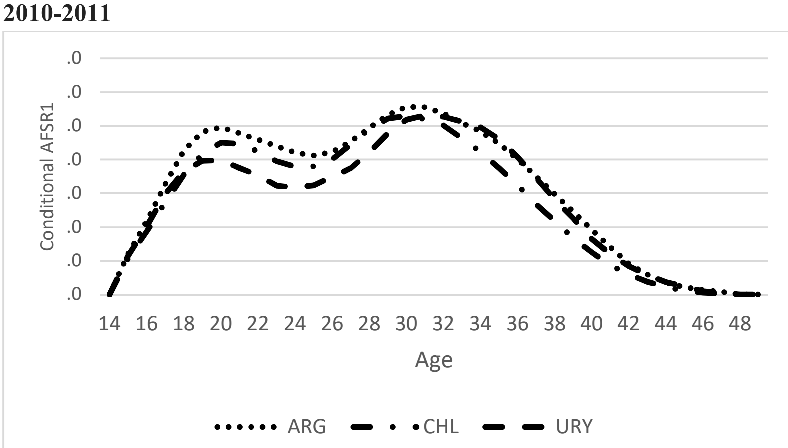
2000-2001



2005-2006



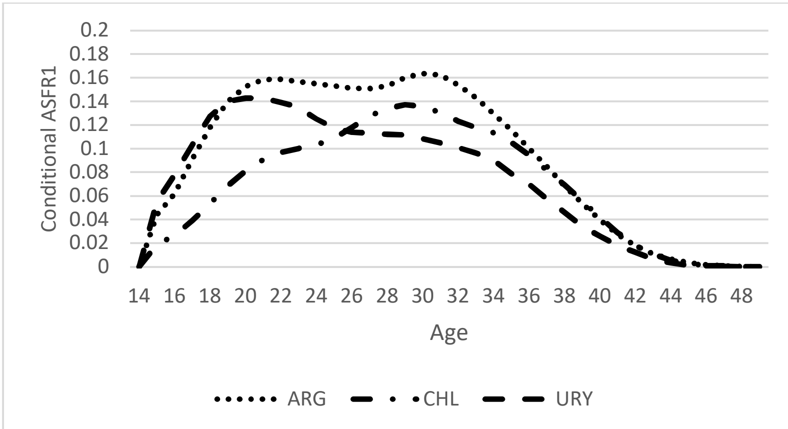
2010-2011



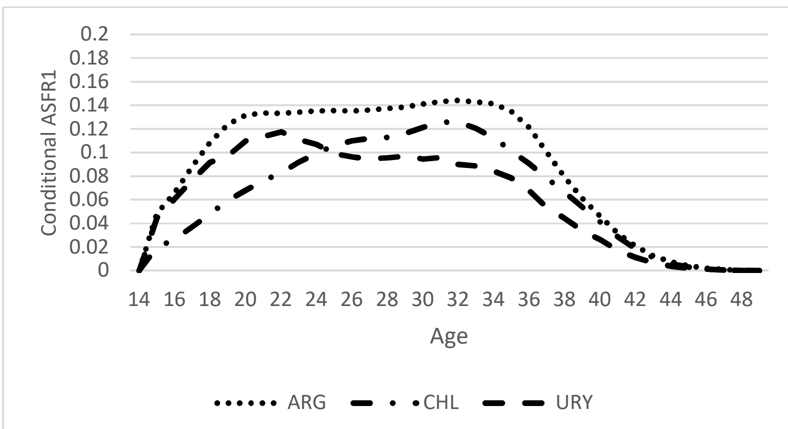
Source: Created by the authors based on census data and vital statistics (age smoothed)

Figures 5a, 5b and 5c. Age-specific conditional fertility rates for second births in Uruguay, Argentina, and Chile from 2000-2001, 2005-2006 and 20-10-2011

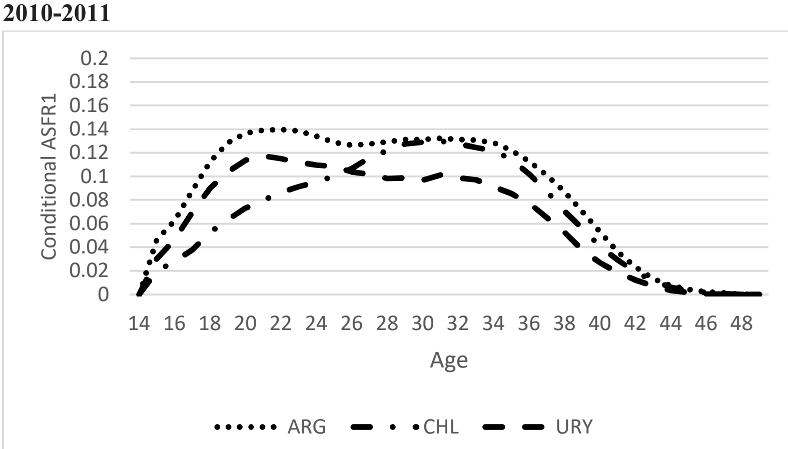
2000-2001



2005-2006



2010-2011



Source: Created by the authors based on census data and vital statistics