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OPCIÓN ESTUDIOS DE POBLACIÓN

La transición hacia un régimen de fecundidad tardía en el Cono Sur

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Resumen

El objetivo de esta tesis es examinar las principales características del aplazamiento de la fecundidad en la región del Cono Sur. El análisis se concentra en los cambios observados en la edad al primer nacimiento en perspectiva comparada, su vinculación con la expansión educativa y la paridez final. Los países del Cono Sur se han posicionado como los pioneros en el cambio hacia un régimen de fecundidad tardía en América Latina, con un creciente número de mujeres que retrasan el inicio de la maternidad hasta edades más avanzadas del ciclo reproductivo. No obstante, mantienen características propias de la fecundidad latinoamericana, como la persistencia de una elevada proporción de mujeres que inician la maternidad a edades tempranas. A partir de fuentes y métodos demográficos, la tesis constata que los países del Cono Sur presentan niveles de heterogeneidad en la edad al primer nacimiento más altos que los observados en las regiones más desarrolladas, incluso que aquellos países en los que también se expresa cierta polarización reproductiva entre sectores sociales. Por otra parte, la tesis pone de manifiesto la complejidad del impacto de la expansión educativa sobre la edad al primer hijo a nivel agregado; más interesante aun, evidencia que el proceso de expansión no se relaciona de forma inequívoca con el retraso de la maternidad en Argentina, Chile y Uruguay. Por último, la tesis describe la relación entre la edad al primer nacimiento y la paridez media final en Chile, Ecuador y Uruguay. Los resultados dan cuenta del debilitamiento en la fuerza de esta relación, a la vez que evidencian una disminución de la fecundidad asociada a la limitación de la intensidad reproductiva entre las mujeres que inician la maternidad a edades tempranas. Se espera que los resultados de esta tesis contribuyan al conocimiento existente sobre la postergación de la fecundidad y la forma en que se desarrolla en los países latinoamericanos, en los que el proceso ha sido incipiente y todavía poco estudiado.

Palabras clave

edad al primer hijo, expansión educativa, descomposición; Cono Sur

Introducción

En la mayoría de los países desarrollados, la caída de la fecundidad hasta niveles bajos estuvo acompañada por el retraso de la edad al primer hijo y una disminución de la maternidad adolescente (Billari, Liefbroer, & Philipov, 2006; Kohler, Billari, & Ortega, 2002; Sobotka, 2004). Kohler et al. (2002) introdujeron el término *transición del aplazamiento* (*postponement transition*) para describir esta tendencia generalizada de cambio hacia un régimen de fecundidad tardía en los países europeos, ocurrida en simultáneo a la difusión de métodos anticonceptivos modernos, el aumento de la participación de las mujeres en el sistema educativo y el mercado de trabajo, transformaciones en las normas y actitudes reproductivas, la dinámica de formación y disolución de parejas, y crecientes condiciones de inestabilidad laboral e incertidumbre económica entre la población joven (Mills, Rindfuss, McDonald, & te Velde, 2011; Sobotka, 2004, 2010).

En el marco del avance de la transición hacia un régimen de fecundidad tardía, Kohler et al. (2002) predijeron una progresiva concentración de la entrada a la maternidad a edades avanzadas del ciclo reproductivo. Desde este enfoque, el aplazamiento de la maternidad sería adoptado inicialmente por las mujeres mejor posicionadas en la estructura social en respuesta a las nuevas oportunidades e incentivos ofrecidas por el sistema educativo y el mercado de trabajo. En este sentido, el desarrollo de la transición del aplazamiento puede ser explicado por mecanismos similares a los de la transición secular de la fecundidad, que combina incentivos a nivel individual y procesos de interacción social que refuerzan esta tendencia. Una vez que un grupo de mujeres se pone a la vanguardia de los cambios y comienza a aplazar el nacimiento de sus hijos, se produce un efecto de arrastre (difusión) que alienta a otros miembros de la población a emular los comportamientos de los grupos pioneros (Bongaarts & Watkins, 1996; Goldstein, Sobotka, & Jasilioniene, 2009).

Aunque un gran número de investigaciones en Demografía se ha centrado en comprender las causas y consecuencias del retraso de la entrada a la maternidad, se ha prestado poca atención a la evolución de la heterogeneidad de los comportamientos al interior de las poblaciones (Balbo, Billari, & Mills, 2013). Revisando la literatura existente, puede decirse que existen dos visiones al respecto: por un lado, la de una *rectangularización* de los patrones de fecundidad, es decir, la concentración del inicio de la maternidad en un intervalo de edad cada vez más estrecho (Kohler et al., 2002) y, por el otro, el de un *polarización* del comportamiento que refleja una creciente heterogeneidad reproductiva entre sectores sociales (Sobotka, 2004). Este último argumento ha sido constatado en algunos países desarrollados, en particular en el mundo anglosajón (McLanahan 2004; Ravanera & Rajulton 2006; Rendall et al. 2010). Más recientemente, se ha incorporado

una tercera perspectiva que advierte una tendencia al aumento de la dispersión de la edad al primer nacimiento en Europa continental, pero que en lugar de calificar este proceso de polarización lo interpreta como un signo de la diversificación de los cursos de vida (Philipov, 2017).

En América Latina, el descenso de la fecundidad observado durante las últimas décadas no estuvo acompañado por un aplazamiento generalizado en la edad de inicio de la fecundidad (Esteve, Castro-Martín, & Castro Torres, 2022; Lima, Zeman, Sobotka, Nathan, & Castro, 2018). La fecundidad adolescente se mantuvo a niveles altos e incluso se registró un rejuvenecimiento de la edad al primer hijo en varios países (Cavenaghi & Diniz Alves, 2009; ECLAC, 2012; Lima et al., 2018; Nathan, 2015b; Rodríguez & Cavenaghi, 2014). Se ha afirmado que la maternidad adolescente se mantiene a edades elevadas producto de una combinación de factores, que conjuga el inicio precoz de las relaciones sexuales y de pareja, el acceso limitado a métodos anticonceptivos modernos al inicio de la actividad sexual y el aborto (Heaton, Forste, & Otterstrom, 2002; Rodríguez, 2013).

El estudio sobre los cambios en la edad al primer nacimiento cobró creciente importancia en los últimos quince años en la región, posicionándose como tópico de investigación en el marco del análisis sobre fecundidad, dinámica familiar y transición a la adultez. Asimismo, en el marco del descenso generalizado del nivel de fecundidad en los países de la región y la convergencia entre estratos sociales (Chackiel & Schkolnik, 2003), la edad de inicio de la fecundidad se reconoce como el *locus* de la vida reproductiva en el que las desigualdades sociales se evidencian con mayor notoriedad: mientras que los sectores socioeconómicos más aventajados comienzan a retrasar la maternidad hasta edades más avanzadas, otro conjunto importante de la población muestra un comportamiento más proclive al inicio temprano, fundamentalmente durante la adolescencia (Batyra, 2019; Binstock, 2010; Bongaarts, Mensch, & Blanc, 2017; Cardozo & Iervolino, 2009; Esteve & Florez-Paredes, 2018; Lima et al., 2018; Nathan, 2015a; Rosero-Bixby, Castro-Martín, & Martín-García, 2009; Varela Petito, Fostik, & Fernández Soto, 2012). Esta particularidad es un indicador potente de que el modelo latinoamericano contrasta con el patrón de reproducción de aplazamiento de la maternidad surgido en los países desarrollados a partir de los años setenta, característico de la denominada Segunda Transición Demográfica (Esteve et al., 2022; Esteve & Florez-Paredes, 2018; Lima et al., 2018; Nathan, 2015a). En este sentido, varios estudios han identificado evidencia inicial de mayores niveles de heterogeneidad en la edad al primer nacimiento en países latinoamericanos que en países desarrollados (Lima et al., 2018; Nathan, 2015b; Nathan, Pardo, & Cabella, 2016; Pardo & Cabella, 2018). Sin embargo, los estudios realizados hasta el momento no han abordado la comparación de la evolución de la edad al primer hijo entre regiones del mundo como objetivo central de investigación. Para el caso de los países latinoamericanos, dicha

comparación se vuelve central si se aspira a identificar las características prominentes de la transición hacia un régimen de fecundidad tardía en la región. Esta tesis avanza en torno al análisis comparado de la evolución de la edad media al primer nacimiento y su heterogeneidad social desde un enfoque de periodo, contrastando las tendencias observadas en dos países del Cono Sur con las de varias subregiones y países de las economías más desarrolladas.

En la enumeración de los factores disparadores del aplazamiento de la edad al primer hijo, la literatura destaca el rol fundamental de la expansión de la educación secundaria y terciaria (Billari et al., 2006; Mills et al., 2011; Neels, Murphy, Ní Bhrolcháin, & Beaujouan, 2017; Ní Bhrolcháin & Beaujouan, 2012; Sobotka, 2004; Vasireddy, Berrington, Kuang, & Kulu, 2022). Como fue mencionado, diversos estudios evidencian que las mujeres más educadas han sido las protagonistas del retraso en el calendario de la fecundidad en América Latina. No obstante, el papel de la expansión educativa –que en América Latina se viene desarrollando con significativo avance (UNESCO, UNICEF, & CEPAL, 2022)- en el cambio del modelo de inicio de la vida reproductiva ha sido cuestionado por algunos autores, que señalan que el avance de la cobertura educativa entre las mujeres ha sido contrarrestado por un aumento de la fecundidad temprana entre las mujeres de niveles educativos bajos (Bongaarts et al., 2017; Esteve & Florez-Paredes, 2018).

La mayoría de los estudios orientados al análisis del vínculo entre cambio en la estructura educativa y el timing de la fecundidad ha dejado de lado a los países del Cono Sur que, paradójicamente, se encuentran a la cabeza de la transición del aplazamiento de la fecundidad en América Latina (Esteve & Florez-Paredes, 2018; Lima et al., 2018).

Las diferencias en el aplazamiento de la maternidad por grupos educativos entre los países del Cono Sur es especialmente ilustrativa debido a las disparidades nacionales en el ritmo de avance de la expansión educativa, con Chile a la cabeza de los cambios, Uruguay ocupando uno de los lugares más rezagados de la región y Argentina en una posición intermedia (UNESCO, 2013; UNESCO et al., 2022). Tomando este aspecto en consideración, en esta tesis se estudian los cambios en la edad al primer hijo por nivel educativo en el Cono Sur desde un enfoque de cohorte, prestando especial atención a las trayectorias divergentes de los países en materia de expansión educativa.

Dada la ausencia de un patrón generalizado de aplazamiento de la fecundidad en América Latina, existe cierto consenso que indica que la caída de la fecundidad en la región se explica por un comportamiento tendiente a limitar y espaciar el número de hijos (Cabella & Nathan, 2018; Casterline & Odden, 2016; Guzmán, Rodríguez, Martínez, Contreras, & González, 2006). Tampoco se ha observado un aumento de la proporción de mujeres

nulíparas, como sí ha ocurrido en otros contextos regionales de disminución de la fecundidad hasta niveles bajos (Binstock & Cabella, 2021; Reher & Requena, 2014).

La edad de inicio de la maternidad suele estar negativamente asociada con la intensidad de la fecundidad de cohorte (Balakrishnan, Rao, Krotki, & Lapierre-Adamcyk, 1988; Kohler et al., 2002; Kohler, Skytthe, & Christensen, 2001; Trussell & Menken, 1978). Sin embargo, varios estudios han constatado que la fuerza de esta relación disminuye a medida que se observa una caída de la fecundidad. En varios países, el descenso de la fecundidad de cohorte estuvo acompañado por una disminución de las diferencias en la paridez final entre mujeres que inician la maternidad a edades tempranas y las que comienzan a edades más avanzadas; no obstante, en otros no se ha evidenciado tal cambio (Andersson et al., 2009; Balakrishnan et al., 1988; Berrington, Stone, & Beaujouan, 2015; Castro, 2015; Gyimah, 2003; Kohler et al., 2001; Morgan & Rindfuss, 1999).

Hasta el momento, la relación entre edad al primer hijo y paridez media final no ha sido estudiada en los países latinoamericanos. Adoptando una perspectiva de cohorte en esta tesis se analizarán de los cambios en el vínculo entre calendario e intensidad reproductiva en tres países sudamericanos (Chile, Ecuador y Uruguay), representantes de tres modelos diferentes de transición de la fecundidad en América Latina. El análisis se plantea la pregunta sobre la evolución esperada en un contexto hipotético de aumento generalizado de la edad al primer hijo y el potencial aumento de la nuliparidez definitiva. Esta perspectiva analítica es crucial para anticipar un nuevo empuje a la baja de los niveles de fecundidad en la región y sus consecuencias.

En resumen, el objetivo de esta tesis consiste en examinar las características del patrón de cambio hacia un régimen de fecundidad tardía en la región del Cono Sur de América Latina. Para ello, se analiza en primer lugar la evolución anual de la edad media al nacimiento del primer hijo y su nivel de heterogeneidad en perspectiva comparada, haciendo foco en las diferencias observadas entre países y regiones que ya iniciaron la transición del aplazamiento. En segundo lugar, se analizan los cambios en la edad de entrada a la maternidad por nivel educativo para las cohortes 1950-1980, en el contexto de diferencias en el ritmo de avance de la expansión educativa entre los países del Cono Sur. Por último, se estudian los cambios en la relación entre la edad al primer hijo y la paridez media final, revisando su impacto en la caída de la fecundidad.

La estrategia metodológica utilizada combina técnicas analíticas descriptivas de uso generalizado en el análisis demográfico en los estudios de periodo y de cohorte. Se destacan entre ellas la aplicación de métodos de tablas de supervivencia, estandarización y descomposición para el análisis del comportamiento reproductivo de las cohortes, a

partir del uso de fuentes de datos con información de fecundidad retrospectiva (censos y encuestas poblacionales). También se recurrió al análisis estadístico descriptivo a través del cálculo de medidas de tendencia central y dispersión para el análisis de las tasas anuales de fecundidad de primer orden por edad de la madre, aprovechando la disponibilidad de los datos provistos por la *Human Fertility Database* y *Human Fertility Collection*.

Se espera que los resultados de esta tesis contribuyan a una mayor comprensión del aplazamiento de la fecundidad en América Latina. Más concretamente, se aspira a ampliar el conocimiento existente en torno a la transición al primer nacimiento a partir del estudio de aspectos críticos de esta transición en los países que lideran este cambio en América Latina. Finalmente, se entiende que la *generación de nueva evidencia* permitirá incorporar elementos novedosos en el esquema interpretativo de los cambios en el calendario de la fecundidad, alimentar la discusión y promover la elaboración de políticas informadas.

La tesis se estructura en tres capítulos. Cada uno de ellos fue diseñado en el formato de artículo científico y cuenta con un resumen, introducción y revisión de antecedentes, descripción de las fuentes de datos y métodos utilizados, presentación de resultados y una discusión de cierre.

En el primer capítulo, titulado ***Fertility postponement and regional patterns of dispersion in age at first birth: Descriptive findings and interpretations***[1] y elaborado en coautoría con Ignacio Pardo, se compara la heterogeneidad en la edad al primer nacimiento en 21 países de 8 regiones del mundo: Europa del Norte, Europa Occidental, Europa del Sur, Europa Central y Oriental, ex repúblicas soviéticas, Asia Oriental, América del Norte y Cono Sur (representada por Chile y Uruguay). Utilizando los datos disponibles en la Human Fertility Database y la Human Fertility Collection, gestionadas por el Max Planck Institute for Demographic Research (Alemania) y el Vienna Institute of Demography (Austria), se describe la evolución de la edad media al primer hijo y su varianza desde 1970, entre otros indicadores. La contribución de este capítulo radica en la identificación de diferentes patrones nacionales y regionales de evolución de la heterogeneidad en la edad al primer hijo durante la transición hacia un régimen de fecundidad tardía, así como sus posibles interpretaciones teóricas e implicaciones metodológicas. Como aspecto a destacar se evidencia que los países del Cono Sur presentan la mayor heterogeneidad observada en el conjunto de las regiones examinadas en la fase inicial de la transición hacia un régimen de fecundidad tardía.

[1] Este capítulo fue publicado en formato de artículo como Nathan, M. and Pardo, I. (2019). Fertility Postponement and Regional Patterns of Dispersion in Age at First Birth: Descriptive Findings and Interpretations. *Comparative Population Studies*, 44. DOI: https://doi.org/10.12765/CPoS-2019-07.

El segundo capítulo, ***The role of educational expansion on the timing of first birth in the Southern Cone region***, compara los cambios en la edad al primer nacimiento por nivel educativo entre las cohortes de mujeres nacidas en 1950, 1965 y 1980, en Argentina, Chile y Uruguay. Para ello, se estima la probabilidad de permanecer sin hijos a una edad determinada, para cada cohorte y grupo educacional, aplicando el método de tablas de supervivencia. Estos tres países presentan diferencias claras en el avance de la expansión educativa, con Chile a la cabeza de los cambios y Uruguay en el lugar más rezagado. Para evaluar el impacto de la expansión educativa en el calendario de entrada a la maternidad, se utiliza una variante del método de estandarización y descomposición para separar los efectos composición y tasa en el cambio observado entre las cohortes 1950 y 1980 en Chile y Uruguay. Los resultados obtenidos ponen de manifiesto que el avance de la transición hacia un régimen de fecundidad tardía en el Cono Sur no se corresponde necesariamente con el grado de avance de la expansión educativa, dejando planteada la importancia del papel desempeñado por factores contextuales e institucionales.

Por último, en el capítulo, ***Is the link between early childbearing and higher completed fertility weakening in Latin America?***, [2] se examina los cambios en la relación entre edad al primer hijo y paridez media final en Chile, Ecuador y Uruguay, y se cuantifica el aporte de los componentes de calendario e intensidad en el descenso de la fecundidad de las cohortes nacidas entre 1940-1965. A partir del uso de información sobre fecundidad retrospectiva de censos y encuestas, y la aplicación de modelos teóricos y estadísticos, se observa una disminución de la pendiente negativa entre edad al primer hijo y paridez final entre las cohortes más jóvenes, producida por una menor progresión de la paridez entre las mujeres que inician la fecundidad a edades tempranas. Asimismo, se formaliza e implementa nuevamente una variante del método de descomposición utilizado tradicionalmente en Demografía para cuantificar el aporte de los cambios en la nuliparidez, la edad al primer hijo y la intensidad reproductiva, condicional a la edad al primer hijo en la paridez media final de las cohortes. Los resultados evidencian que los cambios en la paridez final de los países y cohortes examinadas se explican completamente por la limitación de la intensidad reproductiva luego del nacimiento del primer hijo (mecanismos de "stopping" y "spacing"), y evidencian la nula incidencia, hasta el momento analizado, del retraso de la maternidad y el aumento de la nuliparidez en la fecundidad de cohorte.

El trabajo finaliza con un apartado de conclusiones en el que se discuten los principales hallazgos de cada capítulo y sus implicaciones.

[2] Este capítulo fue aceptado para su publicación como artículo en *Demographic Research, (2023)*.

Referencias

Andersson, G., Rønsen, M., Knudsen, L. B., Lappegård, T., Neyer, G., Skrede, K., … Vikat, A. (2009). Cohort Fertility Patterns in the Nordic Countries. *Demographic Research*, *20*(14), 313–352. https://doi.org/10.4054/DemRes.2009.20.14

Balakrishnan, T. R., Rao, K. V., Krotki, K. J., & Lapierre-Adamcyk, E. (1988). Age at first birth and lifetime fertility. *Journal of Biosocial Science*, *20*(2), 167–174. https://doi.org/10.1017/S0021932000017405

Balbo, N., Billari, F. C., & Mills, M. (2013). Fertility in Advances Societies: A Review of Research. *European Journal of Population*, *29*(1), 1–38. https://doi.org/10.1007/s10680-012-9277-y

Batyra, E. (2019). Increasing Educational Disparities in the Timing of Motherhood in the Andean Region: A Cohort Perspective. *Population Research and Policy Review*. https://doi.org/10.1007/s11113-019-09535-0

Berrington, A., Stone, J., & Beaujouan, E. (2015). Educational differences in timing and quantum of childbearing in Britain: A study of cohorts born 1940−1969. *Demographic Research*, *33*(26), 733–764. https://doi.org/10.4054/DemRes.2015.33.26

Billari, F. C., Liefbroer, A. C., & Philipov, D. (2006). The Postponement of Childbearing in Europe: Driving Forces and Implications. *Vienna Yearbook of Population Research*, 1–17. https://doi.org/10.1553/populationyearbook2006s1

Binstock, G. (2010). Tendencias sobre la convivencia, matrimonio y maternidad en áreas urbanas de Argentina. *Revista Latinoamericana de Población*, *3*(6), 129–146. https://doi.org/10.31406/relap2010.v4.i1.n6.7

Binstock, G., & Cabella, W. (2021). Las mujeres que terminan su vida reproductiva sin hijos: evolución reciente en América Latina (1980-2010). *Población y Sociedad*, *28*(1), 32–52.

Bongaarts, J., Mensch, B. S., & Blanc, A. K. (2017). Trends in the age at reproductive transitions in the developing world: The role of education. *Population Studies*, *71*(2), 139–154. https://doi.org/10.1080/00324728.2017.1291986

Bongaarts, J., & Watkins, S. C. (1996). Social Interactions and Contemporary Fertility Transitions. *Population and Development Review*, *22*(4), 639–682. https://doi.org/10.2307/2137804

Cabella, W., & Nathan, M. (2018). *Los desafíos de la baja fecundidad en América Latina y el Caribe* (Documentos de Trabajo). Retrieved from https://lac.unfpa.org/sites/default/files/pub-pdf/Baja fecundidad en ALC - version web español.pdf

Cardozo, S., & Iervolino, A. (2009). Adiós juventud: tendencias en las transiciones a la vida adulta en Uruguay. *Revista de Ciencias Sociales*, *22*(25), 60–81.

Casterline, J. B., & Odden, C. (2016). Trends in Inter-Birth Intervals in Developing Countries 1965–2014. *Population and Development Review*, *42*(2), 173–194. https://doi.org/10.1111/j.1728-4457.2016.00134.x

Castro, R. (2015). Late-entry-into-motherhood women are responsible for fertility recuperation. *Journal of Biosocial Science*, *47*(2), 275–279. https://doi.org/10.1017/S0021932014000121

Cavenaghi, S., & Diniz Alves, J. E. (2009). Fertility and contraception in Latin America: historical trends, recent patterns. In *Demographic transformations and inequalities in Latin America: Historical trends and recent patterns* (pp. 161–192). ALAP, Serie Investigaciones 8.

Chackiel, J., & Schkolnik, S. (2003). *América Latina: los sectores regazados en la trasicion de la fecundidad*.

ECLAC. (2012). *Social panorama of Latin America* (Vol. 1). Santiago de Chile: ECLAC-UNFPA. https://doi.org/10.1017/CBO9781107415324.004

Esteve, A., Castro-Martín, T., & Castro Torres, A. F. (2022). Families in Latin America: Trends, Singularities, and Contextual Factors. *Annual Review OfSociology*, *48*, 485–505.

Esteve, A., & Florez-Paredes, E. (2018). The Stability Paradox: Why Expansion of Women's Education Has Not Delayed Early Union Formation or Childbearing in Latin America. *Studies in Family Planning*, *49*(2), 127–142. https://doi.org/10.1111/sifp.12055

Goldstein, J. R., Sobotka, T., & Jasilioniene, A. (2009). The End of "Lowest-Low" Fertility? *Population and Development Review*, *35*(4), 663–699.

Guzmán, J. M., Rodríguez, J., Martínez, J., Contreras, J. M., & González, D. (2006). The Demography of Latin America and the Caribbean since 1950. *Population (English Edition)*, *61*(5), 519–620. https://doi.org/10.3917/popu.605.0623

Gyimah, S. O. (2003). A Cohort Analysis of the Timing of First Birth and Fertility in Ghana. *Population Research and Policy Review*, *22*(3), 251–266.

Heaton, T. B., Forste, R., & Otterstrom, S. M. (2002). Family transitions in Latin America: First intercourse, first union and first birth. *International Journal of Population Geography*, *8*(1), 1–15. https://doi.org/10.1002/ijpg.234

Kohler, H.-P., Billari, F. C., & Ortega, J. A. (2002). The Emergence of the Lowest-Low Fertility in Europe during the 1990s. *Population and Development Review*, *28*(4), 641–680.

Kohler, H.-P., Skytthe, A., & Christensen, K. (2001). *The Age at First Birth and Completed Fertility Reconsidered: Findings from a Sample of Identical Twins* (MPIDR Working Paper) (Vol. WP-2001-00).

Lima, E. E. C., Zeman, K., Sobotka, T., Nathan, M., & Castro, R. (2018). The Emergence of Bimodal Fertility Profiles in Latin America. *Population and Development Review*, *4*(1), 723–743. https://doi.org/10.1111/padr.12157

Mills, M., Rindfuss, R. R., McDonald, P., & te Velde, E. (2011). Why do people postpone parenthood? Reasons and social policy incentives. *Human Reproduction Update*, *17*(6), 848–860. https://doi.org/10.1093/humupd/dmr026

Morgan, S. P., & Rindfuss, R. R. (1999). Reexamining the Link of Early Childbearing to Marriage and to Subsequent Fertility. *Demography*, *36*(1), 59–75. Retrieved from http://www.jstor.org/stable/2648134

Nathan, M. (2015a). La creciente heterogeneidad en la edad al primer hijo en el Uruguay: un análisis de las cohortes de 1951 a 1990. *Notas de Población*, *100*, 35–60.

Nathan, M. (2015b). La lenta transición hacia un régimen de fecundidad tardía en Uruguay: los cambios en la edad al primer hijo entre 1978 y 2011. *Revista Latinoamericana de Población*, *9*(17), 37–60.

Nathan, M., Pardo, I., & Cabella, W. (2016). Diverging patterns of fertility decline in Uruguay. *Demographic Research*, *34*(20), 563–586. https://doi.org/10.4054/DemRes.2016.34.20

Neels, K., Murphy, M., Ní Bhrolcháin, M., & Beaujouan, É. (2017). Rising Educational Participation and the Trend to Later Childbearing. *Population and Development Review*, *43*(4), 667–693. https://doi.org/10.1111/padr.12112

Ní Bhrolcháin, M., & Beaujouan, É. (2012). Fertility postponement is largely due to rising educational enrolment. *Population Studies*, *66*(January 2013), 311–327. https://doi.org/10.1080/00324728.2012.697569

Pardo, I., & Cabella, W. (2018). A Bimodal Pattern in Age at First Birth in Southern Cone. *Population Review*, *57*(2), 1–22.

Philipov, D. (2017). *Rising dispersion in age at first birth in Europe: is it related to fertility postponement? VID Working Papers* (Vol. 11). Vienna. Retrieved from https://www.oeaw.ac.at/fileadmin/subsites/Institute/VID/PDF/Publications/Working_Papers/WP2017_11_HFD_RR-2017-005.pdf

Reher, D., & Requena, M. (2014). Was there a mid-20th century fertility boom in Latin America? *Revista de Historia Económica*, *33*(3), 319–350. https://doi.org/10.1017/S0212610914000172

Rodríguez, J. (2013). *High adolescent fertility in the context of declining fertility in Latin America*. New York: United Nations, Department of Economic and Social Affairs, Population Division, Expert Paper No. 2013/14.

Rodríguez, J., & Cavenaghi, S. (2014). Adolescent and youth fertility and social inequality in Latin America and the caribbean: What role has education played? *Genus*, *70*(1), 1–25. https://doi.org/10.4402/genus-543

Rosero-Bixby, L., Castro-Martín, T., & Martín-García, T. (2009). Is Latin America starting to retreat from early and universal childbearing? *Demographic Research*, *20*(9), 169–194. https://doi.org/10.4054/DemRes.2009.20.9

Sobotka, T. (2004). *Postponement of Childbearing and Low Fertility in Europe*. Doctoral dissertation, PhD Thesis, Amsterdam University Press.

Sobotka, T. (2010). A Young Generation Under Pressure? https://doi.org/10.1007/978-3-642-03483-1

Trussell, J., & Menken, J. (1978). Early Childbearing and Subsequent Fertility. *Family Planning Perspectives*, *10*(4), 209–218.

UNESCO. (2013). *Situación Educativa de América Latina y el Caribe: Hacia la educación de calidad para todos al 2015*. Santiago de Chile: OREALC/UNESCO. Retrieved from http://works.bepress.com/cgi/viewcontent.cgi?article=1009&context=cesar_guadalupe

UNESCO, UNICEF, & CEPAL. (2022). *La encrucijada de la educación en América Latina y*

el Caribe. Informe regional de monitoreo ODS4-Educación 2030. Santiago de Chile: UNESCO.

Varela Petito, C., Fostik, A., & Fernández Soto, M. (2012). Maternidad en la juventud y desigualdad social. *Cuadernos Del UNFPA*, *6*(6). Retrieved from http://www.inju.gub.uy/innovaportal/file/22505/1/unfpa_cuaderno6_final_web.pdf

Vasireddy, S., Berrington, A., Kuang, B., & Kulu, H. (2022). *Education and fertility in Europe in the last decade: A review of the literature* (Center for Population Change, Working Paper No. 103).

Fertility postponement and regional patterns of dispersion in age at first birth: Descriptive findings and interpretations

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Abstract

Background. Previous studies have documented an increasing heterogeneity in first-birth timing in countries experiencing the postponement transition. Sobotka (2004), for instance, showed a rising dispersion in age at first birth in developed countries, particularly in the United Kingdom and the United States, where the timing polarization between more and less advantaged women is most evident. However, these studies have included few countries outside Europe and North America, and lack a thorough interpretation of the rising dispersion in first births.

Aim. Our aim is to compare the evolution of dispersion in age at first birth in countries in Europe, East Asia, North America and Southern Cone.

Data and Methods. Using data from the Human Fertility Database and the Human Fertility Collection, we describe the evolution of the period mean age at first birth and its variance for 21 countries since 1970.

Results. In line with previous studies, our results show a widespread pattern of increasing heterogeneity in age at first birth after the onset of the postponement transition, although with marked differences among regions and countries. The greatest heterogeneity can be found in countries where timing of family formation varies greatly among women with different socioeconomic status. Chile and Uruguay, in particular, exhibit the highest heterogeneity even though they are at the beginning of the postponement transition.

Discussion. There is no general explanation of why dispersion increased as the mean age at first birth rose. Further studies in this area should investigate causes and interpretations of this trend, and develop measures for studying heterogeneity in fertility timing.

Keywords: fertility; fertility postponement; dispersion in age at first birth; age-specific fertility rates

Introduction

The postponement of childbearing has been the central focus of tempo studies in fertility research over the last two decades (Balbo et al. 2013). While a large body of research has focused on its driving forces and consequences (Beets 2010; Billari et al. 2006; Kohler et al. 2002; Mills et al. 2011; Ní Bhrolcháin & Beaujouan 2012; Sobotka 2004, 2010), the evolution of heterogeneity in age at first birth across countries and regions has rarely been studied.

Heterogeneity in age at first birth is not only crucial for understanding the evolution of fertility changes but also relevant in itself. Dispersion levels show the diffusion of an emerging reproductive norm. For instance, an increasing concentration of first birth in a late age interval evidences widespread late-childbearing behaviours. Conversely, a more dispersed schedule of age at first birth shows the coexistence of different types of reproductive behaviours and a merely partial diffusion of the new fertility norm. Moreover, even greater heterogeneity in age at first birth possibly suggests high levels of social inequality and stratified life courses among socioeconomic groups (Sobotka 2004).

The few studies that analysed the dispersion in the age at first birth in the context of fertility postponement, describing its evolution in specific countries or regions, focused almost exclusively on Europe and the United States (Burkimsher 2015; Kohler et al. 2002; Philipov 2017; Sobotka 2004). In those regions, whereas Kohler et al. (2002) had predicted an increasing concentration of childbearing at older ages as a result of the advancement of fertility postponement, other researchers showed that this shift was in fact followed by increasing socioeconomic differences in fertility timing (Beets 2010; McLanahan 2004; Ravanera & Rajulton 2006; Rendall et al. 2010; Sobotka 2004 & 2010).

Philipov (2017) found that the transition towards a late fertility regime in Europe was being coupled with growing heterogeneity in the timing of first births and interpreted this as macro-evidence of the diversification of life courses, in which first births occur over a longer reproductive life span. Most studies, however, tend to highlight inequality, such as growing educational disparities among women, as the key factor behind reproductive polarization, especially in highly unequal countries (United States, United Kingdom, Latin American countries). In any case, no comprehensive explanation has indisputably coupled the evolution of dispersion in age at first birth with increasing differences in reproductive careers across different socioeconomic groups. It is reasonable to assume that both processes might foster dispersion concurrently, although one of them may have more impact, depending on the regional and national context.

Our contribution lies in describing different patterns in the evolution of dispersion in age at first birth and in discussing interpretations. More precisely, we describe dispersion in countries going through the postponement transition in eight regions of the world, broadening the scope of the inquiry from previous studies in terms of number of countries and years examined. We aim to compare the evolution of dispersion in European and non-European countries as they move towards a late-fertility regime, identify regional trends and patterns, and discuss theoretical and methodological implications. We believe that revealing different dispersion patterns may contribute to a more thorough description of the unfolding of fertility postponement in several contexts.

Postponement transition and heterogeneity in the age schedule of first birth

The term "postponement transition" (PT) was introduced by Kohler et al. (2002) to describe the widespread and pervasive increase in the period mean age at first birth (MAB1) in developed countries since 1970. The period mean age at first birth (MAB1) increased between 3 and 5 years in European countries from 1970 to 2005, during a steady decrease of fertility levels (Billari et al. 2006; Sobotka 2010). Researchers have identified a broad set of causes behind this shift towards late childbearing. These include the spread of the contraceptive pill, the increase in women's educational attainment and participation in the labour market (Beets 2010; Billari et al. 2006; Frejka & Sardon 2006; Kolher et al. 2002; Mills et al. 2011; Sobotka 2004, 2010 & 2017).

According to the literature, the onset of the PT varies across countries and regions. The PT started in the early 1970s in Northern Europe and most Western European countries, while in Southern European countries the onset took place in the early 1980s, and during the 1990s in Central and Eastern European countries, following the collapse of socialist regimes (Beets 2010; Billari & Liefbroer 2010; Kohler et al. 2002; Philipov 2017; Sobotka 2004). Outside Europe, Canada and the United States began experiencing postponement transition in the 1970s (Beets 2010; Sobotka 2004). In East Asian countries, women born in the 1950s and 1960s showed the first signs of a change towards a later entry into motherhood, making the phenomenon noticeable from a period perspective in the 1970s and 1980s (Frejka et al. 2010). Finally, a set of Latin American countries have shown signs of an initial shift towards fertility postponement since 2000, according to Rosero-Bixby et al. (2009) and Esteve et al. (2012). Argentina, Chile, and particularly Uruguay – all countries from South America's Southern Cone – seem to be at the forefront of this change (Lima et al. 2018; Pardo & Cabella 2018; also see Appendix, Table 2).

It is useful to note different starting points and paces in the MAB1, since its dispersion is usually low before PT, but is expected to increase as the process unfolds. Previous studies show the MAB1 before the onset of fertility postponement within the 23.5-24.5 years interval for almost every country in Northern, Western, and Southern Europe. In the latter case, the average MAB1 was slightly higher than in the other regions mentioned. Former socialist countries, on the other hand, exhibited a lower MAB1 at the start of the PT in comparison to the rest of Europe (less than 23 years) (Beets 2010; Sobotka 2004). After the onset, the pace of postponement also exhibited marked differences among regions. For example, Southern European countries experienced a rapid increase of MAB1 and this region now displays the highest MAB1 in the world (Philipov 2017). Presently, MAB1 continues to rise in most developed countries, although the pace of increase is slowing down (Philipov 2017), fostering debate on whether the PT will reach an end soon (Goldstein et al. 2009; Sobotka 2004).

Research carried out in developed countries showed increasing differences in the age at first birth between social groups, particularly in the United Kingdom and the United States (McLanahan 2004; Ravanera & Rajulton 2006; Rendall et al. 2010; Sobotka 2010). Philipov (2017) also showed that heterogeneity increased in European countries some years after the onset of fertility postponement and remained at a high level towards the end of the PT. Using the standard deviation of the mean age at first birth (sdMAB1) he identified different stages. First, a period when sdMAB1 did not increase, followed by a longer trend where sdMAB1 did increase continuously and a final stage where sdMAB1 stabilised at high levels. Increasing dispersion around the mean age may be seen as a combination of period effects affecting young people, processes of "learning of new behaviour" influencing new cohorts and changes in ideas driving diffusion (Philipov 2017).

Comparative studies showed that cross-country and regional differences in the PT are related to a diverse array of determinants, such as institutional and cultural settings, educational composition of the population, or prevailing social norms, among others (Sobotka 2010; Billari 2004; Gustafsson et al. 2002). In particular, the emergence of different fertility patterns in the context of the PT can be construed as the result of a) the specific influence of each determinant of postponement at the country level, and b) the different starting points at the onset of the process (Frejka & Sardon 2006). Higher educational attainment (via opportunity costs or time constraints due to enrolment), partnership instability and uncertain conditions within the labour market are often-cited factors that foster delayed motherhood at the micro level (Ni Bhrolcháin & Beaujouan 2012; Rindfuss & Brauner-Otto 2008; Gustafsson & Kalwij 2006). Intergenerational transmission of timing preferences and prevailing social norms are also mentioned as well-established determinants (De Valk & Liefbroer 2007; Liefbroer & Billari 2010).

Within the field of fertility research, transition theories have relied on both structural changes and diffusion processes to explain the spread of a new reproductive pattern among the population (Bongaarts & Watkins 1996; Kohler et al. 2002; Lesthaeghe 2010). From this approach, postponement of childbearing is expected to be initially adopted by women with high socioeconomic status, in response to changing external (social, economic) conditions and incentives. After this initial phase, a "bandwagon effect" comes into play, with social interactions encouraging other members of the population to adopt the new behaviour (Goldstein et al. 2009). In this perspective, more disadvantaged women are not entirely "immune" to the overall change in reproductive values, attitudes and behaviour; rather, they should follow the same trend with certain time lag. But to what extent do socioeconomic inequalities limit the spread of long-term changes in fertility among less advantaged groups?

Evidence has shown growing socioeconomic heterogeneity of fertility patterns in countries with "liberal" welfare regimes, and a more homogeneous impact in those countries with universal provision of childcare services (Rendall et al. 2010; Sigle-Rushton 2008; Sullivan 2005). Countries with family-oriented welfare regimes and low institutional compatibility between childrearing and employment (e.g. countries in Southern Europe) also experience increasing heterogeneity (Rendall et al. 2010).

From a life-course perspective, delaying motherhood is one dimension of the general trend towards delayed transitions to adulthood (Billari & Liefbroer 2010; Furstenberg et al. 2005; Billari & Wilson 2001). Changes in the life course trajectories of young adults in this typically "demographically dense" period (Rindfuss 1991) result in more diverse transitions to adulthood. This process in which the social and temporal organization of the life course become less guided by normative, legal or organizational rules (Billari & Wilson 2011; Elzinga & Lifbroer 2007) provides, as a result, a much less clear normative order of events making it more common for people to experience multiple events (e.g. marriages) or combine multiple roles (e.g. worker and student).

The age schedule of events of transition to adulthood is as important as its sequence with other events of transition to adulthood (e.g. leaving parental home, finishing school) with both dimensions influencing one another. Evidence in a variety of countries has shown that women of different social status undergo different sequences in transition to adulthood. Women of lower status not only have a shorter transition to adulthood but also a sequence in which some events are omitted, thus motherhood does not necessarily follow post-secondary graduation, work and marriage/union (Ravanera & Rajulton 2006).

This tendency could favour the bifurcation of the life course (Schulze & Tyrell 2002), given that in the middle and upper social strata the normative sequence is more frequent and,

in that context, the postponement of the entire process "naturally" increases the age to the first child. The differential appropriation of delaying type of behaviour by women of these strata suggests that the influence of ideas is not the only explanation, but that there are costs and restrictions that foster heterogeneity by strata (Neels and Perelli-Harris 2013). In addition, educational expansion could be contributing to said increasing heterogeneity to the extent that in such a context, those left behind progressively move away from the average age to the first child[3]. In fact, a growing body of evidence links increasing heterogeneity to differences in work experience duration and the number of years spent in education (Nicoletti & Tanturri 2008). In any case, micro-level variables such as educational attainment interact with country-level variables such as institutional arrangements and policy regimes (Billari 2004).

Considering the future evolution of dispersion in age at first birth, a possible convergence in fertility by education might generate expectations about diminishing heterogeneity within countries. However, it is reasonable to believe this trend would be limited to certain regions, at least in the short term. Recently, Basten et al. (2014) gathered experts who concluded that diminishing education-fertility differentials are expected especially in Latin America, Middle East and Southern Europe, but are unlikely in other areas, such as the United Sates.

Data and measures

Using data from the Human Fertility Database (HFD) and the Human Fertility Collection (HFC),[4] we jointly examined the evolution of the period MAB1 and sdMAB1 from 1970 to 2014.[5] We also analysed the share of first birth rates before age 20 and after age 29 and the shape of age-specific fertility schedules (ASFR1) in selected years. To discuss the accuracy of the standard deviation as an indicator of heterogeneity in the age at first birth, we also compared the sdMAB1 with the coefficient of variation (CV1). The HFD provides reliable fertility data and estimates that can be compared across countries. The HFC, on the other hand, was originally designed as a supplementary dataset to broaden the scope of countries that are covered by the HFD. Due to variability in data origins and estimation methods, the HFC data do not meet all the quality standards of the HFD and therefore

[3] This process can also be described by focusing on the educational composition of the population from a cohort perspective (Rendall et al. 2010).

[4] The HFD and the HFC are provided by Max Planck Institute for Demographic Research (Germany) and Vienna Institute of Demography (Austria). Available at www.humanfertility.org and www.fertilitydata.org (data downloaded on October 2016).

[5] Both variables were available for most countries; when this was not the case, they were computed with data from HFC.

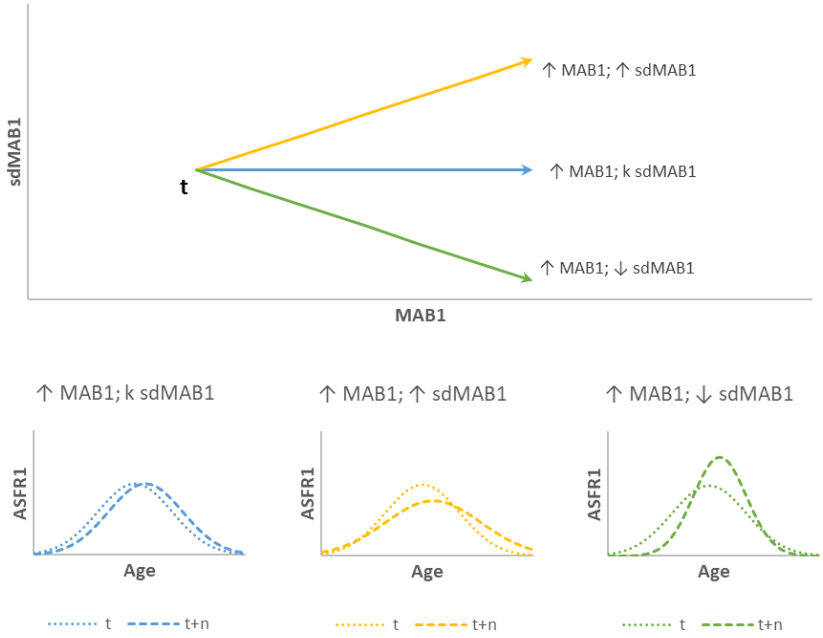
estimates should be analysed with caution. In this work, we used the HFC for a certain number of countries, not available in the HFD, that we considered relevant to improve our depiction of the specific fertility patterns by region.

We selected 21 countries in eight regions: Northern Europe, Western Europe, Southern Europe, Central & Eastern Europe, post-Soviet countries, North America, East Asia, and Southern Cone. Compared to recent studies, our research brings a larger number of countries and regions under analysis, thereby expanding our understanding of the unfolding postponement transition. We selected no more than three countries per region, giving priority to those countries with quality data and well covered in the fertility literature. With a few exceptions, all chosen countries have available data sets beginning in 1970 and continuing until at least 2010 (see Appendix, Table A1). Given that countries started the postponement transition at different points in time, we plotted the joint evolution of the MAB1 and the sdMAB1 without a calendar marker.

The model of the PT has been described from a period perspective. Changes in the MAB1 and sdMAB1, however, are the outcome of cohort-driven fertility changes as well as contextual factors associated with period effects. The mean age at first birth is usually measured from a period approach; however, the examination of heterogeneity in the timing of first births has relied equally on period and cohort approaches. We used a period perspective to examine the evolution of MAB1 and sdMAB1, as we intend to compare aggregate measures for particular years, tracing the course of the PT.

A theoretical sketch of this joint evolution can be useful to understand how the mean age and the standard deviation are expected to evolve in each country. We plot the MAB1 in the horizontal axis and its standard deviation on the vertical axis, and assume that *t* represents the first data point, i.e. the year at the onset of the postponement transition (Figure 1). Assuming a linear relation between these two variables, one stylized path shows an increasing mean age while the standard deviation remains constant (blue line). Another two paths might be observed, while the mean age increases: i) a linear increase (yellow line) or ii) a linear decrease of the standard deviation (green line). Stylized age schedules associated with these paths can also be modelled for two moments in time, assuming a normal distribution of the ASFR1. The peak of the curve moves to the right due to an increase in the mean age at first birth and the shape of the curve varies according to dispersion levels.

Figure 1. Theoretical paths of the joint evolution of the mean age at first birth and its standard deviation



Source: Authors' design. Note: k = constant over time

Results

Joint evolution of the mean age at first birth and its standard deviation

Our results confirm the increasing dispersion of first-birth rates by age as a notable trend throughout the postponement transition. In light of this evidence, the scope of the statement is broadened, since we now know this did not happen exclusively in European countries, as stressed by Philipov (2017), or in other developed countries (Sobotka 2004) and non-developed countries (Lima et al. 2018; Pardo & Cabella 2018, Nathan et al. 2016) but rather more extensively, as shown in Figure 2.

Overall, marked differences exist among countries and regions regarding level and pace of changes in the MAB1 and sdMAB1. As also stated by Philipov (2017), countries in Northern Europe show a very similar pattern of steady increase in both the MAB1 and sdMAB1 (at least after the first years of increase in the MAB1), while post-Soviet countries exhibit a much more modest increase in the MAB1 and do not reach high levels of dispersion. Eastern Asia countries (Japan and Taiwan) experienced an important increase of the sdMAB1, having begun at very low levels. On the other hand, the dispersion of first birth rates increased in England and Wales and the United States, along with a slow pace of postponement.

However, the MAB1 and sdMAB1 did not start to increase at the same time in all cases. In Northern, Eastern, and Southern Europe, East Asia, and Canada, the start of the increase in the sdMAB1 lagged behind that of the MAB1. Our results show this happened once the MAB1 reached 26 years of age. Those countries fit the model described by Philipov (2017), whereby the PT is expected to evolve in 3 phases, as mentioned above: 1) constant dispersion over time, during the first years after the MAB1 starts to increase, 2) increasing dispersion later on, and 3) a stabilization of levels of dispersion at higher levels towards the end of the process. However, our evidence shows that this does not hold for countries where the PT started later (as in Eastern European, post-Soviet and Southern Cone countries). In those countries, the MAB1 and its dispersion increased jointly, since the beginning of the transition. They also showed lower base levels of the MAB1 (below 24 years) compared to countries where the PT began earlier. The evolution of the MAB1 and sdMAB1 in the United States also follows the latter pattern, despite having experienced the onset of the PT at the beginning of the 1970s.

Some of the most relevant conclusions arising from these results are those linked to the stabilization of sdMAB1 at high levels. First, the sdMAB1 in early-postponing countries seems to have stabilized at approximately 5-6 years during the later stages of postponement. Among developed countries, England and Wales, and the United States exhibit the highest heterogeneity in age at first birth, followed by Southern European countries. Also, Central and Eastern European countries also reached high levels of dispersion in their rapid transition to a late-fertility regime. Remarkably, Uruguay started the postponement transition at the end of the 1990s and has reached the highest level of dispersion to date.

Moreover, some countries follow unique paths that depart from the general trend. In the Netherlands the sdMAB1 decreased over the first years of the PT until MAB1 reached age 26, after which sdMAB1 increased. In Spain, sdMAB1 was quite high at the onset but remained almost unchanged while the mean age at first birth experienced a sharp increase, from 24 to 29 years. Thereafter, standard deviation increased only after 15 years of fertility postponement.[6]

As this broader picture shows a certain degree of heterogeneity among countries and regions, it calls for a better understanding of the demographic processes that may lie behind an increase in the sdMAB1, as different patterns of change in fertility timing may produce a similar result in terms of dispersion. Descriptions tend to focus on the decline in adolescent fertility and the simultaneous increase in fertility rates at age 30 and above,

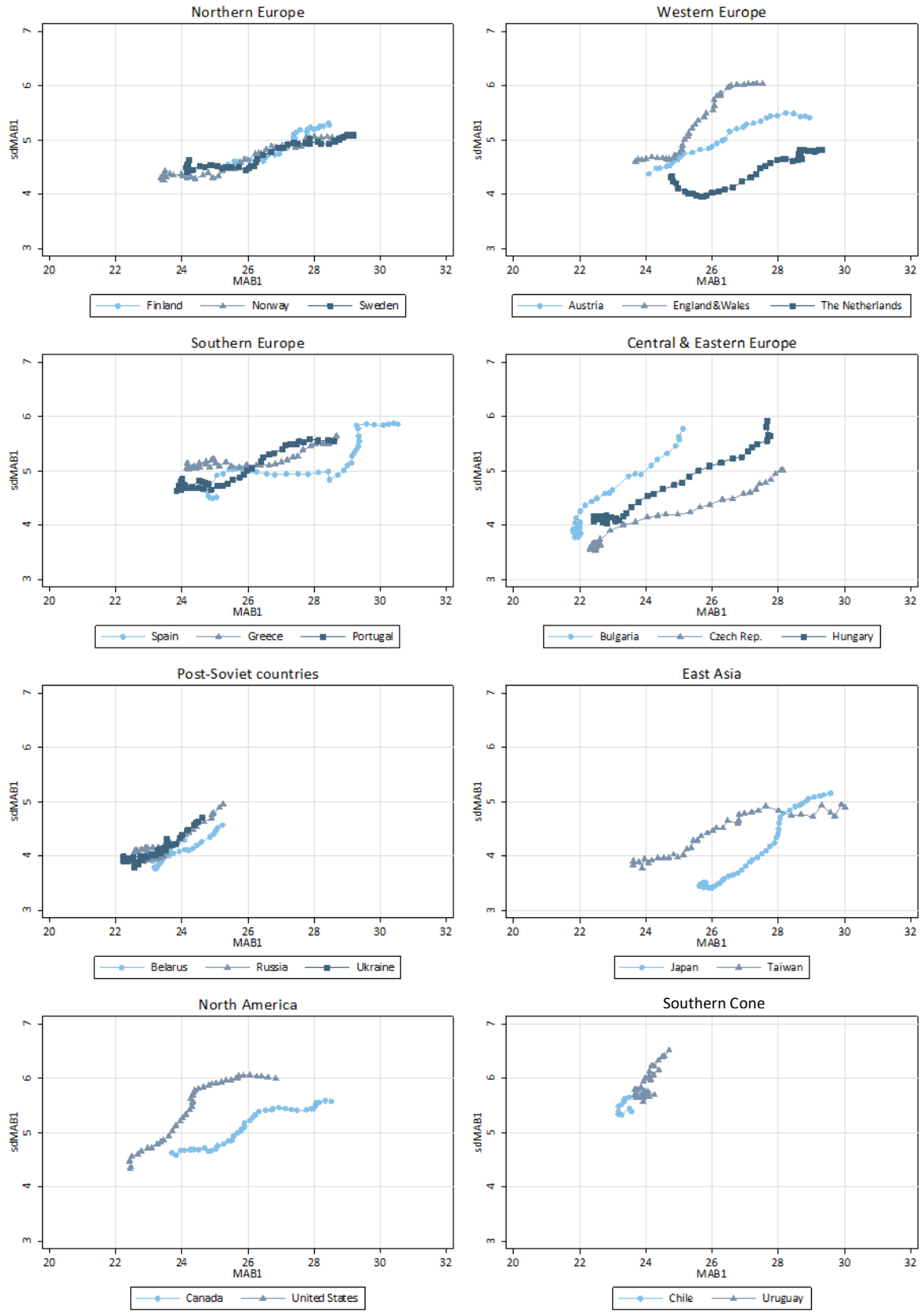
[6] This might be the reason why Kohler et al. (2002) proposed the "rectangularization" hypothesis, missing the rapid increase in dispersion that took place after 2002 in countries like Spain.

assuming that when those two trends do not evolve at the same pace, it is reasonable to expect increasing heterogeneity in period measures. Our results show that the proportion of first births after age 29 has increased in every country almost without any exception since the onset of their respective PT (Figure 3).

Greater differences were found between regions and countries when analysing the evolution of the share of first births occurring before age 20. In some regions, the share of teenage fertility started to decrease almost in parallel with the rise in childbearing at older ages (Northern and Southern Europe). In other regions or countries, such as England and Wales or Uruguay, the percentage of first births at younger ages remained stable or decreased only slightly and remains quite high, fuelling an increase in dispersion.

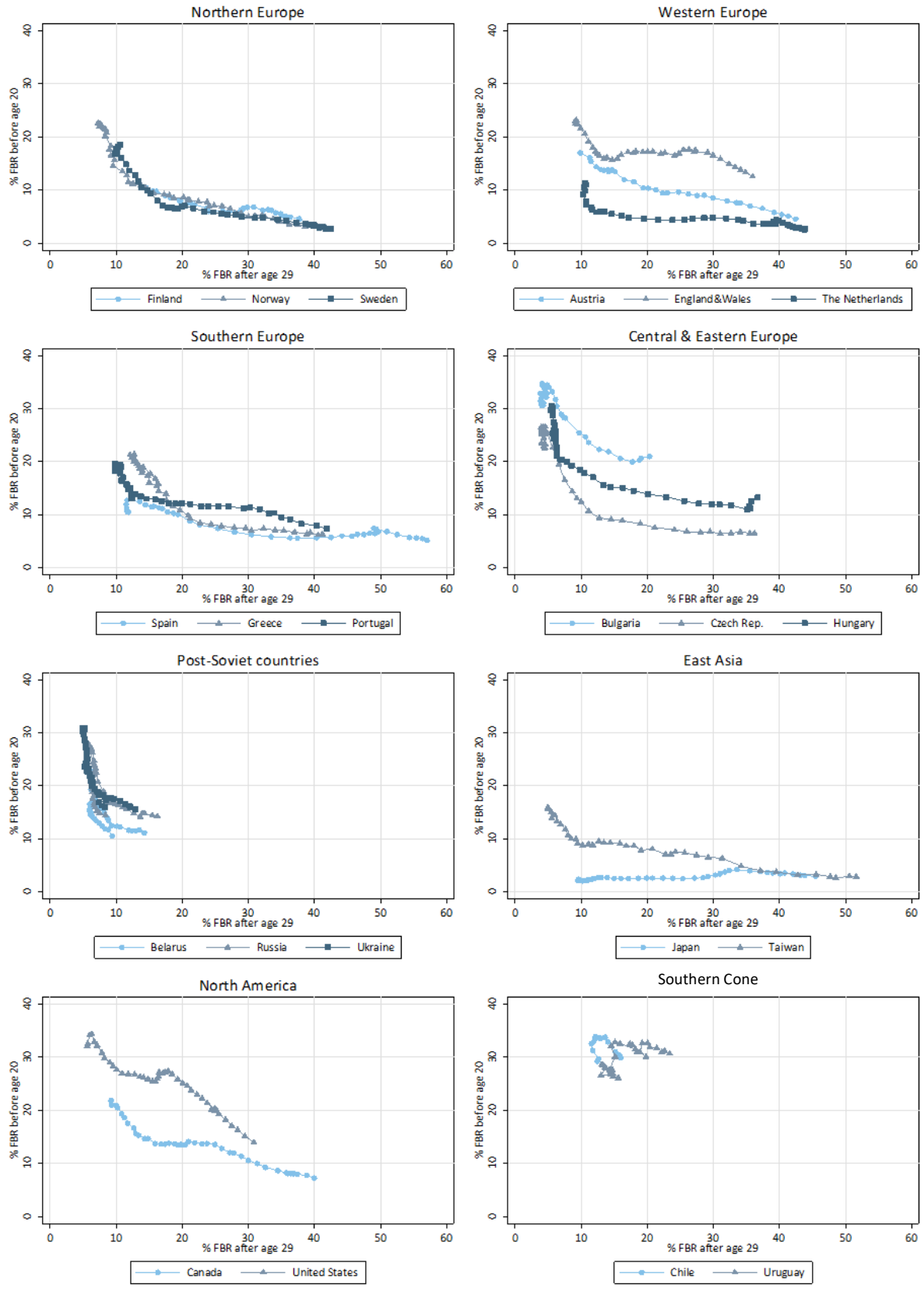
Finally, in other countries (Japan, the Netherlands) there was little change in the share of first births before age 20, but these countries already possessed low levels of teenage fertility at the onset of the PT. In any case, dispersion is determined not only by changes in both extremes of the age schedule range but also by changes in first birth rates at ages 20 to 29. Therefore, a broader picture appears when analysing the evolution of all age-specific fertility rates for first births.

Figure 2. Evolution of the mean age at first birth (MAB1) and its standard deviation (sdMAB1) in selected countries by region



Source: Authors' calculations based on data from Human Fertility Database and Human Fertility Collection

Figure 3. Share of first birth rates (FBR) before age 20 and after age 29 in selected countries by region.



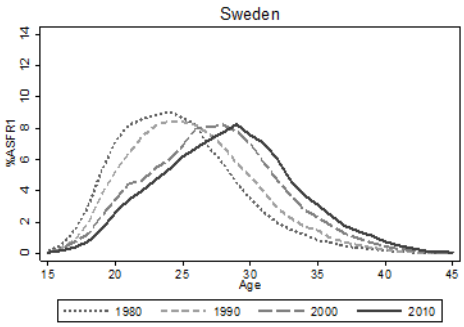
Source: Authors' calculations based on data from Human Fertility Database and Human Fertility Collection

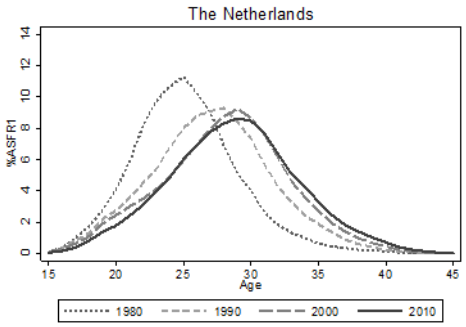
Age-specific fertility patterns

Figure 4 depicts four different patterns of age schedule for first birth rates (ASFR1). Firstly, some countries (for example, Sweden and the Netherlands) exhibit low dispersion levels, both at the onset and at advanced phases of fertility postponement (Group A). Secondly, there are countries with very low dispersion at the onset of the PT that later experienced large increases in the sdMAB1, for instance, ex-socialist countries in Eastern Europe and, to a lesser extent, East Asia (Group B). A third group of countries shows high dispersion levels at the onset and a small increase in the sdMAB1 (countries in Southern Europe; Group C). Finally, the fourth group of countries reached the highest dispersion levels without having reached an advanced stage of the postponement transition (namely, England and Wales, the United States, and Southern Cone countries) (Group D). In these countries, the relative distribution of the ASFR1 does not show a normally distributed curve. Instead, it appears to reflect a polarized pattern, consistent with some of the recent literature on these three countries (Chandola et al. 2002; Lima et al. 2018; Nathan et al. 2016; Sullivan 2005). Polarization implies widening gaps between subgroups of population, usually with different socioeconomic status, and it tends to take place when less advantaged women show no significant signs of birth postponement, while women who are better positioned in the social structure exhibit a pronounced shift in the timing of entering into motherhood (Sobotka 2004).

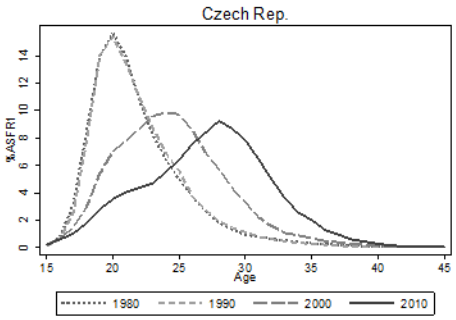
Figure 4. Share of ASFR1 in selected countries, period 1980-2010.

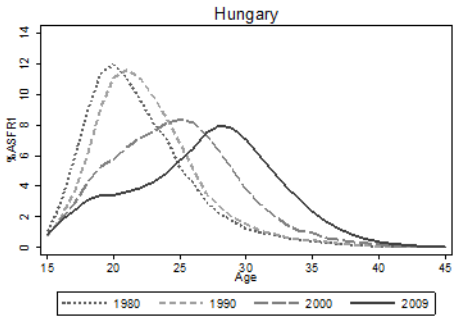
Group A

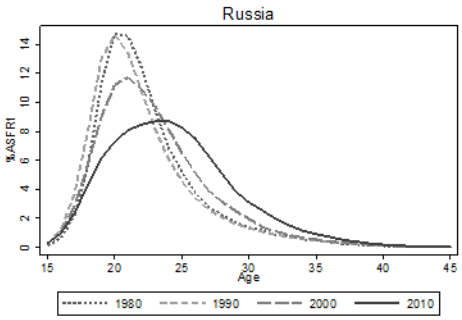


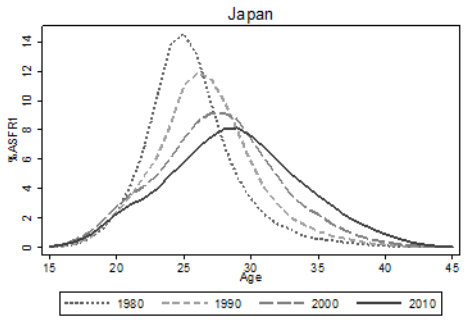


Group B

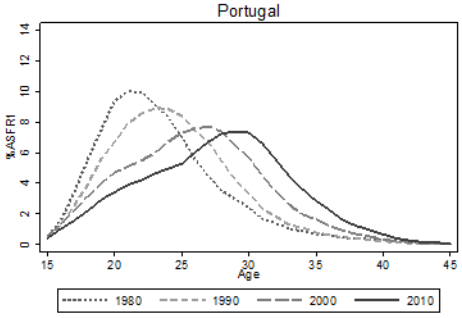


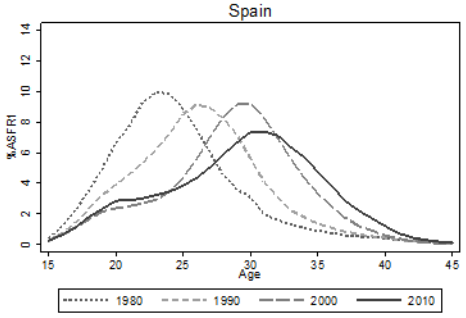




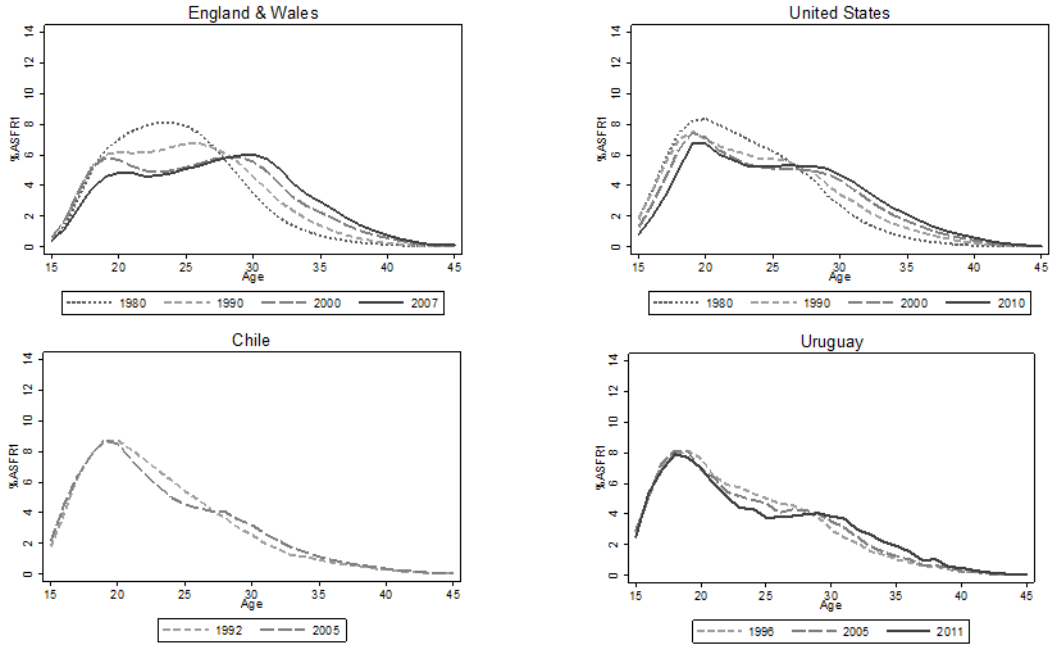


Group C





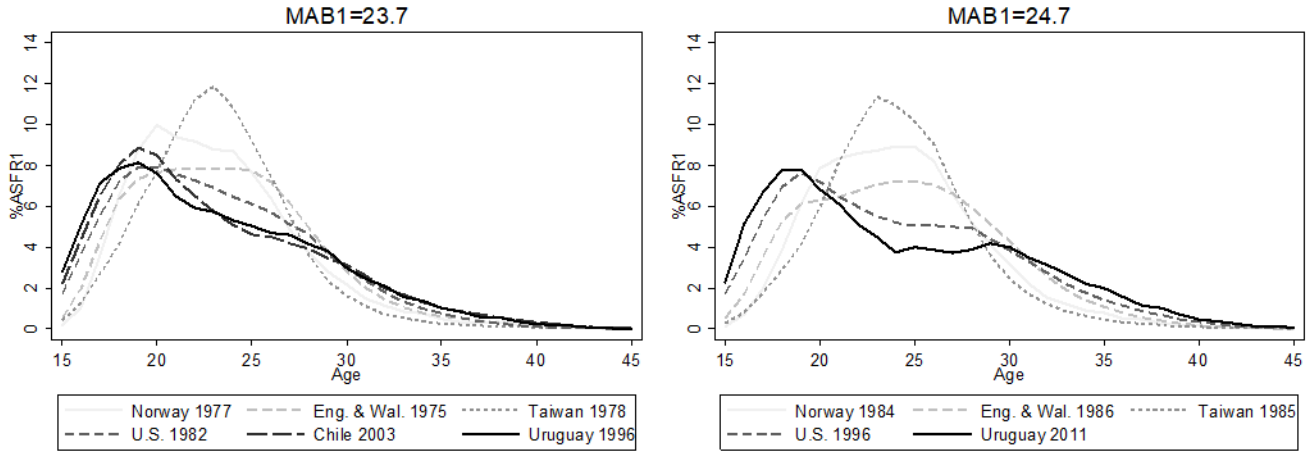
Group D



Source: Authors' calculations based on data from Human Fertility Database and Human Fertility Collection

The emergence of this pattern in Southern Cone countries may be made more visible by comparing the pattern of the ASFR1 with other countries at similar stages of the PT – i.e. those with the same MAB1 (see Figure 5). When countries are compared at the point at which the MAB1 equals 23.7 years, Uruguay and Chile show a slightly more polarized pattern than other countries, whereas by the end of the Uruguayan time span (2011), when the MAB1 equals 24.7, this pattern becomes much more pronounced. At this point, Uruguay resembles the United States – where the MAB1 reached 24.7 in 1996 – while differing from the rest of the countries. A similar pattern is observed in Chile at its highest MAB1 (not shown).

Figure 5. Share of ASFR1, sdMAB1, and modal age at first birth for selected countries for the year in which MAB1=23.7 and MAB1=24.7



Country and year	sdMAB1	Mode
Uruguay 1996	5.8	19
Chile 2003	5.7	19
United States 1982	5.0	19-20
England & Wales 1975	4.7	21-24
Norway 1977	4.3	20
Taiwan 1978	3.9	23

Country and year	sdMAB1	Mode
Uruguay 2011	6.5	18-19
Chile	-	-
United States 1996	5.8	19
England & Wales 1986	5.1	24-25
Norway 1984	4.4	24-25
Taiwan 1985	4.0	23

Source: Authors' calculations based on data from Human Fertility Database and Human Fertility Collection

Discussion

Since literature on fertility postponement tends to concentrate solely on the increase in MAB1, studies focusing on dispersion in timing at first birth are scarce. Still, two hypotheses on the evolution of dispersion emerge from the existing literature. On the one hand, while describing the features of the PT model, Kohler et al. (2002) predicted the "rectangularization" of fertility patterns, suggesting that the concentration of age at first birth becomes increasingly narrow once the increase in MAB1 approaches its limits. On the other hand, Sobotka (2004, 2010) and Philipov (2017) found evidence to support the hypothesis of rising heterogeneity in first-birth timing throughout the PT.

Aiming to contribute to a broadening of the research agenda in the study of the timing of first births, we examined the evolution of the mean age at first birth and its standard deviation since 1970, as well as changes in age schedule of first birth rates across 21 countries from Europe, East Asia, North and Southern Cone. Our results support the hypothesis of a rising heterogeneity in age at first birth throughout the PT (Sobotka 2004; Philipov 2017), and stress the relevance of distinctive regional patterns, which arise in connection to national/regional socio-historical and institutional features. For instance, Southern Cone countries, well known for their high levels of social inequality, showed the highest level of dispersion at the onset of fertility postponement and an extraordinary increase in the sdMAB1 over a short period.

Additionally, we showed that country-specific distribution of age-specific fertility rates of first birth can reveal four basic patterns of dispersion: three are variants of the usual normally distributed pattern, while the remaining group shows greater heterogeneity, which can be associated with social status polarization, particularly noticeable in the United States and Latin American countries. Two underlying processes explain the emergence of this pattern: the persistence of high fertility rates at younger ages, often observed in women from lower social strata, and the postponement of first births pioneered by women in middle and upper socioeconomic strata (Lima et al. 2018; Nathan 2015; Pardo & Cabella 2018; Rendall et al. 2010; Sullivan 2005).

Overall, the debate over the proper interpretation of an increasing dispersion is twofold. On the one hand, an increasing dispersion in age at first birth maintaining a unimodal distribution curve tends to be interpreted within the general framework of increasing heterogeneity in the timing of events in the life course, as an indicator of increasing personal autonomy in the pursuit of self-realization (Billari & Liefbroer 2010; Macmillan 2005). On the other hand, when an increasing variance is associated with a non-normal distribution pattern (usually reaching the highest levels of sdMAB1), it is usually linked to social status polarization.

In Latin America, where data on fertility by birth order are limited, there is consensus that the shift towards late childbearing will produce a rapid rise in heterogeneity in first-birth schedules, due to the persistence of high teenage fertility rates (CEPAL 2012; Rodriguez & Cavenaghi 2014). It has been shown that Chile and Uruguay, for example, underwent the first stages of fertility postponement with a lower MAB1 and higher standard deviation than those of developed countries. This pattern is also reflected in the emergence of bimodal curves of hazard rates of first birth by age. Even though Burkimsher (2017) interprets non-normal shapes as a transitional stage in the postponement transition, it is

likely that Latin American countries were developing a bimodal pattern of their own (Lima et al. 2018; Nathan et al. 2016; Nathan 2015; Pardo & Cabella 2018).

All period trends observed are fostered by a combination of cohort and period factors. Bongaarts & Sobotka (2012) assume that purely period-driven change should leave variance unchanged, while cohort-driven postponement should lead to a decline. Then a stabilized sdMAB1, noticeable in many countries of our sample, suggests the prevalence of period factors of change. But how should the increasing dispersion be interpreted in terms of cohort and period factors? Philipov (2017) assumes that a mixture of both might be behind the increase of sdMAB1, as period-specific factors persist while changes in ideas influence new cohorts, which "learn" new behaviour as they reach reproductive ages. To make matters more complex, period factors may influence only one stage of the age span. However, when marked socioeconomic disparities are observed, period heterogeneity is expected to be high at the onset of the PT and increase as a result of the widening gaps among younger cohorts entering reproductive ages.

In light of these results and discussion, three questions may contribute to a more extensive debate and a broader research agenda. First, how should we interpret an increasing sdMAB1? Data on age-specific first birth rates are crucial to understanding reproductive behaviour, but a more rigorous theoretical perspective is indispensable to interpret data within a broader context of social change and to assign meaning to observed trends and patterns.

Second, are we measuring dispersion with the appropriate indicator? At first glance, a straightforward and highly available measure such as the sdMAB1 seems to be the best option in order to capture dispersion of first births. But when the mean changes, it may be appropriate to measure the ratio of the standard deviation to the mean, i.e. the coefficient of variation of age at first birth (CV1) (see Appendix, Figure A1).[7] In any case, we favoured the sdMAB1 in this study in order to capture absolute instead of relative variation. Additionally, should we discard the sdMAB1 as dispersion measure when dealing with non-Gaussian shaped curves, considering the underlying assumptions of variance and standard deviation? If so, the interquartile range is a suitable alternative, as it is not based on the assumption of a symmetric distribution. Sobotka (2004) arrived at similar results using the interquartile range, as did we (not shown).

[7] Data from two countries may help us illustrate this dilemma. In Sweden, the sdMAB1 has increased over the last 25 years, while the CV1 has remained quite stable (17 to 18%); however, in the United States, the sdMAB1 has plateaued since 2003, while the CV1 has started to decrease (see Appendix, Figure A1). Would it be accurate to prefer the CV1 and state that dispersion has remained constant in Sweden and fallen in the United States?

Third, how might dispersion of first births evolve as postponement reaches its "limits"? This is not yet possible to ascertain, but so far, a noticeable decrease in the pace of postponement seems to be coupled to the sdMAB1 plateauing at high levels. Will countries and regions converge around a similar age schedule of first birth rates?

References

Balbo, Nicoletta, Billari, F. C., & Mills, M. 2013: Fertility in advanced societies: A review. European Journal of Population 29: 1–38, DOI: https://doi.org/10.1007/s10680-012-9277-y

Basten, Stuart, Sobotka, T. & Zeman, K. 2014: Future fertility in low fertility countries. In Lutz, W., Butz, W. P. & Samir K. C. (Eds.) World Population and Human Capital in the 21st Century. Oxford: Oxford University Press

Beets, Gijs. 2010: The Demography of the Age at First Birth: The Close Relationship between Having Children and Postponement. In Beets, G., Schippers, J. & Le Velde, E. (Eds), The Future of Motherhood in Western Societies. New York: Springer.

Billari, Francesco, & Liefbroer, A. C. 2010: Towards a new pattern of transition to adulthood? Advances in Life Course Research 15: 59–75, DOI: 10.1016/j.alcr.2010.10.003.

Billari, Francesco, Liefbroer, A. C. & Philipov, D. 2006: The postponement of childbearing in Europe: driving forces and implications. Vienna Yearbook of Population Research 4: 117.

Billari, Francesco & Wilson, C. 2001: Convergence towards diversity? Cohort dynamics in the transition to adulthood in contemporary Western Europe, Max Planck Institute for Demographic Research, Working Paper 39

Billari, Francesco 2004: Becoming an adult in Europe: A macro (/micro)-demographic perspective. Demographic Research 3(2): 15–44

Brückner, Hannah & Mayer, K.U. 2005: De-standardization of the life course: What it might mean? And if it means anything, whether it actually took place? Advances in Life Course Research 9: 27-53, DOI: 10.1016/S1040-2608(04)09002-1.

Burkimsher, Marion 2017: Evolution of the shape of the fertility curve: Why might some countries develop a bimodal curve? Demographic Research 37(11): 295–324, DOI: 10.4054/DemRes.2017.37.11

Burkimsher, Marion 2015: Europe-wide fertility trends since the 1990s: Turning the corner from declining first birth rates. Demographic Research 32(21): 621-656, DOI: 10.4054/DemRes.2015.32.21

Chandola, Tarani, Coleman, D.A & Hiorns, R.W. 2002: Distinctive features of age-specific fertility profiles in the English-speaking world: Common patterns in Australia,

Canada, New Zealand and the United States, 1970-98. Population Studies 56(2): 181-200.

De Valk, Helga & Liefbroer, A. 2007: Timing Preferences for Women's Family-Life Transitions: Intergenerational Transmission among Migrants and Dutch. Journal of Marriage and Family 69(1): 190-206, DOI: https://doi.org/10.1111/j.1741-3737.2006.00353.x

Duclos, Jean-Yves, Esteban, J. & Ray, D. 2004: Polarization: concepts, measurements, estimation. Econometrica 72: 1737-1772, DOI: https://doi.org/10.1111/j.1468-0262.2004.00552.x

Elzinga Cees & Liefbroer A. 2007: De-standardization of family-life trajectories of young adults: A cross-national comparison using sequence analysis. European Journal of Population 23(3–4): 225–250, DOI: 10.1007/s10680-007-9133-7

Esteve, Albert, J. García-Roman, R. Lesthaeghe & A. López-Gay 2012: The "Second Demographic Transition" Features in Latin America: the 2010 Update, Barcelona: Centre d'Estudis Demografics, Universitat Autonoma de Barcelona, Working paper.

Frejka, Tomas, Jones, G.W. & Sardon, J.P. 2010: East Asian childbearing patterns and policy developments. Population and Development Review 36: 579-606, DOI: https://doi.org/10.1111/j.1728-4457.2010.00347.x

Frejka, Tomas & 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

Furstenberg, Frank, Rumbaut, R. & Settersen Jr, R.A. (eds.) 2005: On the frontier of adulthood: Theory, research and public policy, Chicago: University of Chicago Press

Gustafsson, Siv & Kalwij, A. 2006: Education and Postponement of Maternity. Economic Analysis for Industrialized Countries. Springer.

Gustafsson, Siv, Kenjoh, E., & Wetzels, C. 2002: The role of education on postponement of maternity in Britain, Germany, the Netherlands, Sweden. In E. Ruspini & A. Dale (Eds.), The gender dimension of social change: The contribution of dynamic research to the study of women's life courses (pp. 55-79). Bristol: The Policy Press.

Kohler, Hans-Peter, Billari, F.C. & Ortega, J.A. 2002: The emergence of lowest-low fertility in Europe during the 1990s. Population Development Review 28(4): 641-680, DOI: https://doi.org/10.1111/j.1728-4457.2002.00641.x

Lesthaeghe, Ron 2010: The Unfolding Story of the Second Demographic Transition. Population and Development Review 36(2): 2011-251.

Liefbroer Aart & Billari, F. 2010: Bringing norms back in: a theoretical and empirical discussion of their importance for understanding demographic behaviour. Population, Space and Place 16(4): 287–305, DOI: https://doi.org/10.1002/psp.552

Lima Everton, Zeman K., Castro R., Nathan M. & Sobotka T. 2017: The Emergence of Bimodal Fertility Profiles in Latin America. Population and Development Review, DOI: https://doi.org/10.1111/padr.12157

Livi Bacci, Massimo 2008: La sindrome del ritardo e l'autonomia dei giovani. In Un Welfare per crescere, Roma: AREL

MacMillan, Ross (ed.) 2005: The Structure of the Life Course: Standardized? Individualized? Differentiated? Advances in Life Course Research 9: 1-366

McLanahan, Sara 2004: Diverging destinies: how children are faring under the Second Demographic Transition. Demography, 41(4): 607-627, DOI: 10.1353/dem.2004.0033

Mills, Melinda, Rindfuss, R., McDonald, P. & Te Velde, E. 2011: Why do people postpone parenthood? Reasons and social policy incentives. Human Reproduction Update 17(6): 848–860, DOI: 10.1093/humupd/dmr026

Nathan, Mathias 2017: Polarization of the age at first birth in the Southern Cone. Presented at XXVIII IPC, Cape Town, October 2017

Nathan, Mathias 2015: La lenta transición hacia un régimen de fecundidad tardía en Uruguay: los cambios en la edad al primer hijo entre 1978 y 2011. Revista Latinoamericana de Población 17: 37-60.

Nathan, Mathias, Pardo, I. & Cabella, W. 2016: Diverging patterns of fertility decline in Uruguay. Demographic Research 34(20): 563-586, DOI: 10.4054/DemRes.2016.34.20

Ní Bhrolcháin Marie & Beaujouan É. 2012: Fertility postponement is largely due to rising education enrolment. Population Studies 66(3): 311-327, DOI: 10.1080/00324728.2012.697569

Nico, Magda 2014: Variability in the Transitions to Adulthood in Europe: A Critical Approach to De-Standardization of the Life Course'. Journal of Youth Studies 17(2), 166-82, DOI: https://doi.org/10.1080/13676261.2013.805877

Nicoletti, Cheti & Tanturri, M. L. 2008: Differences in Delaying Motherhood Across European Countries: Empirical Evidence from the ECHP. European Journal of Population 24, 157-183, DOI: 10.1007/s!0680-008-9161-y

Pardo, Ignacio & Cabella, W. 2018: A Bimodal Pattern in Age at First Birth in Southern Cone Countries?. Population Review 57(2), 1-22, DOI: 10.1353/prv.2018.0004

Philipov, Dimitri 2017: Rising Dispersion in Age at First Birth in Europe: Is it related to Fertility Postponement?, VID Working Paper 11

Ravanera, Zenaida & Rajulton, F. 2006: Social Status Polarization in the Timing and Trajectories to Motherhood. Canadian Studies in Population 33(2): 179-207, DOI: http://dx.doi.org/10.25336/P6Q90M

Rendall, Michael, Aracil, E., Bagavos, C., Couet, C., De Rose, A., Di Giulio, P., Lappegard, T., Robert-Bobée, Is. Rønsen, M., Smallwood, S., & Verropoulou, G. 2010: Increasingly heterogeneous ages at first birth by education in Southern-European and Anglo-American family-policy regimes: A seven-country comparison. Population Studies 64(3): 209–227, DOI: 10.1080/00324728.2010.512392

Rindfuss, Ronald 1991: The young adult years: Diversity, structural change, and fertility. Demography 28: 493-512, DOI: 10.2307/2061419

Rindfuss, Ronald & Brauner-Otto, S. 2008: Institutions and the transition to adulthood: Implications for fertility tempo in low-fertility settings. Vienna Yearbook of Population Research 2008. Vienna: Vienna Institute of Demography, DOI: 10.1553/populationyearbook2008s57

Rodriguez, Jorge & Cavenaghi, S. 2014: Adolescent and youth fertility and social inequality in Latin America and the Caribbean: what role has education played? Genus 70(1): 1-25.

Rosero-Bixby, Luis, Castro-Martín, T. & Martín-García, T. 2009: Is Latin America starting to retreat from early and universal childbearing? Demographic Research 20(9): 169-194, DOI: 10.4054/DemRes.2009.20.9

Sobotka, Tomáš 2004: Postponement of childbearing and low fertility in Europe. Amsterdam: Dutch University Press.

Sobotka, Tomáš 2010: Shifting parenthood to advanced reproductive ages: Trends, causes and consequences". In J.C. Tremmel (ed.) A Young Generation Under Pressure? Berlin Heidelberg: Springer-Verlag: 129-154, DOI: 10.1007/978-3-642-03483-1_7

Sobotka, Tomáš 2017: Post-Transitional Fertility: Childbearing Postponement and the Shift to Low and Unstable Fertility Levels. Vienna Institute of Demography, Working Papers, 01/2017.

Sullivan, Rachel 2005: The age pattern of first-birth rates among U.S. women: the bimodal 1990s. Demography 42(2): 259−273, DOI: 10.1353/dem.2005.0018

Appendix

Table A1. List of countries by region, data source, and time span.

Region & Country		Source	Time span
Northern Europe			
Finland	FIN	HFD	1982-2012
Norway	NOR	HFD	1970-2014
Sweden	SWE	HFD	1970-2014
Western Europe			
Austria	AUT	HFD	1984-2014
The Netherlands	NLD	HFD	1970-2012
England and Wales	GBRTENW	HFC	1970-2007
Southern Europe			
Greece	GRC	HFC	1970-2008
Portugal	PRT	HFD	1970-2012
Spain	ESP	HFD	1975-2014
Central & Eastern Europe			
Bulgaria	BGR	HFD	1970-2009
Czech Republic	CZE	HFD	1970-2014
Hungary	HUN	HFD	1970-2014
Post-Soviet countries			
Belarus	BLR	HFD	1970-2014
Russia	RUS	HFD	1970-2014
Ukraine	UKR	HFD	1970-2013
East Asia			
Japan	JPN	HFD	1970-2012
Taiwan	TWN	HFD	1976-2014
North America			

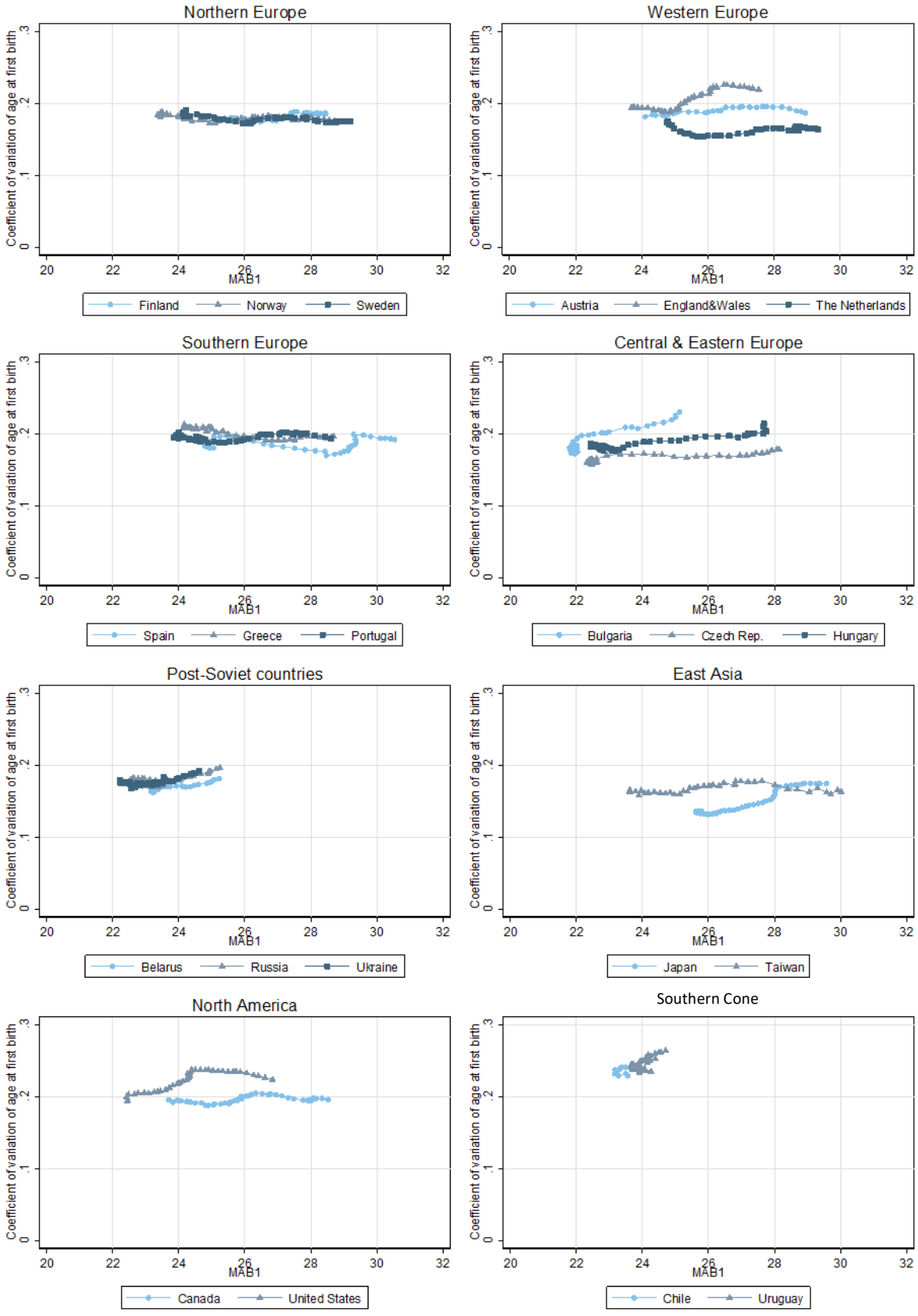
Canada	CAN	HFD	1970-2011
United States	USA	HFD	1970-2014
Southern Cone			
Chile	CHL	HFD	1992-2005
Uruguay	URY	HFC	1978-2011

Table A2: Percentage of women aged 25-29 who are childless in Latin American countries, 1970-2011.

	1970-77	1978-85	1990-97	1998-2005	2006-2011
Argentina		30.4	32.9	36.9	39.1
Bolivia	19.1		19.3	22.9	20.2
Brazil	29.5	28.3	29.2	30.8	39.9
Chile	15.6	26.1	27.2	31.4	39.7
Colombia	27.1	27.2	29.1	29.4	
Costa Rica	22.1	22.2		25.9	36.1
Ecuador	18.8	20.6	23.9	23.4	24.8
El Salvador			25.6		26.4
Mexico	23.2		24.1	27.6	30.2
Nicaragua	15.5		14.7	17.5	
Panama	17.7	21	24.5	26.1	28.3
Peru			26.3		33.3
Puerto Rico	23.5	25.2	33		
Uruguay	32.8	32.1	34.4		43.7
Venezuela	26.9		27.2	28.2	33.4

Source: Esteve et al. (2012), using IPUMS data files, and author's computations for Argentina, Bolivia, Chile and Venezuela 2006-2011, using census tabulations from national statistical offices (Argentina 2010; Bolivia 2012; Venezuela 2011) and microdata from the Chilean survey *Encuesta de Caracterización Socioeconómica Nacional* (CASEN 2011).

Figure A1. Evolution of the mean age at first birth and its coefficient of variation by region and country



Source: Authors' calculations based on data from Human Fertility Database and Human Fertility Collection

The role of educational expansion on the timing of first birth in the Southern Cone region

Mathías Nathan

Abstract

Background. The expansion of secondary and tertiary education has been the main driver of the shift to delayed childbearing in industrialized countries. However, its impact on the timing of first birth in Latin America is unclear. Previous studies in this region have shown little or even null effects as a result of increasing differences between educational groups.

Aim. This study examines the effect of educational expansion on the timing of the first birth in Southern Cone's countries from a cohort perspective. These countries have been at the forefront of the fertility transition in Latin America but display remarkable differences in the pace of educational expansion.

Data and methods. Using retrospective fertility data from nationally representative surveys and population census, I applied fertility tables to compute the probability of remaining childless between ages 12 to 44, by country, cohort, and educational group. I use standardization and decomposition methods to separate structure effects from rate effects in the overall change between the 1950 and 1980 cohorts.

Results. Lower-educated women from the youngest cohort show higher probabilities of entering motherhood at younger ages, while the highly educated are postponing the occurrence of the first birth. This reproductive polarization that unfolded with successive cohorts has become exceptionally high in Uruguay, particularly due to an elevated proportion of women with completed secondary (and more) education remaining childless at age 30. Still, this country also shows a modest impact of the educational expansion on the timing of first birth. On the contrary, the rapid increase in women's educational attainment has contributed significantly to Chile's emerging postponement transition. Argentina shows a unique pattern of first birth, with a moderate trend towards fertility postponement.

Discussion. These findings question the widely spread assumption of a direct correspondence between educational expansion and the postponement of motherhood. This study raises the critical role displayed by contextual and institutional factors in

equalizing the impact of educational expansion and shaping how the postponement transition unfolds in the region.

Keywords: educational expansion, timing of first birth, reproductive polarization, Southern Cone

Introduction

The postponement of childbearing has been widely linked to educational expansion in the existing literature (Billari, Liefbroer, & Philipov, 2006; Kohler, Billari, & Ortega, 2002; Mills, Rindfuss, McDonald, & te Velde, 2011; Neels, Murphy, Ní Bhrolcháin, & Beaujouan, 2017; Ní Bhrolcháin & Beaujouan, 2012; Sobotka, 2004, 2017). At the individual level, women who attain higher levels of education are more likely to delay the transition to motherhood compared to their less-educated peers. This positive association between education and the timing of first birth suggests that an expansion of secondary and tertiary education could lead to a composition effect toward later childbearing at the population level.

Latin America has made significant strides in expanding secondary and tertiary education in recent decades (UNESCO, UNICEF, & CEPAL, 2022). However, the impact of this educational expansion on the timing of first birth in the region has been unclear. While it is widely acknowledged that highly educated women in Latin America tend to postpone first births (Batyra, 2019; Binstock, 2010; Lima, Zeman, Sobotka, Nathan, & Castro, 2018; Nathan, 2015a; Rosero-Bixby, Castro-Martín, & Martín-García, 2009), many experts argue that the composition effect resulting from an increasing number of better-educated women among younger cohorts has been entirely offset by changes in age-specific first birth rates within low and medium educational groups (Bongaarts, Mensch, & Blanc, 2017; Esteve & Florez-Paredes, 2018).

According to the literature, the impact of educational disparities on the age at first birth can be expected to diminish as a new and emerging reproductive norm eventually spreads throughout society (Bongaarts & Watkins, 1996; Kohler et al., 2002; Lesthaeghe, 2014). On the other hand, differences in educational attainment might act as a mechanism of stratification, producing stable or increasing disparities in fertility outcomes over time. The latter argument is in line with previous research about the social polarization in fertility timing and family behavior in Europe and North America (McLanahan, 2004; Ravanera & Rajulton, 2006; Rendall et al., 2010; Rendall, Ekert-Jaffé, Joshi, Lynch, & Mougin, 2009; Sobotka, 2004, 2010).

Countries from the Southern Cone (Argentina, Chile, and Uruguay) seem to be at the forefront of the shift toward a late fertility regime in Latin America (Lima et al., 2018; Nathan, Pardo, & Cabella, 2016; Pardo & Cabella, 2018), yet they have been excluded from almost every regional study about fertility timing, probably due to lacking comparable datasets in these countries. Recent studies have overcome this by integrating alternative survey data on the pool of Demographic and Health Survey countries (Castro Torres, Batyra, & Myrskylä, 2022), using census data (Rodriguez & San Juan, 2020), while others have produced estimates of first birth rates combining data from vital statistics, census

and population estimates (Lima et al., 2018; Nathan & Pardo, 2019; Pardo & Cabella, 2018; Rosero-Bixby et al., 2009). It is possible that considering countries like Argentina, Chile, and Uruguay would give a complementary outlook of the trends in age at first birth and the effect of educational change compared with previous studies. Southern Cone's countries also experienced an uneven pace of educational expansion, which allows examining to what extent education has played a critical role in the emergence of delayed childbearing.

This study aims to analyze changes in age at first birth by level of education in Argentina, Chile, and Uruguay from a cohort perspective. Describing the differences in the timing of childbearing by educational groups in Southern Cone countries provides further evidence of the evolution of fertility postponement in Latin America due to their prevailing differences in the proportion of women who completed secondary education, with Chile exhibiting the highest figure in Latin America, Uruguay one of the lowest, and Argentina standing somewhere in between (UNESCO, 2013).

The contribution of the rise in female education to the postponement of first birth

The relationship between educational attainment and age at first birth is well-established, with women who have lower levels of education tending to experience early motherhood and highly educated women often delaying their first birth until advanced ages (Billari et al., 2006; Sobotka, 2004; Vasireddy, Berrington, Kuang, & Kulu, 2022). Four main micro-level factors shape this relationship: school enrollment and role incompatibility, attitudes towards childbearing and fertility intentions, opportunity costs associated with family formation, and contraceptive use.

The school enrollment and role incompatibility explanation emphasizes the difficulty of balancing the demands of being a student and a parent simultaneously, particularly for women (Mills et al., 2011). Individuals who are enrolled in school often prioritize their education over starting a family, and students typically have limited economic resources and face normative expectations surrounding childbearing in their social networks (Billari et al., 2006; Neels et al., 2017). Two studies found that the rise in educational participation explained between three-fifths and three-quarters of the observed increase in the mean age at first birth in Belgium, France, and the United Kingdom between 1970 and 2000, indicating that enrollment has a stronger net effect than educational attainment (Neels et al., 2017; Ní Bhrolcháin & Beaujouan, 2012).

Attitudes toward childbearing and fertility intentions are associated with the ideational changes described within the Second Demographic Transition theory (Lesthaeghe, 2010). The cultural shift towards a more individualistic lifestyle, characterized by increased individual autonomy, greater aspirations for self-realization, higher consumption and leisure goals, and the retreat from long-term commitments, has produced a rising demand for higher education among women and resulted in the postponement of family transitions (Billari et al., 2006; Sobotka, 2008). Highly educated individuals are also more likely to adopt values, preferences, and behaviors associated with the Second Demographic Transition (Billari & Philipov, 2004; Perelli-Harris et al., 2010).

The literature suggests that highly educated women face higher opportunity costs associated with childbearing, which may lead to a delay in their transition to motherhood (Gustafsson, 2001). Moreover, highly educated women often have aspirations to return to work after maternity leave. Increasing the provision of formal childcare may help facilitate the combination of economic activity and childbearing, thereby reducing opportunity costs reduced (Billari, Kohler, Andersson, & Lundström, 2007). Differences in the economic return of education, such as better job opportunities, job security, and higher wages, may affect both the reproductive aspirations and preferences of individuals, as well as the opportunity costs of childbearing. Therefore, higher levels of education returns may lead to a delay in the transition to motherhood (Gustafsson & Kalwij, 2006).

Finally, the argument surrounding contraceptive use and knowledge suggest that women with higher levels of education are usually better informed about available methods of birth control and have more positive attitudes towards deliberate fertility regulation (JejeeBhoy, 1995). Education also plays a role in improving interpersonal communication within couples, including those concerning family decisions, such as family size and how to achieve it. Hence, better-educated women are more likely to have the authority and power to make decisions on reproductive matters from an early stage in their sexual and marital lives.

At a macro-level, increasing women's educational attainment tends to be associated with higher ages at first birth. This is due to a postponement of childbearing behavior among women who attain secondary and tertiary education. However, the impact of this "composition effect" depends on changes in the differences in first-birth timing between educational groups over time. If the education gradient remains constant, expanding education should result in a later age at first birth at the aggregate level (Grant, 2015). This effect could be reinforced if delayed childbearing becomes widespread across educational groups. However, if early childbearing becomes more common among women

with lower educational levels, the impact of educational expansion on age at first birth could be small or even non-existent.

Additionally, educational expansion may produce changes within each educational group, leading to greater diversity in social backgrounds, attitudes, reproductive preferences, and aspirations. As more women attain higher education, the group becomes more heterogeneous. At the other end of the educational gradient, the least-educated may become more homogeneous, consisting increasingly of individuals from low socioeconomic backgrounds (Beaujouan, Brzozowska, & Zeman, 2016; Castro Torres et al., 2022; Grant, 2015; Raymo et al., 2015).

Despite the widespread belief that educational expansion drives fertility postponement, evidence suggests that its effects on age at first birth may be limited due to changes within educational groups, both in developed regions (Neels & De Wachter, 2010; Ní Bhrolcháin & Beaujouan, 2012; Rendall et al., 2010; Rindfuss, Morgan, & Offutt, 1996) and in Latin American countries (Bongaarts et al., 2017; Esteve & Florez-Paredes, 2018).

The timing of first birth in the Southern Cone

The salient feature of the fertility transition in Latin America has been the persistence of an early pattern of entry into motherhood in the context of a rapid decline in overall fertility (Guzmán, Rodríguez, Martínez, Contreras, & González, 2006). This 'Latin American paradox' (Bozon, Gayet, & Barrientos, 2009) contrasts with trends observed in most regions of the world, where the drop in fertility levels was accompanied by delayed childbearing (Kohler et al., 2002; Sobotka, 2004). Early sexual initiation age and early entry into the first union have been strongly associated with stability in women's mean age at first birth in Latin America (Bongaarts et al., 2017; Bozon et al., 2009; Rodríguez, 2013).

The pattern of low fertility and stable age-schedule of first birth persisted even in the context of a substantial expansion of education. The modest impact of educational expansion on the timing of the transition to motherhood was termed the 'stability paradox' (Bongaarts et al., 2017; Esteve & Florez-Paredes, 2018). Researchers pointed out that the expected postponement of first birth in the context of educational expansion was offset by changes in first birth rates within educational strata: women from younger cohorts, particularly those whit low levels of education, were experiencing the first union and motherhood at earlier ages than previous cohorts. Yet, the composition effect of rising educational levels in the region accounted for the observed decline in the percentage of adolescent and young mothers between 1990 and 2010; in countries where adolescent

motherhood increased anyway, the magnitude of the increase would have been much higher in the absence of compositional changes (Rodríguez & Cavenaghi, 2014; Rodriguez & San Juan, 2020).[8]

Within Latin America, countries from the Southern Cone region (Argentina, Chile, and Uruguay) were signaled as the forerunners of the postponement transition (Esteve & Florez-Paredes, 2018; Lima et al., 2018; Rosero-Bixby et al., 2009). Previous studies have revealed a gradual increase in the mean age at first birth since the early 2000s in these countries, together with a rising dispersion in first birth timing (Binstock, 2010; Fuentes et al., 2010; Lima et al., 2018; Nathan, 2015b; Nathan & Pardo, 2019; Nathan et al., 2016; Pardo & Cabella, 2018). Uruguay is clearly leading the way. This country exhibits the highest mean age at first birth but also the highest heterogeneity in the age at first birth, which has been attributed to increasing educational differentials (Cardozo & Iervolino, 2009; Nathan, 2015a; Varela Petito, Fostik, & Fernández Soto, 2012; Videgain, 2006). In Argentina, specifically, the age at first birth has not changed substantially between women born before 1960 and after 1980: an incipient postponement among the more advantaged groups was observed together with the persistence of early childbearing among the low socio-economic groups (Binstock, 2010; Mertehikian, 2022; Pardo & Cabella, 2018). While experiencing the increase in women's schooling, no substantial change in age at first birth was observed in Chile before the end of the 2000s, besides the postponement of first birth exclusively among women from high socio-economic groups (Fuentes et al., 2010).

Regarding the historical composition of their populations as well as the demographic, social, and cultural paths they have followed, Argentina, Chile, and Uruguay have a variety of characteristics in common like the significant influence of European immigration on cultural behaviors and the early development of welfare states (Binstock, Cabella, Salinas, & López-Colás, 2016). Argentina and Uruguay experienced the earliest fertility transition in Latin America, beginning in the late nineteenth century (Pantelides, 2006; Pellegrino, 2010). Fertility rates in Chile began falling later and from a considerably higher level than in Argentina and Uruguay in the early 1960s (Chackiel, 2004; Guzmán et al., 2006). These countries, together with Cuba, have been leading Latin America's fertility decline to sub-

[8] These authors examined the combined effect of changes in educational and age structures on the aggregate level of motherhood in adolescents. The effects of the age structure are important when comparing age-groups across time (e.g., 15-19), as the probability of having a child at a young age increases sharply with age. Changes in the age structure could be controlled if the analysis is restricted to a single year of age (e.g. 25) or considerably mitigated by using a shorter age interval (e.g., 19-20), as in the work of Rodriguez and San Juan (2020). In any case, the authors pointed out that changes in the educational structure have had a greater effect than changes in the age structure.

replacement levels, despite the differences in the beginning and progression of their fertility transitions.

However, there are differences between countries from the Southern Cone that influenced the fertility behaviors in each country. Due to its high rate of secularization and the weakening influence of the Church, Uruguay is at the forefront of legal reform and the acknowledgment of civil society demands (Binstock et al., 2016). For instance, divorce is legal in Uruguay since 1907; Chile's divorce laws were approved in the first decade of this century (2004), whereas Argentina's were approved toward the end of the 20th century (1987). More recently, Uruguay was the first country in the region where same-sex marriages and abortion under all conditions were made lawful (in 2010 and 2012, respectively), followed sometime after by Argentina.

Data

I used three data sources in this study: i) the 2011-2012 MICS4 survey, conducted in Argentina as part of the global MICS (Multiple Indicator Cluster Surveys) program implemented by UNICEF; (N=5,751)[9]; ii) the 2011 Survey of National Socioeconomic Characteristics (CASEN, for its Spanish acronym) for Chile (N=18,716), a large-scale survey that has been conducted by the Ministry of Social Development of Chile since 1990 to gather information on the socio-economic characteristics of its population[10]; and iii) the 2011 national population census for Uruguay (N=298,218), conducted by the National Institute of Statistics to obtain information on the demographic, social, and economic characteristics of the population[11]. These datasets have been used by scholars in studies about fertility timing at the national level (see Fanta & Tumas, 2020; Nathan, 2015a; Rodríguez et al., 2017).

Data on women's date or the age of the first birth - among those with at least one child ever born - were available in all selected data sources. While survey questionnaires in Argentina and Chile introduced a direct question to capture the age at first birth, the Uruguayan census asked the year of the first birth.[12] The proportion of women with missing

[9] The 2011-2012 MICS4 survey in Argentina collected information from a representative sample of households and individuals on a range of topics, including fertility and family planning, maternal and child health, education, and other indicators related to the well-being of children and women. The dataset was downloaded from http://mics.unicef.org/surveys on July 1, 2015.

[10] Dataset downloaded from http://observatorio.ministeriodesarrollosocial.gob.cl/encuesta-casen-2011 on July 1, 2015.

[11] Dataset downloaded from https://www.ine.gub.uy/ on July 1, 2015.

[12] The data for Chile shows a mild concentration of ages at first birth at 18, 20 and 30 (see Appendix, Figure A-1).

data for the timing of first birth for the selected cohorts was relatively low, ranging from 0.1% in Chile to 4.1% in Uruguay. Only respondents with complete data were analyzed in the present study.

For comparative purposes, women were grouped into three 5-year birth cohorts (1948-52, 1963-67, and 1978-82) and labeled as '1950', '1965', and '1980', respectively. It should be noted that the data for Argentina do not provide information about the reproductive experience of the 1948-1952 cohort, as only women under age 50 were surveyed in the MICS4. The number of cases and missing data in critical variables by country and cohort are displayed in the Appendix (

Table **A-1**).

I used UNESCO's International Standard Classification of Education (ISCED), 2011 revision, to categorize women according to their level of education in each country:

a) Low: up to incomplete secondary school (ISCED 0-2 and incomplete ISCED 3);
b) Medium: completed secondary school or incomplete tertiary education (completed ISCED 3 and incomplete ISCED 5-6);
c) High: completed short-cycle tertiary, bachelor's or equivalent level, Master or doctoral studies (completed ISCED 5-6 and ISCED 7-8).

The 2011-2012 MICS-4 and the 2011 CASEN original datasets include aggregated variables of the level of education and its completion (*xwelevel* and *educ*, respectively), which could be directly transformed into the specific variable of educational attainment used in this study. However, the 2011 census of Uruguay does not provide such information in a single variable. To compute the educational attainment of Uruguayan women, I combined the data from three original variables: the highest academic qualification (*niveledu_r*), the completion of that level –yes/no (*pered04_r*), and the entrance requirements in case of the technical-education path (*pered06_r*).

As this study relies on the highest level of education a woman has completed by the time of the survey/census, the results might be subject to reverse causality. Women who enter into motherhood at early ages are more likely to abandon education before attaining higher levels (Cohen, Kravdal, & Keilman, 2011; Tropf & Mandemakers, 2017). The issue of possible reverse causality could not be addressed here with the available data – the data do not provide information regarding the age at leaving education, so it is impossible to analyze the sequence of events. This study does not aim to establish a causal relationship between education and age at first birth, i.e., the ability to empirically determine whether the education factor is a determinant of fertility timing or vice versa. Also, the relationship between education and the timing of childbearing can be spurious (i.e., affected by

common observed or unobserved factors), reversed, or the result of an individual's simultaneous choice in the two life spheres (Balbo, Billari, & Mills, 2013).

Methods

Computation of cohort fertility tables

I applied the single-decrement life table method to compute the probability of remaining childless $\boldsymbol{S_0}$ at the exact age $\boldsymbol{x}$, by country, cohort, and educational group. The life table method has been regularly utilized by demographers as an effective approach to model the progression of women from childlessness to parity one and subsequent parities as they age (Jasilioniene et al., 2015; Ortega & Kohler, 2002).

In this study, the calculation of $\boldsymbol{S_0(x)}$ is analogous to the survival probability function in the life table. It assumes that all women are childless at age 12 (the onset of their reproductive lifespan). Therefore,

(1) $S_0(12) = 1$,

As they age, the proportion of women remaining childless at the beginning of each age interval is calculated as:

(2) $S_0(x) = 1 - \frac{B_1(x)}{W_0}$, for $12 < x < (30)45$

where $\boldsymbol{B_1(x)}$ is the number of women who had their first birth during the age interval 12 and x, and $\boldsymbol{W_0}$ is the number of childless women at age 12, corresponding to the size of the cohort. The proportion of childless women at any given age was analyzed at any single age within the 12 to 44 age-interval for the 1950 and 1965 cohorts, and the 12 to 29 age-interval for the 1980 cohorts. The *country* and *education* variables were introduced as time-constant variables in the correspondent fertility tables.

The estimates of $S_0(x)$ are displayed by cohort, country, and educational group. To enhance the visualization of the results, I used a three-years-of-age moving average to smooth the $S_0(x)$ curves in Argentina and Chile. I particularly focused on the values of $S_0(20)$ and $S_0(29)$ to examine fertility changes between cohorts regarding early and delayed childbearing, respectively.

Standardization and decomposition

I applied standardization and decomposition methods to separate the effects of changes in the age at first birth within each educational group (rate effect) from changes in the

distribution of women by educational group (composition effect), on the overall shift in $S_0(x)$ between the 1950 and 1980 cohorts. To perform the decomposition, it should be noted that,

(3) $$S_0(x) = \sum_{edu=low}^{high} \left[S_{0,edu}(x) \times w_{0,edu} \right] ,$$

where $w_{0,edu}$ is the proportion of childless women by educational group edu within a given country.

As an extension of the decomposition method developed by Kitagawa (1955), I decomposed the overall difference in the cumulated probability of being childless at age x between the 1950 and 1980 cohorts into rate and composition effects, in each country, using the following formula:

(4) $$S_0^{1980}(x) - S_0^{1950}(x) = \sum_{edu=low}^{high} \left[\left[S_{0,edu}^{1980}(x) - S_{0,edu}^{1950}(x) \right] \times \left[\frac{w_{0,edu}^{1950} + w_{0,edu}^{1980}}{2} \right] \right] +$$

$$\sum_{edu=low}^{high} \left[\left[\frac{S_{0,edu}^{1950}(x) + S_{0,edu}^{1980}(x)}{2} \right] \times \left[w_{0,edu}^{1980} - w_{0,edu}^{1950} \right] \right] ,$$

The first component of the equation $\left[S_{0,edu}^{1980}(x) - S_{0,edu}^{1950}(x) \right] \times \left[\frac{w_{0,edu}^{1950} + w_{0,edu}^{1980}}{2} \right]$ accounts for the contribution of changes in specific $S_0(x)$ within each educational group (rate effect), while the second component $\left[\frac{S_{0,edu}^{1950}(x) + S_{0,edu}^{1980}(x)}{2} \right] \times \left[w_{0,edu}^{1980} - w_{0,edu}^{1950} \right]$ indicates the contribution of changes in the educational structure of the female population in each country.

Thus, in each country, the rate effect provides the expected change in $S_0(x)$ if the population composition by education had remained as in the 1950 cohort. The composition effect, on the other hand, quantifies the difference in $S_0(x)$ if only changes in the educational structure had been observed between cohorts. As the data for the 1950 cohorts were only available for Chile and Uruguay, Argentina was excluded from this analysis.

Finally, I performed the direct standardization of $S_0(x)$ to evaluate the hypothetical evolution of cohorts' age at first birth in Chile and Uruguay if having experienced the pace of educational expansion of the other country,

(5) $$S'_0(x) = \sum_{edu=low}^{high} \left[S_{0,edu}(x) \times w'_{0,edu} \right] ,$$

where and cohort $w'_{0,edu}$ is the relative distribution by educational group used as a standard. To deliver the results, I compared the interpolated median ages at first birth derived from $S_0(x)$ and $S'_0(x)$ for 1950, 1965, and 1980 cohorts in each country. For this

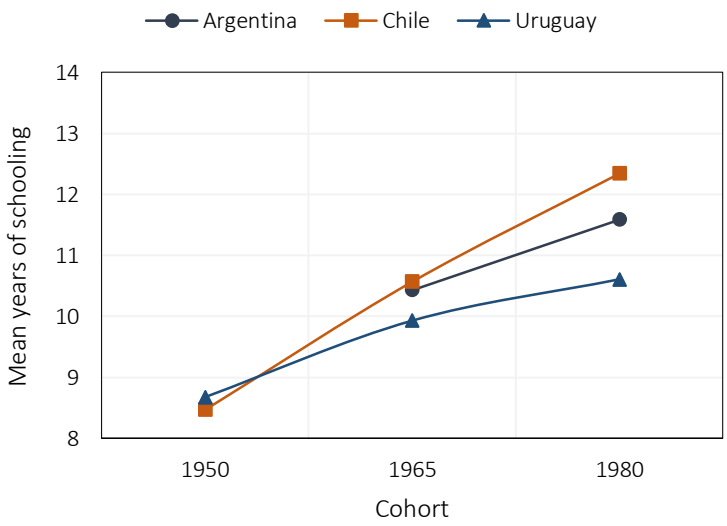
calculation, I applied linear interpolation between the lower- and upper-class boundaries of the age-interval containing the median of the distribution.

Results

The evolution of women's educational attainment across cohorts

In line with the literature, the data examined in this study show that the educational attainment of women in the Southern Cone has increased with successive cohorts, but the pace of this increase exhibited marked differences between countries. As illustrated in Figure 1, Chile went through a rapid educational expansion compared to Argentina and, notably, Uruguay. The mean years of schooling for women averaged around 8.5 years for the 1950 cohorts in Chile and Uruguay. While for the 1980 cohorts, this average had increased by four years in Chile, it had risen by just two in Uruguay. The path of change in Chile also departed from that of Argentina when observing the 1980 cohorts.

Figure 1. Mean years of schooling for women, by country and cohort

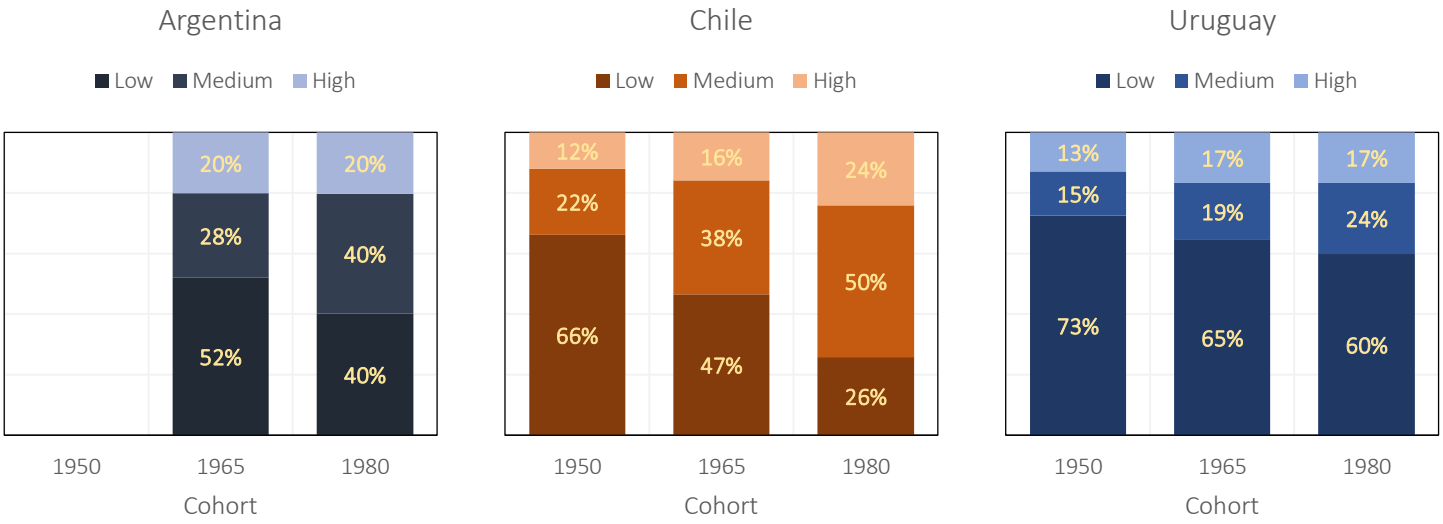


Source: Own computations using the 2011-2012 MICS4 for Argentina, the 2011 CASEN for Chile, and the 2011 Census for Uruguay.

The examination of the distribution of women by level of education illustrates the diverging trends in education within the Southern Cone. As shown in Figure 2 (also Figure A-1), the proportion of women with medium and high levels of education increased considerably in Chile, followed by Argentina, but less so in Uruguay. In Chile, three-quarters of women in the 1980 cohort attained at least 12 years of schooling; in Argentina, the percentage was

60%; in Uruguay, less than 40%. Yet, if just the number of women with completed tertiary education (high education) is compared, differences between countries become smaller: 24% in Chile, 20% in Argentina, and 17% in Uruguay, for the 1980 cohorts.

Figure 2. Distribution of women by educational attainment, country, and cohort



Source: Own computations using the 2011-2012 MICS4 for Argentina, the 2011 CASEN for Chile, and the 2011 Census for Uruguay.

Note: Low = less than completed secondary school; Medium = completed secondary and less than completed tertiary education; High = completed tertiary education.

Changes in the timing of first birth across cohorts and educational groups

Figure 3 provides an overview of changes in the cumulative probability of being childless at a given age, by country and cohort. Noticeably, the youngest cohorts from Argentina and Uruguay experienced an earlier entry into motherhood compared with their older counterparts. In Uruguay, for instance, the proportion of childless women at the exact age of 20 decreased from 83% to 75% between the 1950 and 1980 cohorts. This pattern was not observed in Chile as the percentage of childless women by age 20 increased slightly (from 68% to 71%).

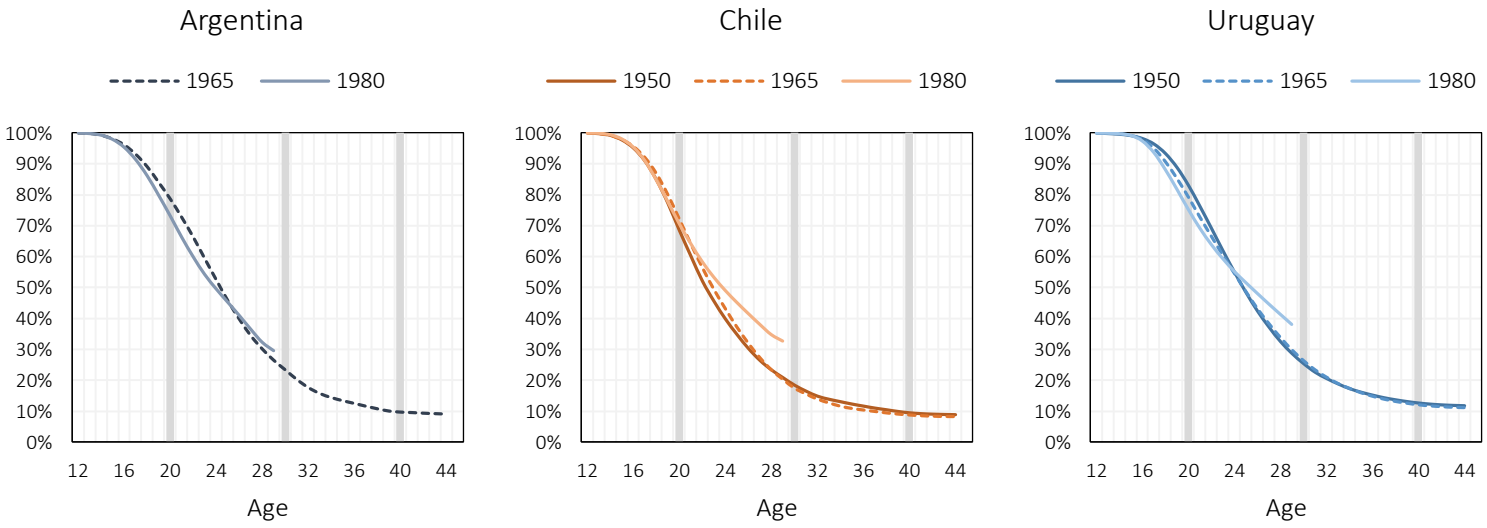
On the other hand, the observed higher number of childless women from age 25 in examined countries evidences a shift towards a later entry into motherhood with subsequent cohorts. The proportion of childless women at age 29 increased from 20% to 33% in Chile and 30% to 38% in Uruguay between the 1950 and 1980 cohorts. Weaker signs of fertility postponement were found in Argentina, as indicated by a modest increase between the 1965 and the 1980 cohorts (26% to 30%).

These two opposing trends observed among the youngest cohorts in the Southern Cone (i.e., a higher probability of entering into motherhood before age 25 and a delayed transition to first birth), especially in Uruguay, define the pattern of increasing heterogeneity of age at first birth in the Southern Cone.

Finally, the proportion of lifetime childlessness (i.e., at age 40) among women with completed fertility trajectories (1950 and 1965 cohorts) remained stable in all three countries, with Uruguay showing the highest proportion (12%) and Chile the lowest (8%).

Figure 3. Cumulative proportion of childless women at a given age, by country and cohort

[Age range: 12-44; ages 20, 30 and 40 are highlighted]



Source: Own computations using the 2011-2012 MICS4 for Argentina, the 2011 CASEN for Chile, and the 2011 Census for Uruguay.

As shown in Figure 4, the timing of first birth has evolved differently across educational groups. Overall, women from the low educational group in the 1980 cohorts experienced an earlier entry into motherhood than previous cohorts: the cumulative probability of having the first birth by age 20 increased from 40% to 54% in Chile and from 22% to 38% in Uruguay, between the 1950 and 1980 cohorts. This trend was already visible in Uruguay in women born around 1965 but did not appear in Chile until the 1980 cohort. The cumulative proportion of mothers by the age of 20 also increased in Argentina, reaching 46% of women in the 1980 cohort.

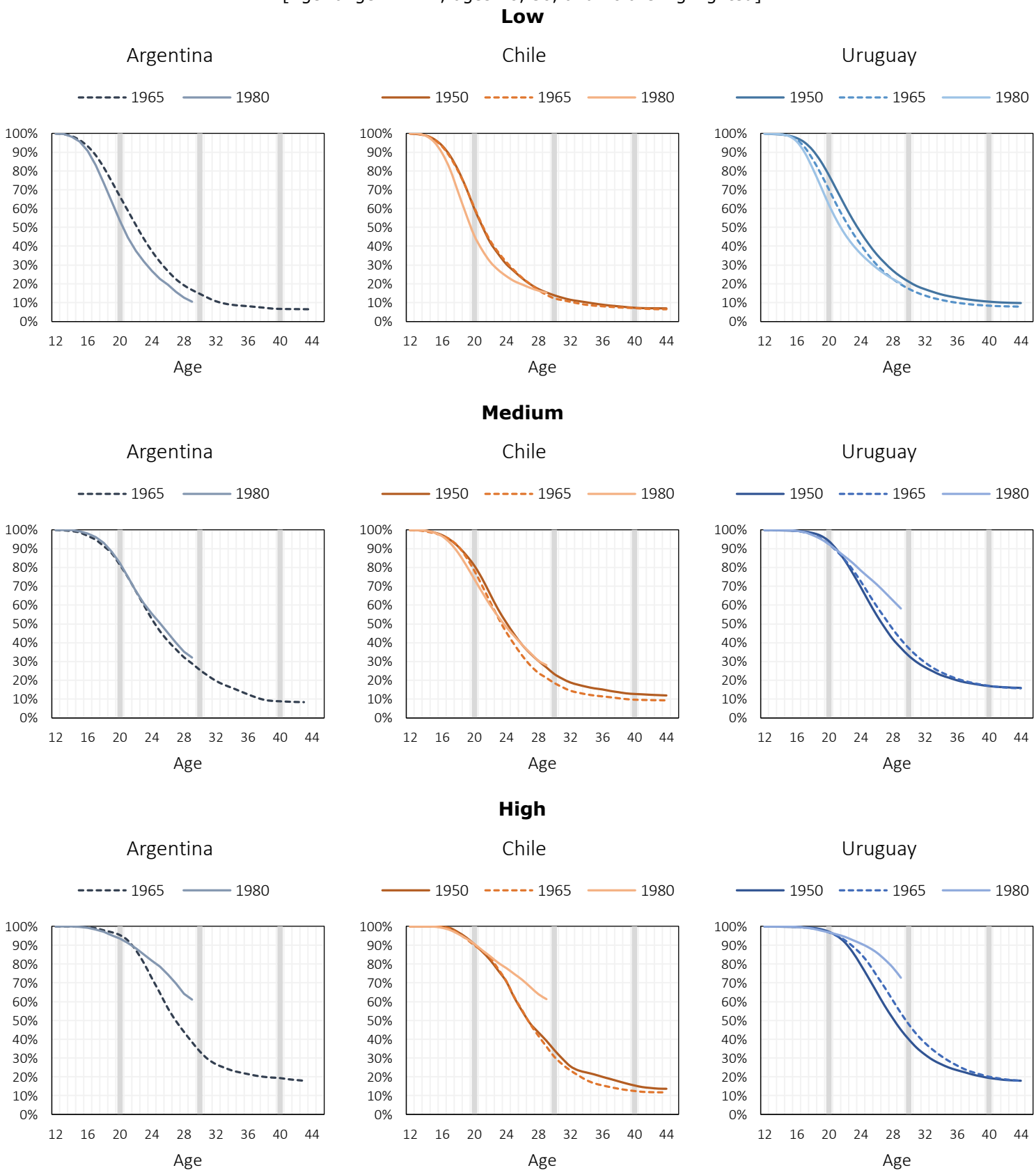
Differences between countries regarding the evolution of the behavior among the medium educational group are noteworthy. A shift towards a later onset of childbearing was observed in Uruguay but not in Argentina and Chile. The proportion of childless women by age 29 for those with a medium level of education increased from 37% (1950) to 58% (1980) in Uruguay, reaching a much higher percentage than that seen in women from Argentina (30%) and Chile (27%). Remarkably, those with a medium level of education in Argentina and Chile showed a similar pattern of behavior to women in the low-education group. Moreover, the 1980 cohorts in these two countries were more likely to experience their first birth at young ages than their older counterparts.

The postponement of first birth and higher ultimate childlessness were observed among the highly educated across all countries. The delay of first birth among this educational group started earlier in Argentina and Uruguay than in Chile. However, women in Chile exhibited a rapid shift towards postponement between the 1965 and 1980 cohorts (from 36% to 61%), catching up with Argentina. The delay in the transition to motherhood was remarkably high in Uruguay: the proportion of childless women at 29 reached 73% in the 1980 cohort.

Described changes across cohorts in Southern Cone countries indicate increasing gaps in the age at first birth between low and high educational groups with corresponds to the notion of reproductive polarization. Thus, as more women are attaining higher levels of education, the educational gradient of first-birth timing has become steeper, possibly limiting the potential role of educational expansion in the transition towards a late fertility regime in examined countries.

Figure 4. Cumulative proportion of childless women at a given age, by education, country, and cohort

[Age range: 12-44; ages 20, 30, and 40 are highlighted]



The role of educational expansion on the timing of first birth in Chile and Uruguay

As discussed in the methods section, differences in the cumulative proportion of childlessness at a given age between the 1950 and 1980 cohorts can be separated into changes in the educational distribution of women (composition effect) and changes in the first-birth intensities within each educational group (rate effect). The results of this decomposition analysis are presented in Figure 5. As also mentioned in the methods section, this analysis comprises Chile and Uruguay because no data for the 1950 cohort was available for Argentina.

Figure 5 shows the results of the decomposition analysis. Differences in the cumulative proportion of childless women by age between the 1950 and 1980 cohorts are expressed in percentage points; the curve labeled as 'Total' exhibits the overall differences between these two cohorts in each country. For instance, as there were almost no differences between the 1950 and 1980 cohorts in the probability of entering motherhood at early ages in Chile, the value remains close to zero until age 20. Conversely, Uruguay's total curve shows negative values between ages 15 to 24, as a higher proportion of women from the 1980 cohort were having their first birth at young ages compared to the 1950 cohort, peaking at age 20. When differences turn positive it means that the proportion of childless women at a specific age is higher in the 1980 cohort than in 1950 cohort, indicating a type of behavior associated with the postponement of childbearing.

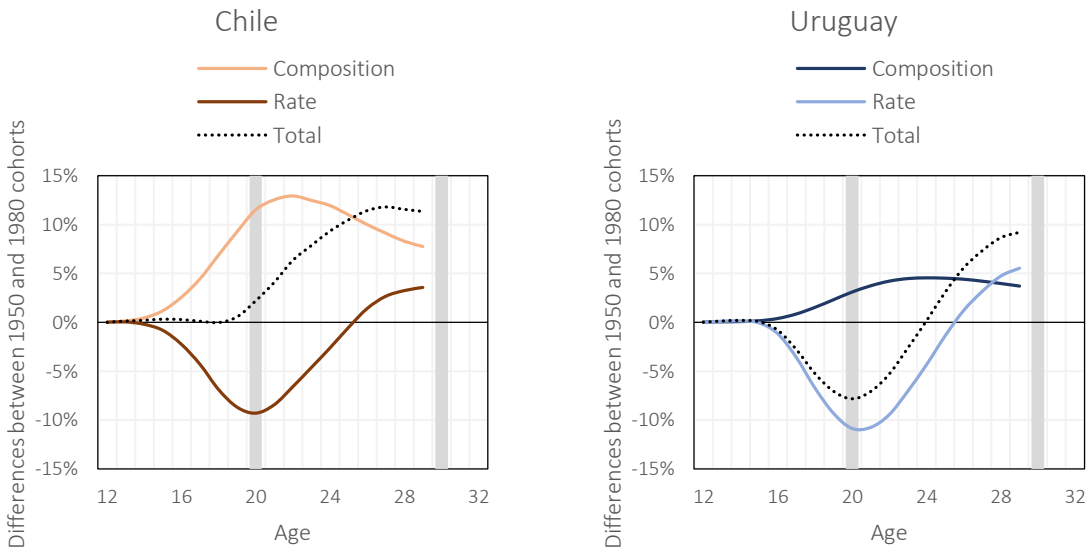
The magnitude of the educational composition effect was remarkably higher in Chile than in Uruguay and high enough to cancel out the negative impact of the differences in age-specific first-birth intensities between cohorts. In other words, the effect of higher first-birth probabilities at early ages observed in the 1980 cohort was neutralized by the upward educational mobility experienced by the female cohorts in Chile. That was not the case in Uruguay, where the balance between composition and rate effects produced negative differences in the overall proportion of childlessness before 25 years.

Notably, without considering the effects of the educational expansion, the pattern of change between the 1950 and 1980 cohort would have been the same in Chile and Uruguay ('Rate' effect curve). Women from the 1980 cohort were more likely to enter into motherhood at younger ages than their counterparts from 1950 due to increasing probabilities of having the first child by age 20 among the less educated. The negative contribution of this factor becomes smaller in older ages and turns positive from age 25. In the 25-29 age range of childbearing, both the composition and the rate effects contributed in the same direction. As a result, the proportion of childless women increased

by ten percentage points in Chile and between five and ten percentage points in Uruguay, between the 1950 and 1980 cohorts.

Figure 5. Decomposition of differences in the cumulative proportion of childless women by age between the 1950 and the 1980 cohorts, into composition and rate effects, by country

[Age range: 12-44; ages 20 and 30 are highlighted]



Source: Own computations using data from the 2011 CASEN for Chile and the 2011 Census for Uruguay.
Note: The composition effect is produced by changes in the distribution of women by educational attainment, and the rate effect by changes in age-specific first-birth probabilities within each educational group.

What would the speed of fertility postponement in Uruguay have been if the educational composition of female cohorts had evolved as it did in Chile? To answer that question, observed and standardized median ages at first birth were calculated (Table 1). Differences between actual and standardized median ages are very low for the starting cohorts (0.2 years), as Chile and Uruguay exhibited a similar distribution of women by level of education. But, due to the increasing gaps between countries regarding the educational composition of successive cohorts, the differences between observed and standardized ages at first birth become larger. For instance, Uruguay could have reached a median age at first birth in the 1980 cohort that is almost 4 years higher if having experienced the pace of educational expansion observed in Chile (29.4 years), similar to those observed in late-fertility regimes from developed countries.

In summary, while educational expansion could have played a substantial role in the transition towards a late-fertility setting in the Southern Cone region, results show that it

has had a limited impact. Rapid educational expansion, as in the case of Chile and to a lesser extent in Argentina, has been accompanied by a novel emerging shift towards delayed entry into motherhood among the highly educated from the 1980 cohort. On the other hand, in the case of Uruguay, a slower educational expansion has developed with a historically-rooted and substantial shift in the age at first birth of medium and high-educated groups, positioning this country as the forerunner of the postponement transition in the region despite having the modest improvements in education compared with its neighbor countries.

Table 1. Observed and standardized median ages at first birth, by country and cohort

	Chile			Uruguay		
	Observed	Standardized	Differences	Observed	Standardized	Differences
1950	22.3	22.1	-0.2	24.8	24.9	0.2
1965	22.9	22.5	-0.4	24.8	25.7	0.9
1980	23.8	21.4	-2.4	25.5	29.4	3.9
Differences*	1.5	-0.8		0.7	4.5	

* Differences between values from the 1950 and 1980 cohorts.

Source: Own computations using the 2011 CASEN for Chile and the 2011 Census for Uruguay.

Discussion

Countries from the Southern Cone share various demographic, social, and historical traits that set them apart from the rest of Latin America. Previous studies have stressed that these countries have been at the forefront of the transition to a late fertility regime in the region. Notwithstanding these similarities between these countries, there are differences regarding their rate of secularization, economic development, and social inequalities, that have influenced the characteristics of the fertility transition at the national level.

This study focused on the differences regarding educational expansion and its association with changes in the timing of first birth. While Chile experienced a rapid increase in the proportion of women with completed secondary and post-secondary between the 1950 and 1980 cohorts, the pace of educational expansion has been lower in Argentina and very low in Uruguay. The data used in this study show that the proportion of women with at least completed secondary school was 74% in Chile, 60% in Argentina, and 40% in Uruguay when considering the educational attainment of the 1980 cohorts.

The results for Southern Cone's countries evidenced that the advancement of the educational expansion does not correlate with the overall age at first birth. Despite having a higher proportion of women with unfinished secondary school than Argentina and Chile, Uruguay is most advanced regarding the postponement of childbearing compared to Argentina and Chile. Almost 40% of women in Uruguay from the 1980 cohort remain childless by the end of their 20s, while the proportion is 33% in Chile and 30% in Argentina. In Chile, the prevailing cultural and social norms regarding family formation, as well as fewer opportunities for women to participate in the labor force, may have offset the impact of the rapid expansion of education on the timing of first birth.

By computing the cumulative probability of remaining childless between ages 12-45 by educational group among the 1950, 1965, and 1980 cohorts, this study documents the shift towards a later entry into motherhood among younger generations of women with completed tertiary education in the Southern Cone. Only in Uruguay, this trend is also visible for those with completed secondary school,[13] which indicates that the level of education that defines the threshold to a postponement type of behavior is context-based. Moreover, women from the medium-educated group in Uruguay were almost as likely to delay the transition to motherhood than those with completed tertiary education in Argentina and Chile.

As less than half of the examined cohorts finished secondary school, it is reasonable to presume that women who complete secondary school in Uruguay belong to more advantaged socio-economic groups, are more career-oriented, and have fewer expectations of motherhood. In Chile, selectivity mechanisms start once individuals finish secondary school as opportunities to pursue tertiary education are limited and costly (Filgueira, Filgueira, & Fuentes, 2003). Also, Uruguay has a state university that is entirely free of charge and that is attended by the majority of the country's tertiary-level students. This university permits students to work and study concurrently by offering flexible hours and by not requiring specific grades or yearly progress to remain in a degree program. This also results in lengthy academic careers that usually last past the age of 30. In Chile, academic careers are shorter, working and studying are more challenging to combine, and access to higher education is more unequal. Also, female participation in the labor market has been historically low (Yopo Díaz, 2018). The case of Argentina, on the other hand, is quite puzzling. Having higher levels of completed secondary education than Uruguay but lower levels of female labor force participation –although higher than in Chile, Argentina shows weaker signs of postponement among the highly educated which could be explained due to the elevated heterogeneity observed in fertility behaviors between provinces and

[13] In this regard, Nathan (2015a) showed that the postponement of first birth among subsequent generations have been displayed by women with 10+ years of schooling.

socio-demographic groups (Binstock, 2010; Mertehikian, 2022; Pelaez, Lema Cuesta, Pastorino, Trincheri, & Viganó, 2022).

Introducing a simple extension of the classic standardization and decomposition method developed by Kitagawa (1955), I analyzed the rate and composition effects on the overall difference in the probability of being childless at certain ages between the 1950 and 1980 cohorts in Chile and Uruguay. Results from the decomposition analysis showed a similar pattern of behavioral change within educational groups (rate effect) in Chile and Uruguay: increasing probabilities of experiencing the first birth at younger ages and delayed entry into motherhood when comparing the 1950 and 1980 cohorts. Therefore, the difference in the overall inter-cohort change between Chile and Uruguay is mainly explained by composition effects –i.e., the magnitude of change in the educational structure between the 1950 and 1980 cohorts.

A non-desired effect of rapid educational expansion is the decreasing quality of education and learning outcomes due to the tradeoff between quantity and quality (Grant, 2015). This has been argued in recent work to explain the inconsistency between educational expansion and the timing of family transitions in Latin American countries (Bongaarts et al., 2017; Esteve, Castro-Martín, & Castro Torres, 2022; Esteve & Florez-Paredes, 2018). Following this argument, it should be expected that students' learning outcomes in Chile might be adversely affected by the rapid expansion of education at the secondary level. However, this hypothesis is not supported by PISA results (Méndez & Zerpa, 2011; UNESCO et al., 2022).

The differences in the timing of first birth between educational groups have increased with successive cohorts in all countries, resulting in high adolescent fertility rates and early childbearing among less-educated women. The reasons for this trend are still unclear, but factors such as changes in sexual and reproductive behavior, socio-economic inequality, and insufficient awareness and knowledge about contraceptive use have been discussed (Batyra, 2019; ECLAC, 2012; Esteve & Florez-Paredes, 2018; Lima et al., 2018; Nathan, 2015a).

However, the prevalence of high adolescent fertility rates that have been observed in the Southern Cone until recent years may be nearing its conclusion. In addition to the steady decline exhibited by Chile since the late 2000s, Argentina and Uruguay have shown an unexpectedly drastic decrease in adolescent fertility since 2015, after several decades of rates fluctuating between 60 and 70 births per one thousand women (Cabella, Nathan, & Pardo, 2019; Dirección General de Población, 2021; Pelaez et al., 2022). This turning point seems not to reflect structural changes but rather a shift in attitudes toward adulthood and parenthood in the time of social media and virtual interactions, which are shaping a

new era of intimate relationships and contraceptive use among young people. All in all, the observed trends from last years, could be a sign of the consolidation of low and late fertility settings in the region, which could be confirmed over the coming years. On the other hand, as more women are progressing through the educational ladder, the high-education group has become more heterogeneous regarding the socioeconomic background of individuals, their aspirations and lifestyles, and fertility behavior (Castro Torres et al., 2022).

In summary, the results of this study highlight the need for a more nuanced understanding of the relationship between educational expansion and fertility postponement in Latin America. Since educational expansion has a positive composition effect on the timing of first birth, the key to unpacking its role still resides in the factors affecting the evolution of the fertility behavior within each educational group (i.e., changes in the educational gradient). Based on the data for Southern Cone countries, this study raises the critical role displayed by contextual and institutional factors in equalizing the impact of educational expansion and shaping how the postponement transition unfolds in the region.

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References

Balbo, N., Billari, F. C., & Mills, M. (2013). Fertility in Advances Societies: A Review of Research. *European Journal of Population*, *29*(1), 1–38. https://doi.org/10.1007/s10680-012-9277-y

Batyra, E. (2019). Increasing Educational Disparities in the Timing of Motherhood in the Andean Region: A Cohort Perspective. *Population Research and Policy Review*. https://doi.org/10.1007/s11113-019-09535-0

Beaujouan, E., Brzozowska, Z., & Zeman, K. (2016). The limited effect of increasing educational attainment on childlessness trends in twentieth-century Europe, women born 1916–65. *Population Studies*, *70*(3), 275–291. https://doi.org/10.1080/00324728.2016.1206210

Billari, F. C., Kohler, H.-P., Andersson, G., & Lundström, H. (2007). Approaching the Limit: Long-Term Trends in Late and Very Late Fertility. *Population and Development Review*, *33*(1), 149–170.

Billari, F. C., Liefbroer, A. C., & Philipov, D. (2006). The Postponement of Childbearing in Europe: Driving Forces and Implications. *Vienna Yearbook of Population Research*, 1–17. https://doi.org/10.1553/populationyearbook2006s1

Billari, F. C., & Philipov, D. (2004). *Education and transition to motherhood: A comparative analysis of Western Europe* (No. 3). *European Demographic Research Papers*. Vienna Institute of Demography.

Binstock, G. (2010). Tendencias sobre la convivencia, matrimonio y maternidad en áreas urbanas de Argentina. *Revista Latinoamericana de Población*, *3*(6), 129–146. https://doi.org/10.31406/relap2010.v4.i1.n6.7

Binstock, G., Cabella, W., Salinas, V., & López-Colás, J. (2016). The Rise of Cohabitation in the Southern Cone. In A. Esteve & R. Lesthaeghe (Eds.), *Cohabitation and Marriage in the Americas: Geo-historical Legacies and New Trends* (pp. 247–268). Cham: Springer. https://doi.org/10.1007/978-3-319-31442-6_9

Bongaarts, J., Mensch, B. S., & Blanc, A. K. (2017). Trends in the age at reproductive transitions in the developing world: The role of education. *Population Studies*, *71*(2), 139–154. https://doi.org/10.1080/00324728.2017.1291986

Bongaarts, J., & Watkins, S. C. (1996). Social Interactions and Contemporary Fertility Transitions. *Population and Development Review*, *22*(4), 639–682. https://doi.org/10.2307/2137804

Bozon, M., Gayet, C., & Barrientos, J. (2009). A Life Course Approach to Patterns and Trends in Modern Latin American Sexual Behavior. *Journal of Acquired Immune Deficiency Syndromes*, *51*, S4–S12. https://doi.org/10.1097/QAI.0b013e3181a2652f

Cabella, W., Nathan, M., & Pardo, I. (2019). La caída de la fecundidad en Uruguay entre 2015 y 2018. In M. de S. P. y U. de la R. Fondo de Población de las Naciones Unidas (Ed.), *Descenso acelerado de la fecundidad en Uruguay entre 2015 y 2018. Tres estudios para su análisis* (pp. 33–70). Montevideo: UNFPA, MSP y UNiversidad de la República.

Cardozo, S., & Iervolino, A. (2009). Adiós juventud: tendencias en las transiciones a la vida adulta en Uruguay. *Revista de Ciencias Sociales*, *22*(25), 60–81.

Castro Torres, A. F., Batyra, E., & Myrskylä, M. (2022). Income Inequality and Increasing Dispersion of the Transition to First Birth in the Global South. *Population and Development Review*, *48*(1), 189–215. https://doi.org/10.1111/padr.12451

Chackiel, J. (2004). La transición de la fecundidad en América Latina 1950-2000. *Papeles de Población*, *10*(41), 9–58. Retrieved from http://www.scielo.org.mx/pdf/pp/v10n41/v10n41a2.pdf

Cohen, J. E., Kravdal, Ø., & Keilman, N. (2011). Childbearing impeded education more than education impeded childbearing among Norwegian women. *Proceedings of the National Academy of Sciences of the United States of America*, *108*(29), 11830–11835. https://doi.org/10.1073/pnas.1107993108

Dirección General de Población. (2021). *La natalidad y fecundidad en Argentina entre 1980 y 2019*. Retrieved from https://www.argentina.gob.ar/sites/default/files/2021/09/natalidad_y_fecundidad_en_argentina.1980_a_2019.dnp_resumen_ejecutivo_nacional_final.pdf

ECLAC. (2012). *Social panorama of Latin America* (Vol. 1). Santiago de Chile: ECLAC-UNFPA. https://doi.org/10.1017/CBO9781107415324.004

Esteve, A., Castro-Martín, T., & Castro Torres, A. F. (2022). Families in Latin America: Trends, Singularities, and Contextual Factors. *Annual Review OfSociology*, *48*, 485–505.

Esteve, A., & Florez-Paredes, E. (2018). The Stability Paradox: Why Expansion of Women's Education Has Not Delayed Early Union Formation or Childbearing in Latin America. *Studies in Family Planning*, *49*(2), 127–142. https://doi.org/10.1111/sifp.12055

Fanta, J., & Tumas, N. (2020). Sincronicidades entre la transición sanitaria y la segunda

transición demográfica en Argentina durante la primera década del siglo XXI Synchronicities between the Health Transition and the Second Demographic Transition in Argentina during the First Decade. *Revista Latinoamericana de Población*, *14*(27), 257–295.

Filgueira, C., Filgueira, F., & Fuentes, A. (2003). School Attainment and Transitions to Adulthood. In S. Duryea, A. Cox Edwards, & M. Ureta (Eds.), *Critical decisions at a critical age: adolescents and young adults in Latin America* (pp. 179–218). Washington: Inter-American Development Bank.

Fuentes, A., Jesam, C., Devoto, L., Angarita, B., Galleguillos, A., Torres, A., & Mackenna, A. (2010). Postergación de la maternidad en chile: Una realidad oculta. *Revista Medica de Chile*, *138*(10), 1240–1245. https://doi.org/10.4067/s0034-98872010001100005

Grant, M. J. (2015). The Demographic Promise of Expanded Female Education: Trends in the Age at First Birth in Malawi. *Population and Development Review*, *41*(3), 409–438. https://doi.org/10.1111/j.1728-4457.2015.00066.x

Gustafsson, S. (2001). Optimal age at motherhood. Theoretical and empirical considerations on postponement of maternity in Europe. *Journal of Population Economics*, *14*(2), 225–247. https://doi.org/10.1007/s001480000051

Gustafsson, S., & Kalwij, A. (2006). *Education and Postponement of Maternity. Economic Analyses for Industrialized Countries*. (S. Gustafsson & A. Kalwij, Eds.), *European Studies of Population*. The Netherlands: Springer. https://doi.org/10.1017/CBO9781107415324.004

Guzmán, J. M., Rodríguez, J., Martínez, J., Contreras, J. M., & González, D. (2006). The Demography of Latin America and the Caribbean since 1950. *Population (English Edition)*, *61*(5), 519–620. https://doi.org/10.3917/popu.605.0623

Jasilioniene, A., Jdanov, D. A., Sobotka, T., Andreev, E. M., Zeman, K., & Shkolnikov, V. . M. (2015). *Methods Protocol for the Human Fertility Database* (Human Fertility Database). Retrieved from http://www.humanfertility.org/Docs/methods.pdf

JejeeBhoy, S. J. (1995). *Women's Education, Autonomy, and Reproductive Behaviour*. Oxford: Oxford University Press.

Kitagawa, E. M. (1955). Components of a Difference Between Two Rates. *Journal of the American Statistical Association*, *50*(272), 1168–1194.

Kohler, H.-P., Billari, F. C., & Ortega, J. A. (2002). The Emergence of the Lowest-Low

Fertility in Europe during the 1990s. *Population and Development Review*, *28*(4), 641–680.

Lesthaeghe, R. (2010). The unfolding story of the second demographic transition. *Population and Development Review*, *36*(2), 211–251. https://doi.org/10.1111/j.1728-4457.2010.00328.x

Lesthaeghe, R. (2014). The second demographic transition: A concise overview of its development. *Proceedings of the National Academy of Sciences*, *111*(51), 18112–18115. https://doi.org/10.1073/pnas.1420441111

Lima, E. E. C., Zeman, K., Sobotka, T., Nathan, M., & Castro, R. (2018). The Emergence of Bimodal Fertility Profiles in Latin America. *Population and Development Review*, *4*(1), 723–743. https://doi.org/10.1111/padr.12157

McLanahan, S. (2004). Diverging Destinies: How Children are Faring under the Second Demographic Transition. *Demography*, *41*(4), 607–627. https://doi.org/10.1353/dem.2004.0033

Méndez, N., & Zerpa, M. (2011). Desigualdad en las capacidades educativas. Los casos de Uruguay y Chile. *Revista de Economía*, *18*(1), 153–197.

Mertehikian, Y. (2022). Argentina's fertility regime (1980-2010): the end of the first demographic transition or an emergent second one? *Revista Brasileira de Estudos de População*, *39*, 1–29.

Mills, M., Rindfuss, R. R., McDonald, P., & te Velde, E. (2011). Why do people postpone parenthood? Reasons and social policy incentives. *Human Reproduction Update*, *17*(6), 848–860. https://doi.org/10.1093/humupd/dmr026

Nathan, M. (2015a). La creciente heterogeneidad en la edad al primer hijo en el Uruguay: un análisis de las cohortes de 1951 a 1990. *Notas de Población*, *100*, 35–60.

Nathan, M. (2015b). La lenta transición hacia un régimen de fecundidad tardía en Uruguay: los cambios en la edad al primer hijo entre 1978 y 2011. *Revista Latinoamericana de Población*, *9*(17), 37–60.

Nathan, M., & Pardo, I. (2019). Fertility Postponement and Regional Patterns of Dispersion in Age at First Birth: Descriptive Findings and Interpretations. *Comparative Population Studies*, *44*, 37–60. https://doi.org/10.12765/CPoS-2019-07en

Nathan, M., Pardo, I., & Cabella, W. (2016). Diverging patterns of fertility decline in Uruguay. *Demographic Research*, *34*(20), 563–586.

https://doi.org/10.4054/DemRes.2016.34.20

Neels, K., & De Wachter, D. (2010). Postponement and recuperation of Belgian fertility: How are they related to rising female educational attainment? *Vienna Yearbook of Population Research*, *8*(1), 77–106. https://doi.org/10.1553/populationyearbook2010s77

Neels, K., Murphy, M., Ní Bhrolcháin, M., & Beaujouan, É. (2017). Rising Educational Participation and the Trend to Later Childbearing. *Population and Development Review*, *43*(4), 667–693. https://doi.org/10.1111/padr.12112

Ní Bhrolcháin, M., & Beaujouan, É. (2012). Fertility postponement is largely due to rising educational enrolment. *Population Studies*, *66*(January 2013), 311–327. https://doi.org/10.1080/00324728.2012.697569

Ortega, J. A., & Kohler, H.-P. (2002). *Measuring Low Fertility: Rethinking Demographic Methods*. *Max Planck Institute for Demographic Research Working Paper* (Vol. 1).

Pantelides, E. A. (2006). *La transición de la fecundidad en la Argentina 1869-1947*. *Cuaderno del CENEP* (Vol. 54). Buenos Aires.

Pardo, I., & Cabella, W. (2018). A Bimodal Pattern in Age at First Birth in Southern Cone. *Population Review*, *57*(2), 1–22.

Pelaez, E., Lema Cuesta, C. D., Pastorino, L. A., Trincheri, T. M., & Viganó, A. (2022). La fecundidad en Argentina a inicios del siglo XXI: ¿el fin de la meseta? El papel de la educación en los cambios. *Revista Brasileira de Estudos de População*, *39*(e0224), 1–22.

Pellegrino, A. (2010). *La población de Uruguay. Breve caracterización demográfica*. Montevideo: UNFPA.

Perelli-Harris, B., Sigle-Rushton, W., Kreyenfeld, M., Lappegård, T., Keizer, R., & Berghammer, C. (2010). The Educational Gradient of Childbearing within Cohabitation in Europe. *Population and Development Review*, *36*(4), 775–801. https://doi.org/10.1111/j.1728-4457.2010.00357.x

Ravanera, Z. R., & Rajulton, F. (2006). Social Status Polarization in the Timing and Trajectories to Motherhood. *Canadian Studies in Population*, *33*(2), 179–207.

Raymo, J. M., Carlson, M., VanOrman, A., Lim, S., Perelli-Harris, B., & Iwasawa, M. (2015). Educational differences in early childbearing: A cross-national comparative study. *Demographic Research*, *33*(3), 65–92. https://doi.org/10.4054/DemRes.2015.33.3

Rendall, M., Aracil, E., Bagavos, C., Couet, C., De Rose, A., Di Gulio, P., … Verropoulou, G. (2010). Increasingly heterogeneous ages at first birth by education in Southern-European and Anglo-American family-policy regimes: A seven-country comparison. *Population Studies*, *64*(3), 209–227. https://doi.org/10.1016/j.freeradbiomed.2008.10.025

Rendall, M., Ekert-Jaffé, O., Joshi, H., Lynch, K., & Mougin, R. (2009). Universal versus economically polarized change in age at first birth: A French-British comparison. *Population and Development Review*, *35*(1), 89–116. https://doi.org/10.1111/j.1728-4457.2009.00262.x

Rindfuss, R. R., Morgan, S. P., & Offutt, K. (1996). Education and the Changing Age Pattern of American Fertility: 1963-1989. *Demography*, *33*(3), 277–290. Retrieved from http://www.jstor.org/stable/2061761

Rodríguez, J. (2013). *High adolescent fertility in the context of declining fertility in Latin America*. New York: United Nations, Department of Economic and Social Affairs, Population Division, Expert Paper No. 2013/14.

Rodríguez, J., & Cavenaghi, S. (2014). Adolescent and youth fertility and social inequality in Latin America and the Caribbean: What role has education played? *Genus*, *70*(1), 1–25. https://doi.org/10.4402/genus-543

Rodriguez, J., & San Juan, V. (2020). *Maternidad, fecundidad y paridez en la adolescencia y la juventud. Continuidad y cambio en América Latina*. *Población y Desarrollo* (Vol. 131). Santiago de Chile.

Rodríguez Vignoli, J., Páez, K., Ulloa, C., & Cox, L. (2017). *Reproduccion en la adolescencia en Chile: la desigualdad continua y urgen politicas activas* (Población y Desarrollo No. 116). *Serie Población y Desarrollo* (Vol. 116). Santiago de Chile. Retrieved from https://www.cepal.org/es/publicaciones/41135-reproduccion-la-adolescencia-chile-la-desigualdad-continua-urgen-politicas

Rosero-Bixby, L., Castro-Martín, T., & Martín-García, T. (2009). Is Latin America starting to retreat from early and universal childbearing? *Demographic Research*, *20*(9), 169–194. https://doi.org/10.4054/DemRes.2009.20.9

Sobotka, T. (2004). *Postponement of Childbearing and Low Fertility in Europe*. Doctoral dissertation, Ph.D. Thesis, Amsterdam University Press.

Sobotka, T. (2008). Overview Chapter 6: The diverse faces of the second demographic transition in Europe. *Demographic Research - Special Collection 7: Childbearing*

Trends and Policies in Europe, *19*(8), 171–224. https://doi.org/10.4054/DemRes.2008.19.8

Sobotka, T. (2010). Shifting Parenthood to Advanced Reproductive Ages: Trends, Causes and Consequences. In J. Tremmel (Ed.), *A Young Generation Under Pressure?* (pp. 129–154). Springer Berlin Heidelberg. https://doi.org/10.1017/CBO9781107415324.004

Sobotka, T. (2017). *Post-Transitional Fertility: Childbearing Postponement and the Shift to Low and Unstable Fertility Levels*. *Vienna Institute of Demography Working Paper* (Vol. 01/2017). Retrieved from http://www.humanfertility.org/cgi-bin/reports.php.

Tropf, F. C., & Mandemakers, J. J. (2017). Is the Association Between Education and Fertility Postponement Causal? The Role of Family Background Factors. *Demography*, *54*(1), 71–91. https://doi.org/10.1007/s13524-016-0531-5

UNESCO. (2013). *Situación Educativa de América Latina y el Caribe: Hacia la educación de calidad para todos al 2015*. Santiago de Chile: OREALC/UNESCO. Retrieved from http://works.bepress.com/cgi/viewcontent.cgi?article=1009&context=cesar_guadalupe

UNESCO, UNICEF, & CEPAL. (2022). *La encrucijada de la educación en América Latina y el Caribe. Informe regional de monitoreo ODS4-Educación 2030*. Santiago de Chile: UNESCO.

Varela Petito, C., Fostik, A., & Fernández Soto, M. (2012). Maternidad en la juventud y desigualdad social. *Cuadernos Del UNFPA*, *6*(6). Retrieved from http://www.inju.gub.uy/innovaportal/file/22505/1/unfpa_cuaderno6_final_web.pdf

Vasireddy, S., Berrington, A., Kuang, B., & Kulu, H. (2022). *Education and fertility in Europe in the last decade: A review of the literature* (Center for Population Change, Working Paper No. 103).

Videgain, K. (2006). *Análisis de los cambios en la transición a la adultez en mujeres de distintas cohortes en contexto de cambios sociales en el Uruguay contemporáneo*. El Colegio de México.

Yopo Díaz, M. (2018). Enacting motherhood: time and social change in Chile. *Journal of Gender Studies*, *27*(4), 411–427. https://doi.org/10.1080/09589236.2016.1223619

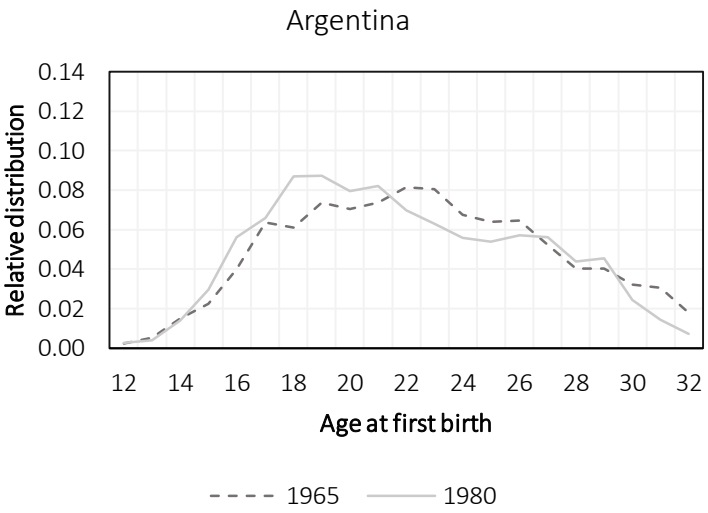
Appendix

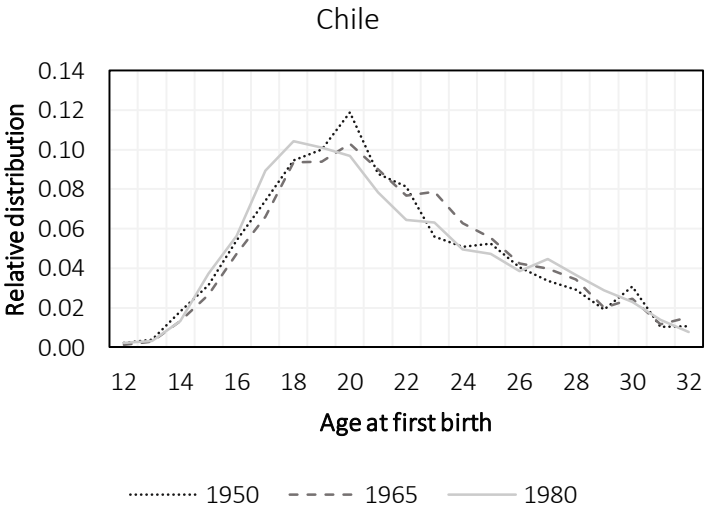
Table A-1. Sample size, women's ages at the time of the survey/census, and percentage of missing data on the age at first birth and the educational variables, by country and cohort

		Birth cohort			
		1948-52 (1950)	**1963-67 (1965)**	**1978-82 (1980)**	**Total**
		Argentina 2011-2012 MICS4			
Number of cases	Unweighted		2,403	3,348	5,751
	Weighted		1,094,684	1,381,598	2,476,282
	Age range		44-48	29-33	29-48
Unknown data	Age at first birth		2.9%	0.4%	1.5%
	Level of education		0.5%	0.8%	0.7%
	Years of schooling		1.6%	1.8%	1.7%
		Chile 2011 CASEN			
Number of cases	Unweighted	4,967	7,373	6,376	18,716
	Weighted	410,448	625,468	552,120	1,588,036
	Age range	59-63	44-48	29-33	29-63
Unknown data	Age at first birth	0.1%	0.1%	0.0%	0.1%
	Level of education	0.0%	0.0%	0.0%	0.0%
	Years of schooling	0.0%	0.0%	0.0%	0.0%
		Uruguay 2011 Census			
Number of cases	Unweighted	81,022	100,892	116,304	298,218
	Weighted				
	Age range	59-63	44-48	29-33	29-63
Unknown data	Age at first birth	4.1%	2.7%	2.2%	2.9%
	Level of education	0.5%	0.2%	0.1%	0.3%
	Years of schooling	1.6%	1.6%	1.9%	1.7%

Source: Own computations using 2011-2012 MICS4 for Argentina, 2011 CASEN for Chile, and 2011 Census for Uruguay.

Figure A-1. Relative distribution of mother's age at first birth between ages 12 to 32, by country and cohort





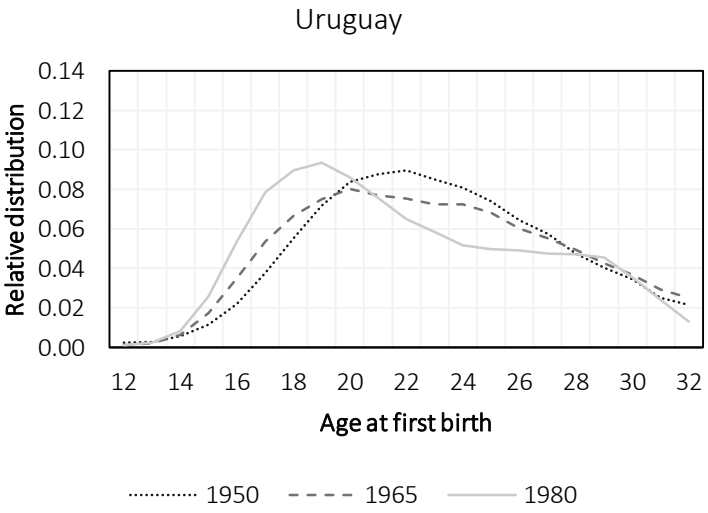
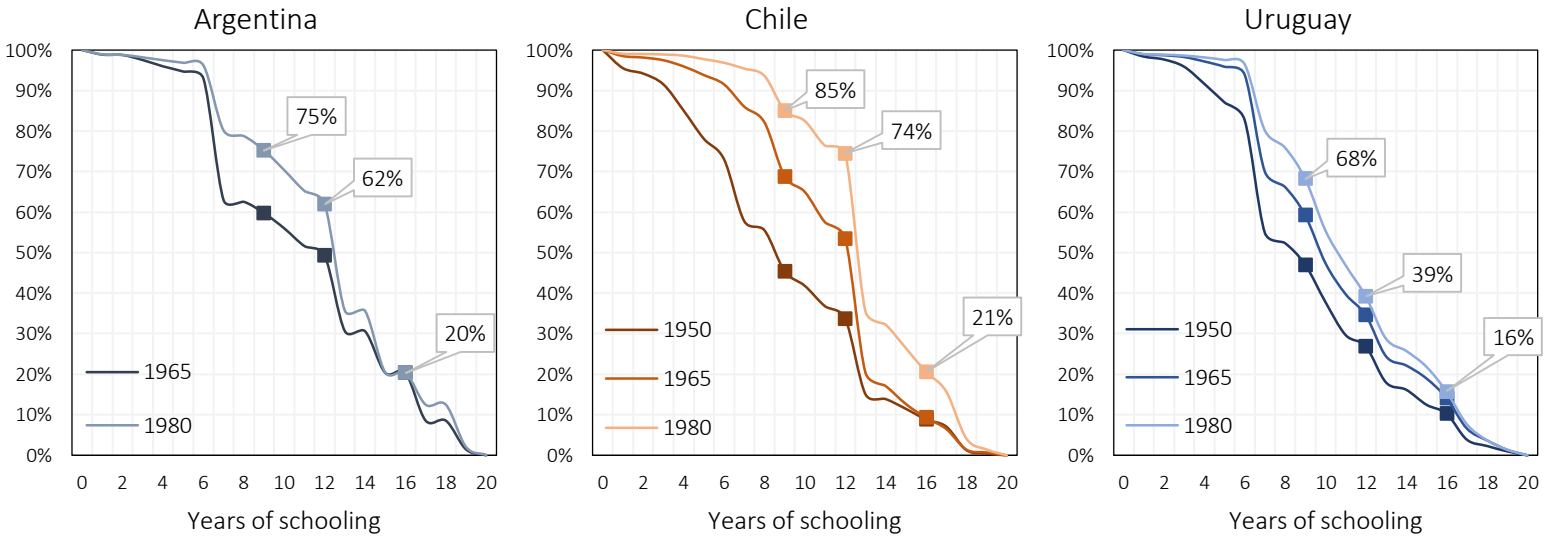


Figure A-2. Cumulative proportion of women at a given number of years of schooling, by country and cohort

[Markers at 9+, 12+ and 16+ years of education]



Source: Own computations using 2011-2012 MICS4 for Argentina, 2011 CASEN for Chile, and 2011 Census for Uruguay.

Is the link between early childbearing and higher completed fertility weakening in Latin America?

Mathías Nathan

Abstract

Background. Several studies have documented a negative association between the timing of first birth and the completed fertility of mothers. Still, the strength of this relationship varies across time and space. Despite the extensive literature on this topic, no study has so far examined whether changes in the timing-quantum link have been influential for fertility decline in Latin America.

Aim. To analyze the variation in the timing-quantum components of fertility and their contribution to changes in overall cohort fertility levels in Latin America.

Data and methods. I applied theoretical and statistical tools to evaluate the strength of the timing-quantum link, using data from two censuses and a nationally representative survey in Chile, Ecuador, and Uruguay. I also used decomposition techniques to depict the timing-quantum components' contribution to the inter-cohort change in completed fertility among women born in 1940-1965. Finally, I selected a set of standard schedules of the age at first birth to simulate different scenarios of cohort fertility decline in the context of delayed childbearing.

Results. The weakening of the timing-quantum link, observed in Chile and to a lesser extent in Ecuador, was driven by women with an early onset of childbearing having fewer children than previous cohorts. In all countries, the decrease of completed fertility across cohorts was entirely explained by the limitation of higher-order births after the onset of childbearing.

Conclusion. Societal changes and public policies in Latin America have fueled the diffusion of fertility 'stopping' and 'spacing' norms and behaviors, particularly among early starters, but have not influenced the occurrence and timing of first birth among women born in the 1950s and 1960s. The negative association between age at first birth and completed fertility tends to diminish with the overall fertility decline. This study provides new evidence for this argument in three Latin American countries with distinctive fertility transitions.

Keywords: Age at first birth; completed cohort fertility; childlessness; decomposition; Latin America

Introduction

The relationship between age at first birth and completed cohort fertility is an essential topic in fertility research. The age at the onset of childbearing has been proven to be negatively associated with lifetime cohort fertility across populations: the younger a woman starts having children, the higher the number of children she will give birth to in her lifetime (Balakrishnan, Rao, Krotki, & Lapierre-Adamcyk, 1988; Kohler, Billari, & Ortega, 2002; Kohler, Skytthe, & Christensen, 2001; Trussell & Menken, 1978). However, the strength of this relationship has been in dispute (Morgan & Taylor, 2006). While in some countries declining cohort fertility has been accompanied by flattened differences between early- and late-starting mothers, other countries exhibited little or no change (Andersson et al., 2009; Balakrishnan et al., 1988; Berrington, Stone, & Beaujouan, 2015; Castro, 2015; Gyimah, 2003; Kohler et al., 2001; Morgan & Rindfuss, 1999). Despite the extensive literature on this topic, little evidence is available for Latin American countries.

Latin America has experienced a marked decrease in the quantum of fertility since 1960, dropping from high to close to replacement levels (Cabella & Pardo, 2014; ECLAC, 2012). Previous studies have shown that both the limitation of parity progression and the greater spacing between births have played a role in the transition towards low fertility in Latin America (Batyra, 2016; Casterline & Odden, 2016; Guzmán, Rodríguez, Martínez, Contreras, & González, 2006). These changes in reproductive behavior were associated with an increase in effective contraception and a desire for smaller family size (Cavenaghi & Diniz Alves, 2009; Chackiel, 2004; Guzmán et al., 2006).

The postponement of childbearing and increasing childlessness have played a crucial role in explaining differences in the quantum of fertility across countries in highly developed regions (Sobotka, 2017). However, there has been no evidence of a similar shift in the timing of first birth in Latin American countries, despite the steady decline of fertility levels over the last decades. Further, a widespread decline in childlessness, at least among those born before the 1960s, was also evidenced in the region (Reher & Requena, 2014).

In particular, it has been pointed out that Latin America exhibits a distinct feature regarding the Second Demographic Transition (SDT). The 'non-conformist transition' -i.e., the expansion of cohabitation and parenthood among cohabitants- preceded the 'postponement' component of the SDT -i.e., the shift to older ages of both nuptiality and fertility. In Western and Northern Europe, both features developed almost concurrently, and in Southern Europe, the postponement dimension occurred before the emergence of cohabitation (Esteve, Garcia-Roman, Lesthaeghe, & Lopez-Gay, 2013; Esteve, Lesthaeghe, & López-Gay, 2012; Sobotka, 2017).

The unfolding of the fertility transition in Latin America has been characterized by persistent high adolescent fertility rates (Cavenaghi & Diniz Alves, 2009; ECLAC, 2012; Lima, Zeman, Sobotka, Nathan, & Castro, 2018; Rodríguez & Cavenaghi, 2014). The combination of early sexual debut and partnership, poor access to contraceptive methods at the onset of sexual activity, and limited access to abortion have been argued as the main proximate determinants behind the notable prevalence of early childbearing (Heaton, Forste, & Otterstrom, 2002; Rodríguez, 2013). Furthermore, the heterogeneity of fertility trajectories among individuals from different socioeconomic backgrounds is still very high in the region, especially in the timing of births and the occurrence of unwanted pregnancies (Chackiel, 2004; ECLAC, 2012).

In this study, I used retrospective data regarding the timing of first birth and the number of children ever born in Ecuador, Chile, and Uruguay to analyze the evolution of the timing-quantum link among women born between 1940 and 1965, and to assess the role of changes in fertility intensity after the first birth on the overall cohort fertility decline. I also examined to what extent a theoretical scenario of postponement of childbearing, coupled with increasing childlessness, might depress cohort fertility to below-replacement levels.

Based on these observed features of the fertility transition in America Latina, I hypothesize that the association between early onset of childbearing and higher completed fertility has been weakening with successive cohorts -i.e., a reduction in the difference between the number of children ever born to those who start childbearing at early or late ages, in the context of increasing limitation of subsequent parity after the first birth.

While comparative studies in Latin America have focused almost exclusively on lagged-transition countries, the analysis of Ecuador, Chile, and Uruguay allows for a more accurate picture of the diversity of fertility patterns within the region. Ecuador belongs to the Latin American countries that developed a rapid decline from high fertility levels during the second half of the twentieth century (Brazil, Mexico, and Colombia, among others, displaying similar patterns). Chile also experienced a rapid transition, but the decline in fertility started earlier than in countries like Ecuador. Uruguay, on the other hand, experienced an early onset of the fertility transition at the beginning of the twentieth century, and by 1950 women were having an average of three children. However, compared to the rest of the region, this country experienced a modest decline in fertility levels during the second half of the century (Guzmán et al., 2006; Reher & Requena, 2014).

The relationship between age at first birth and completed cohort fertility

Previous studies have found an inverse association between age at first birth and lifetime fertility across populations. That is to say that the earlier the onset of childbearing, the larger the number of children by the end of the reproductive lifespan (Billari & Borgoni, 2005; Bumpass, Rindfuss, & Janosik, 1978; Gyimah, 2003; Kohler et al., 2002, 2001; Morgan & Rindfuss, 1999; Tomkinson, 2019; Trussell & Menken, 1978). Both biological and behavioral mechanisms can explain this regularity in the fertility pattern of individuals. First, an early onset of childbearing increases the risk of subsequent unintended pregnancies/births since individuals are exposed for a longer time to sexual intercourse and contraceptive failure. Second, declining fecundity with age hampers the progression to higher parities for women who postpone the first birth until advanced ages, yet this effect is not substantial until women are in their the mid-30s. In addition, the pursuit of career goals that compete with childbearing might discourage late-start mothers from desiring a large family size (Kohler et al., 2001; Marini & Hodsdon, 1981; Morgan & Rindfuss, 1999; Morgan & Taylor, 2006). Besides, opportunities to pursue individual careers might be limited for women experiencing an early first birth, reinforcing the psychological and social rewards of motherhood (Morgan & Rindfuss, 1999).

Despite the logic underlying these mechanisms, several researchers have warned against establishing a causal relationship between the timing of first birth and the quantum of fertility at the micro-level. It has been claimed that early transition into motherhood, rapid progression to subsequent fertility, and higher completed fertility might be simultaneously explained by differences among individuals and couples. Such differences appear, for instance, in preferences and desires for children before the first birth, fecundity, and the ability to pursue and invest in educational and working activities (Berrington et al., 2015; Kohler et al., 2001; Marini & Hodsdon, 1981; Medina, 2019; Morgan & Rindfuss, 1999).

A weakening of the relationship between age at first birth and completed fertility among younger cohorts has been documented in some developed countries. Early-starting mothers typically have more children than those who delay childbearing, but the difference decreased over time. In Canada and the United States, the association between early childbearing and higher completed fertility flattened among women born in the 1950s and 1960s (Balakrishnan et al., 1988; Morgan & Rindfuss, 1999; Trussell & Menken, 1978). Increased control of (unwanted) subsequent fertility among early starters was observed in the context of women's increased participation in the labor market, the desire for fewer children, and increased use of effective contraception (Morgan, 1996; Morgan & Rindfuss, 1999).

The path towards attenuation of the relationship between the timing and the quantum of fertility might also be driven by the increasing fertility of late-starting mothers (i.e., fertility recuperation), as observed in low-fertility countries from Western Europe (Castro, 2015). The advancement of delayed transitions into motherhood has been progressively accompanied by increased recuperation of fertility at later ages, particularly in the Nordic countries (Andersson et al., 2009; Kohler et al., 2002; Sobotka, Zeman, Lesthaeghe, & Frejka, 2011). However, in European countries with low institutional support for childbearing and high fertility differences between educational groups, the timing-quantum link has remained relatively stable across cohorts (Berrington et al., 2015; Billari & Borgoni, 2005; Castro, 2015). Overall, the reduction in fertility levels produced by a shift towards late childbearing (the so-called "postponement-quantum interaction effect") has underpinned the divergence between low- and lowest-low fertility countries (Kohler et al., 2002).

Assessing the strength of the relationship between age at first birth and completed fertility: a theoretical modelling approach

The visual analysis of the strength of the timing-quantum link has been a recurrent strategy in previous studies (see Andersson et al., 2009; Castro, 2015). To refine this type of approach, I introduced four hypothetical patterns of fertility change. This stylized scheme is depicted comparing mothers' fertility from cohort b and the baseline cohort a, assuming a constant shape of first birth by age across cohorts. Two features of the interaction between the timing of first birth and completed fertility were integrated here: (1) the strength of the inverse relationship between the onset of childbearing and lifetime fertility, and (2) the quantum of cohort fertility of mothers.

To that aim, and for the sake of simplicity, the relationship between age at first birth and completed cohort fertility can be formalized as a linear function with a negative slope,

$$(1) \qquad CFM(AFB) = \beta_0 - \beta_1(AFB - x_{min}) \qquad \text{for } x_{min} \leq AFB \leq x_{max} \ ,$$

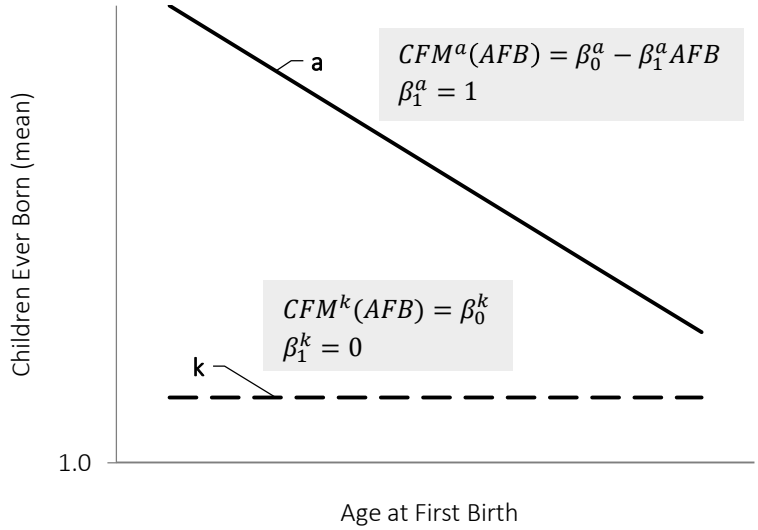
where CFM is the completed fertility of mothers and AFB the age at first birth in a given cohort,[14] β_0 is the intercept and β_1 the slope of the function, and x_{min} and x_{max} are the theoretical minimum and maximum values of the age at first birth among women. The coefficient β_1 therefore indicates the strength of the relationship between the timing of first birth and the quantum of fertility. Attenuation of this relationship over time should

[14] Completed fertility of mothers represents the mean number of children ever born for women who had at least one child.

produce a β_1 approaching zero in successive cohorts, meaning narrower differences in ultimate fertility between early- and late-starters (Balakrishnan et al., 1988). Conversely, β_1 express a stronger relationship as it approaches 1, which can be set as the theoretical maximum value of the slope (i.e., an absolute decrease of one child in predicted lifetime fertility for every one-year increase in age at first birth). Therefore, $0 < \beta_1 < 1$.

In Figure 6, cohorts a and k represent the two theoretical limits of the inverse linear association between AFB and CFM. Cohort a exhibits the strongest possible association $(\beta_1 = 1)$. In cohort k, however, mothers are expected to have the same number of children irrespective of their timing of first birth $(\beta_1 = 0)$.[15] Successive cohorts would tend to approach k if the relationship becomes weaker, corresponding to flatter curves.

Figure 6. Theoretical maximum and minimum slope of completed fertility of mothers (CFM) as a linear function of the age at first birth (AFB), represented by two hypothetical cohorts (a, k)



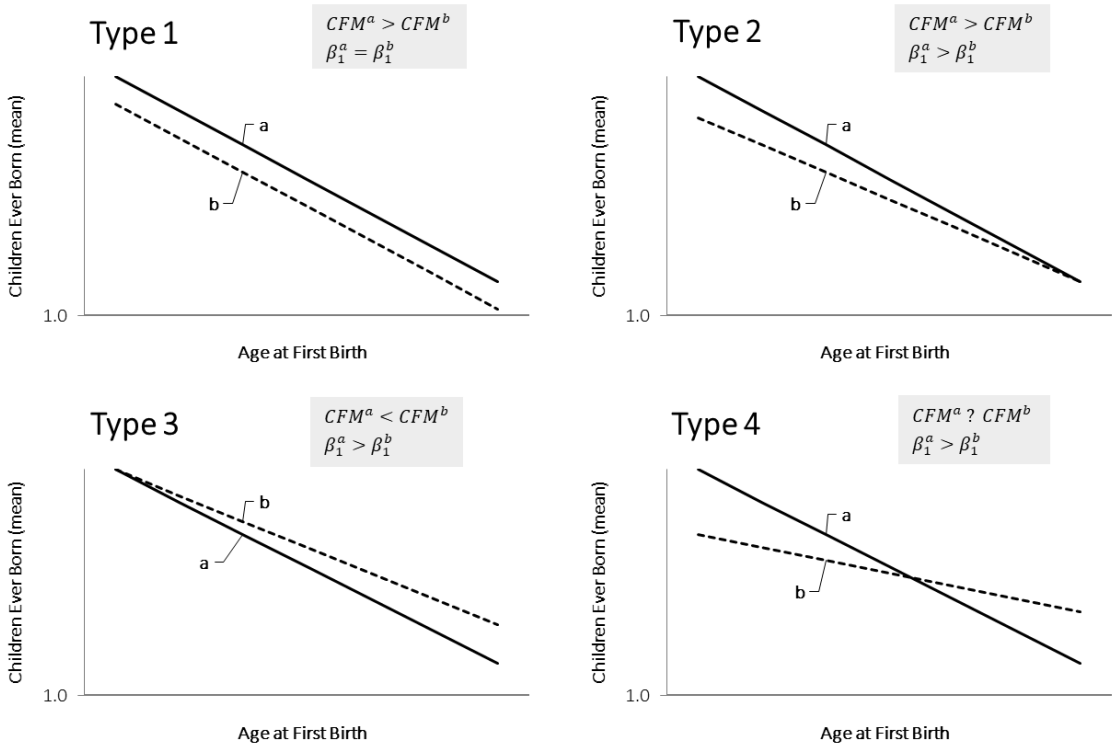
Note: β_0 and β_1 are the intercept and the slope of the function, respectively.

Figure 7 shows the four hypothetical patterns of change in the relationship between age at first birth and completed fertility of mothers, and resulting overall completed fertility of mothers, between cohorts a and b. The first pattern (Type 1) illustrates how a cohort's overall fertility may decline without experiencing any change in the strength of the timing-quantum association. Cohort b exhibits lower overall fertility than cohort a (the intercept

[15] The example of cohort k can be linked to what Kohler et al. (2002) defined as a "pure postponement of fertility": a theoretical post-transitional fertility setting in which there is a perfect recuperation of postponed fertility for late-starting mothers. As a result, age at first birth would become a weak predictor of lifetime fertility.

value in cohort b is lower than in cohort a). At the same time, the strength of the effect of age at first birth remains unchanged (both cohorts a and b have the same slope). Types 2 and 3, on the other hand, depict an attenuation of the impact of age at first birth over cohort fertility (as the value of the slope of b is higher than a, i.e., closer to zero). Still, they display opposite results in terms of the quantum of fertility. While Type 2 implies a decline in the completed fertility of mothers, Type 3 portrays an increase in the quantum of fertility. In the context of the fertility transition, I expect the Latin American countries and cohorts examined in this study to resemble Type 1 or Type 2 introduced above, as both stylized patterns predict a decline in cohort fertility cohorts.

Figure 7. Stylized patterns of change in the relationship between age at first birth and completed fertility of mothers, and resulting overall completed fertility of mothers in two hypothetical cohorts (a, b)



Note: CFM is the overall completed fertility of mothers; β_1 is the slope of the linear function.

The attenuated relationship and reduced overall fertility of mothers in Type 2 might be driven by a significant decline in completed fertility among women with an early onset of childbearing. This stylized pattern is similar to cohort fertility changes seen in Canada and the United States since the mid-1960s, where the limitation of subsequent childbearing after first birth was more pronounced in mothers who started fertility at young ages (Balakrishnan et al., 1988; Morgan & Rindfuss, 1999; Trussell & Menken, 1978).

The Type 3 model depicts higher childbearing intensities at later ages in cohort b than cohort a, which contributes to the increase in completed fertility of mothers and the diminishing of the predictive power of the age at first birth. Changes of this nature were found in some low-fertility European countries. The spread of a late onset of childbearing among women born after 1950 was compensated for by fertility recuperation at advanced reproductive ages (Castro, 2015).

Finally, Type 4 also depicts a shift in the relationship between age at first birth and completed fertility of mothers, with a cross-over between cohorts a and b. Mothers experiencing an early onset of childbearing in cohort b had fewer children than the early starters in cohort b. Those with a late first birth in younger cohorts ended up with slightly more children than their counterparts in the earlier cohorts. This general pattern is similar to that shown by Andersson et al. (2009), who examined the 1935-1954 cohorts in the Nordic countries. As in models 2 and 3, the timing-quantum link is weaker in cohort b than in cohort a. However, the shift experienced by cohort b might produce both depressing and boosting effects regarding cohort fertility. Differences in the overall cohort fertility of mothers between cohorts a and b would depend on the balance of the depressing effect occurring at a young age, and the boosting effect occurring at an old age at first birth.

There are different drivers of changes in cohort fertility, resulting in a weakening of the timing-quantum link. Increased use of effective contraception and sterilization might explain a low fertility progression after the first birth, as in types 2 and 4, and possibly also in Type 1, through a higher control over unwanted fertility (Balakrishnan et al., 1988; Morgan & Rindfuss, 1999). On the other hand, institutional changes that facilitate the reconciliation of work and family responsibilities, together with the improved health of women and the emergence of assisted reproductive techniques, could reduce the social and biological barriers to achieving the desired family size among late-starting mothers (Kohler et al., 2002; Morgan & Taylor, 2006).

Data

I analyzed retrospective fertility data using available datasets from the 2011 nationally-representative large-scale Survey of National Socioeconomic Characteristics (CASEN, for its Spanish acronym) for Chile (N=19,651)[16], the 2010 population census for Ecuador (N=911,308)[17] and the 2011 population census for Uruguay (N=310,217)[18]. The analysis

[16] Dataset downloaded from http://observatorio.ministeriodesarrollosocial.gob.cl/encuesta-casen-2011 on July 1, 2015.
[17] Dataset downloaded from https://www.ecuadorencifras.gob.ec on July 1, 2015.
[18] Dataset downloaded from https://www.ine.gub.uy on July 1, 2015.

was based on women born between 1940 and 1965, classified into three birth cohorts: 1940-1945, 1950-1955, and 1960-1965. Women born after 1965 were disregarded from the analysis because, being under 45 years of age at the time of the survey/census, they might not yet have completed their fertility by 2010-2011.

These data sources allow the comparison of the timing of first birth and the quantum of fertility in examined countries, without implementing imputation techniques or other sophisticated estimation methods (see, for instance, Castro, 2017; Rios-Neto et al., 2018, for Brazil). Data on the total number of children ever born alive and the mother's age at birth (or the date) of the first child born alive was collected for all women aged 12 years and over, regardless of marital status.[19]

As detailed in the literature, retrospective data might underestimates the fertility of a cohort as it may underreport the fertility of older women (Pullum, 2004).[20] To minimize this potential bias, I examined birth cohorts since 1940, i.e., younger than 72 years of age at the time of the survey/census. Also, the proportion of women with missing data for age at first birth for the selected cohorts was relatively low, ranging from 0.1% in Chile to 4.3% in Ecuador; the percentage of missing data for the number of children ever born was even lower: 0.3% in Chile, 0.4% in Uruguay and 1.7% in Ecuador. Given this acceptable percentage of unknown observations, only respondents with complete data for the timing of first birth and lifetime fertility were left in the analysis.

Methods

This study implemented a three-fold analytical strategy to examine the evolution of the timing-quantum link over time and the role of fertility components in explaining overall cohort fertility in each country. First, I estimate the 'postponement' coefficients (Billari & Borgoni, 2005; Kohler et al., 2002) to measure the strength of the association between age at first birth and completed fertility. Second, I apply demographic decomposition techniques to assess the effect of changes in childlessness, the timing of first birth, and progression to subsequent births on the overall inter-cohort change in fertility quantum. Finally, I perform a set of simple simulations of changes in the quantum of cohort fertility

[19] Issues of age heaping in the age at first birth were found in Chile and - most notably - Ecuador. The fact that these two countries asked the "age at first birth" (direct question) instead of the "date of first birth" (indirect question) might explain the peaks at 18, 20 and 30 years of age (see

Figure **A-1**).

[20] Retrospective fertility data could also be subject to selectivity effects in case of sharp differences in mortality and migration between cohort members.

in a context of delayed childbearing using a set of selected standard schedules of age at first birth.

Estimation of the slope coefficient using log-linear models

Defining the relationship between age at first birth and completed fertility of mothers as a linear function might be a reasonable strategy to outline a theoretical scheme with stylized patterns of change in the timing-quantum link (as introduced above). However, the linear function might not provide a good fit for empirical data. It should be noted that the marginal effect of a one-year increase in the age at first birth on ultimate fertility is expected to become smaller at advanced reproductive ages due to biological and behavioral factors. Thus, the predicted absolute decline in the quantum of fertility would be higher when moving the age at first birth from age 15 to 20 than from age 20 to 25, and the latter would have a more significant effect than that of increasing the age at first birth from 30 to 35, and so forth.

To handle this non-linearity in our estimates and also to maintain the sign of the slope throughout the range of possible values of age at first birth, the outcome variable was logarithmically transformed.[21] Using the logarithmic transformation makes the effective relationship non-linear while preserving the linear model for the estimates, allowing the rate of change of completed fertility of mothers conditional on age at first birth to decrease as age at first birth increases.

Regressions of the logarithm of completed fertility of mothers were performed for each country and cohort using Ordinary Least Squares (OLS). The estimated coefficient β_1 in each regression measures the relative reduction in completed fertility of mothers associated with a one-year delay in the age at first birth (i.e., the postponement effect).[22]

Kohler et al. (2001) pointed out that the estimates of the postponement effect using OLS can be potentially distorted by unobserved factors affecting both the timing and the quantum of fertility (e.g., preferences for children, economic costs and returns of a delay in childbearing, and differences in fecundity). Using Danish longitudinal data on

[21] A quadratic coefficient was first introduced into the linear model equation to capture decreasing marginal effects of age at first birth over completed fertility of mothers. Although the quadratic function provides a better fit of empirical observations than a linear model, it might also produce a reversal in the direction of the relationship (i.e. turning the slope from negative into positive), and therefore completed fertility of mothers might start to increase when increasing the age at first birth at advanced ages. While this might be a feature of late fertility in some countries -for instance, due to the introduction of assisted reproductive technologies and the consequently higher risks of multiple births, it is not likely to be confirmed with empirical data for Latin American countries.

[22] The literal interpretation of the estimated coefficient is that a one-unit increase in age at first birth would produce an expected decrease in log of completed fertility of mothers by β_1 units.

monozygotic twins, they proved that disregarding such factors may underestimate the postponement effect by about 10%-25%. However, in a subsequent study, Kohler et al. (2002) highlight that this type of analysis is not feasible when using less sophisticated data and applied OLS to examine the timing-quantum link in a set of lowest-low fertility countries in Europe. Moreover, after analyzing the results of more complex models, Billari & Borgoni (2005) conclude that OLS provide reliable estimations of the postponement effect for comparative purposes.

Decomposition of completed fertility change into childlessness, the timing of first births, and fertility intensity effects

Based on the work of Berrington et al. (2015), the present study formalized the completed fertility of a given cohort c (CF^c) as follows:

(2) $CF^c = [1 - Ch^c] \times \sum_{x=15}^{44} [M_x^c \times CFM_x^c]$,

where Ch^c is the proportion of childless women, M_x^c is the share of mothers with first birth at age x, and CFM_x^c is the completed fertility conditional on age at first birth x. In this regard, it should be noted that $0 < Ch < 1$, and

(3) $\sum_{x=15}^{44} M_x^c = 1$.

Given the equation (1), it is also possible to derive CFM^c ,

(4) $CFM^c = \sum_{x=15}^{44} [M_x^c \times CFM_x^c]$,

and CF^c ,

(5) $CF^c = [1 - Ch^c] \times CFM^c$,

therefore, $CF^c < CFM^c$.

The terms in the first equation provide how to decompose the effects of childlessness, the timing of first birth, and lifetime fertility conditional on age at first birth, between cohorts. They can also be linked to the usual mechanisms of fertility change: while M_x^c is associated with the 'starting' component of cohort fertility, CFM_x^c reflects the pace of progression to higher parities after the onset of childbearing, which is driven by the length of intervals between births (spacing) and the timing of termination of childbearing (stopping) (Casterline & Odden, 2016; Knodel, 1987; Van Bavel, 2004).

The decomposition method applied in this study can be found in Berrington and colleagues (2015), who adapted the original method proposed by Kitagawa (1955) into two steps. In

the first place, the contribution of changes in *childlessness* was obtained using the following equation:

$$(6) \qquad CF^b - CF^a = \left[\frac{pm^a + pm^b}{2}\right] \times [CFM^b - CFM^a] + \left[\frac{CFM^a + CFM^b}{2}\right] \times [pm^b - pm^a] \ ,$$

where $pm^c = 1 - Ch^c$.

The first component of the above equation expresses the contribution of differences in completed fertility of mothers to the overall difference in completed fertility between the oldest and youngest cohorts. In contrast, the second component reflects the contribution of childlessness to the absolute difference. The contribution of the first component is attributed to changes in the timing of first birth and progression to subsequent parities, which can be decomposed by applying the same procedure as before, but this time including exclusively the quantum of the fertility of mothers:

$$(7) \qquad CFM^b - CFM^a = \sum_{x=15}^{44} \left[\left[\frac{M_x^a + M_x^b}{2}\right] \times [CFM_x^b - CFM_x^a]\right] + \sum_{x=15}^{44} \left[\left[\frac{CFM_x^a + CFM_x^b}{2}\right] \times [M_x^b - M_x^a]\right] .$$

The first component of the latter equation expresses the contribution of changes in completed fertility conditional on age at first birth (rate effect) to the overall change in completed fertility of mothers between cohorts. In contrast, the second component reflects the contribution of changes in the distribution of mothers by age at first birth (composition effect). The relative weight of these two components is then used to separate the total contribution of CFM into rate and composition effects.

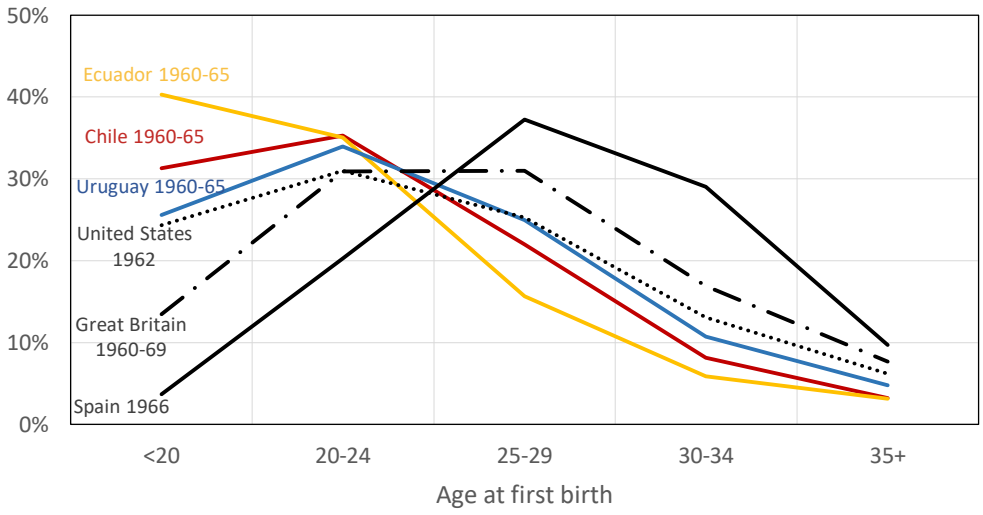
Prospective changes in completed cohort fertility due to postponement of childbearing

Due to the negative timing gradient of completed fertility, changes in the distribution of age at first birth of mothers (M_x^c) have the potential to affect the quantum of fertility. If the gradient remains constant, a shift towards a younger age distribution of first-time mothers would increase cohort fertility, while the postponement of childbearing would push cohort fertility downwards. Also, postponement of age at first birth could reduce the quantum of fertility through increased childlessness (Berrington, 2017; Kneale & Joshi, 2008; Nicoletti & Tanturri, 2008; Rybińska & Morgan, 2019).

This study examines the potential decrease in completed fertility in Chile, Ecuador, and Uruguay in the scenario of higher mean ages at first birth by preserving the fertility intensities conditional on the age at first birth of the 1960-1965 cohorts. The age schedules of first birth among the 1962 cohort from the United States and the 1960-1969 cohort from Great Britain were also used for this simulation. These standard age schedules were selected for two reasons: they have a mean age at first birth that is higher (24.8 and 25.8,

respectively) than that observed in the respective Latin American countries; and they display high levels of dispersion in age at first birth (see Figure 8), something that has also been proved to be a salient feature during the onset of the postponement transition in Latin America (Lima et al., 2018; Nathan & Pardo, 2019; Nathan, Pardo, & Cabella, 2016). The age schedule of the 1966 birth cohort from Spain was also applied to the Latin American dataset to assess changes in the context of an intense postponement of first births as the mean age at first birth in this cohort was 27.8 years. Finally, to calculate the completed cohort fertility by country in each alternative scenario, three magnitudes of final childlessness were used in the simulation: 10%, 15%, and 20%.

Figure 8. Relative distribution of first birth rates by the age of the mother in selected countries and cohorts



Source: Own computations using data from 2010 Census for Ecuador, 2011 CASEN for Chile, and 2011 Census for Uruguay; the Human Fertility Database for Spain and the United States[23]; Berrington et al. (2015) for Great Britain.

Results

Fertility profiles in Ecuador, Chile, and Uruguay

Analyzing the quantum and timing of cohort fertility in Ecuador, Chile, and Uruguay illustrates the diversity of fertility transitions within Latin America. As detailed in Table 2,

[23] Human Fertility Database. Max Planck Institute for Demographic Research (Germany) and Vienna Institute of Demography (Austria). Available at www.humanfertility.org (data downloaded on 02/26/2019).

Ecuador and Chile experienced a rapid decline in fertility. In Ecuador, completed fertility decreased from 5.2 to 3.5 children per woman between the 1940-1945 and 1960-1965 birth cohorts, while in Chile, it was from 3.5 to 2.5 children. A different trend was observed in Uruguay, characterized by stagnation in fertility: cohort fertility decreased from 2.6 to 2.4 children per woman over this period. As a result, the difference in fertility levels between Chile and Uruguay has reduced, and the differences between these two countries and Ecuador have also become less notable.

Declining completed cohort fertility was accompanied by a decreasing proportion of childless women in Ecuador and Uruguay, the latter showing the highest proportion of childless women among the examined countries (13% for the 1960-1965 cohort). Chile, on the other hand, showed little change between cohorts and remained the country with the lowest percentage of childless women (around 7%).

Results also evidence the absence of fertility postponement in the examined cohorts. A slight increase in the mean age at first birth in Ecuador and Chile was found, yet both countries show a pattern of early entrance into motherhood - with an average age at first birth of around 23 and 22 years, respectively. Uruguay, which exhibits an exceptionally high mean age for the Latin American context, experienced an increase in the proportion of women entering into motherhood before age 20 in successive cohorts (from 20% to 25%), but no change in the proportion of first-time mothers at ages 25 and older (40%) (see Table A-1).

Table 2. Completed fertility, the proportion of childless women, and mean age at first birth, by country and cohort

	Ecuador	Chile	Uruguay
Completed fertility			
1940-45	5.2	3.5	2.6
1950-55	4.3	2.9	2.6
1960-65	3.5	2.5	2.4
Childlessness			
1940-45	10.9%	6.8%	13.3%
1950-55	9.2%	8.5%	11.4%
1960-65	9.3%	7.3%	10.9%
Mean age at first birth			
1940-45	21.8	23.1	24.8
1950-55	22.1	22.8	24.3
1960-65	22.2	23.3	24.3

Source: Own computations using data from 2010 Census for Ecuador, 2011 CASEN for Chile, and 2011 Census for Uruguay.

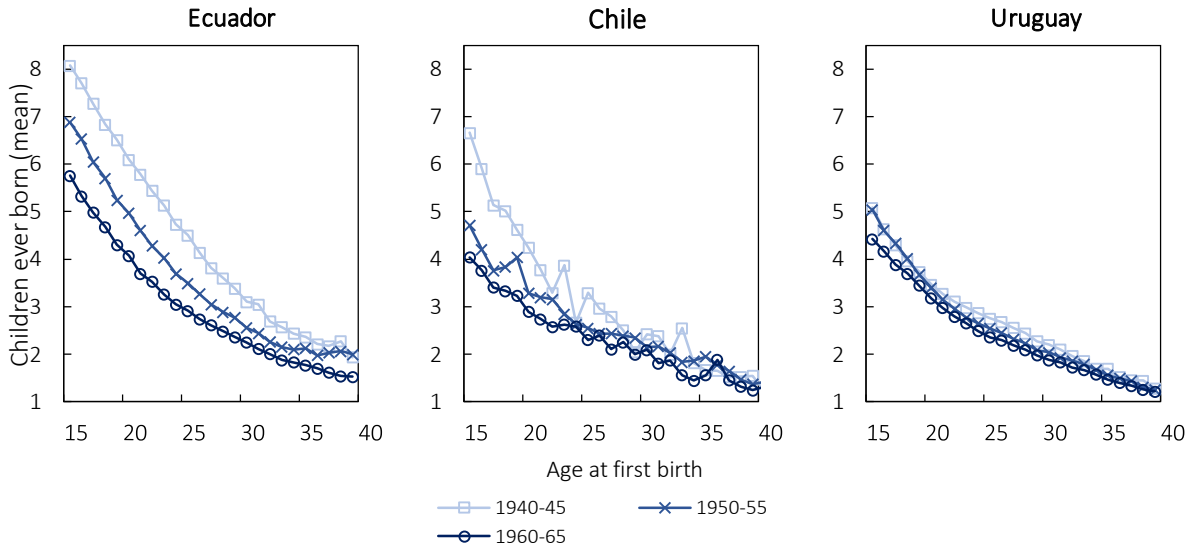
The predominance of the 'later means fewer' pattern

As documented in other countries, completed fertility of women in Ecuador, Chile, and Uruguay is inversely associated with the timing of first birth (Figure 9), confirming the regularity of this reproductive pattern across fertility settings. These results also evidence the non-linearity of the relationship between the timing and the quantum of fertility: although the direction of the association remains negative across all ages, the marginal effect of each one-year increase in the age at first birth tended to decrease.

Ecuador and Chile experienced substantial declines in mothers' fertility by age at first birth in successive cohorts. In Ecuador, fertility declined across a wide range of ages at first birth. In Chile, the decline was particularly prevalent in the early starters, especially those entering into motherhood before 25 years old. The fertility decline was minimal in Uruguay

and concentrated in two age ranges: mothers starting childbearing before age 20 and those starting between 25 and 32. In all three countries, changes in completed fertility conditional on age at first birth produced an increasing number of mothers having fewer than two children. For instance, the age at first birth after which the average fertility is below two children shifted from 34 to 30 in Chile and 32 to 29 in Uruguay.

Figure 9. Completed cohort fertility conditional on age at first birth, by country, and cohort



Source: Own computations using data from 2010 Census for Ecuador, 2011 CASEN for Chile, and 2011 Census for Uruguay.

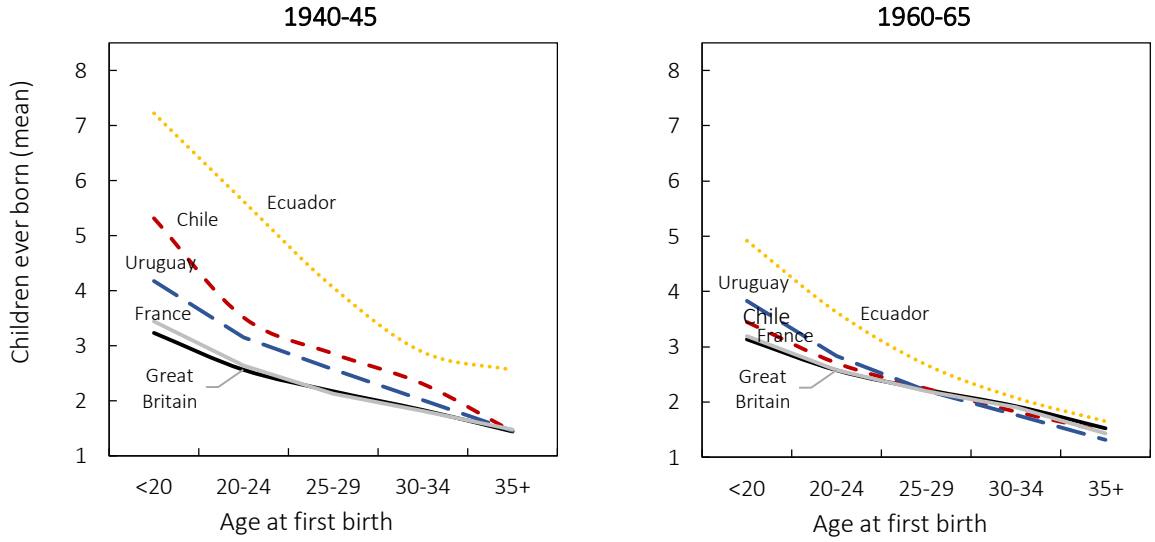
As a result, the completed fertility conditional on age at first birth has converged across countries. The differences between countries particularly narrowed when looking at younger ages at first birth. Differences between Chile and Uruguay at younger ages at first birth first disappeared and then reversed, positioning the fertility intensities of Chile below those of Uruguay.

Another exciting feature of changes in the timing-quantum link in Latin America arises when comparing the examined countries with two Western European countries (France and Great Britain). Having similar total fertility –around the replacement level, the age schedule of first birth in France is concentrated around the mean age. In contrast, the age pattern of first births in Great Britain shows a higher heterogeneity resulting from high adolescent fertility rates (Tomkinson, 2019). Overall, these two countries are helpful to

shed light on the evolution of completed cohort fertility conditional on age at first birth among the examined countries.

As shown in Figure 10, the 1960-1965 cohorts in Chile and Uruguay still exhibit higher completed fertility rates than France and Great Britain for women starting childbearing at younger ages, but not for those with a later onset of motherhood. Notably, the higher completed fertility of late starters in France and Great Britain illustrates the prevalence of higher fertility recuperation in the context of advanced postponement of childbearing than in Latin American countries and, therefore, an attenuated relationship between timing and quantum.

Figure 10. Comparison of completed cohort fertility conditional on age at first birth for the 1940-1945 and 1960-1965 cohorts by country, including France and Great Britain



Source: Own computations using data from 2010 Census for Ecuador, 2011 CASEN for Chile, and 2011 Census for Uruguay. Calculations for France were provided by Eva Beaujouan, using data from the INSEE's 2011 Survey on Family and Housing; calculations for Great Britain were produced by Berrington et al. (2015), using data from the General Household Survey and the Understanding Society survey.

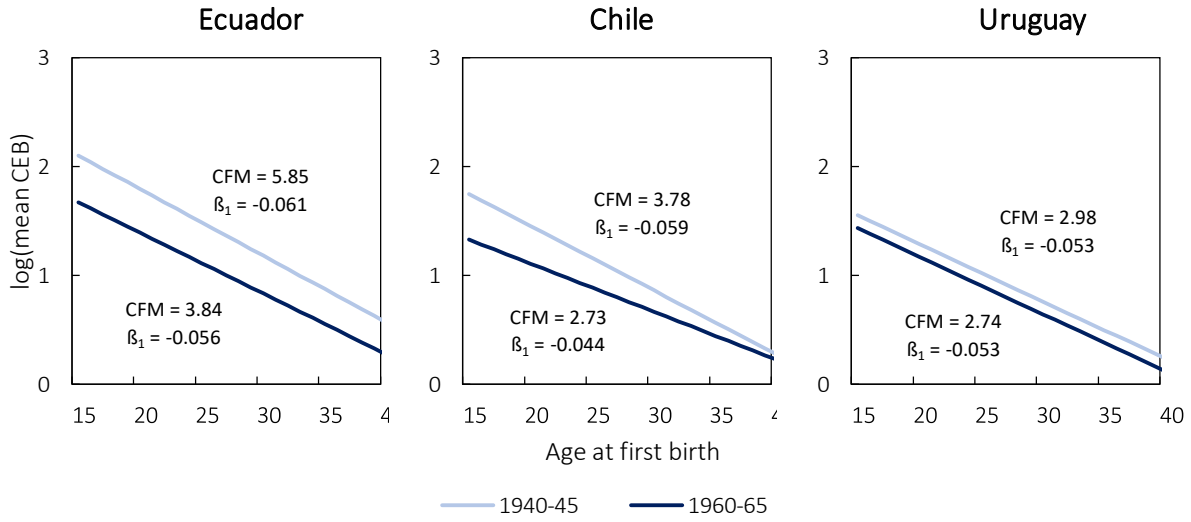
Has the link between timing and quantum weakened over time in examined countries? Chile, Ecuador, and Uruguay depict three different patterns of change in the relationship between age at first birth and completed fertility of mothers (

Figure 11). In Chile, a flatter relationship was found, resembling the Type 2 pattern of fertility change discussed in the previous section: an overall cohort fertility decline accompanies the weakening of the tempo-quantum link. Ecuador, on the other hand, exhibited a minor decrease in the effect of age at first birth but a significant decline in completed fertility of mothers, thus falling between Type 1 and Type 2. In this regard, the

magnitude of the regression coefficients estimated for age at first birth on the logarithm of completed fertility of mothers decreased by 25% in Chile and 9% in Ecuador. At the same time, the fertility quantum decreased by about one-third in both countries.

Uruguay did not register further attenuation of the relationship between age at first birth and completed fertility of mothers in the following cohorts. Having already achieved relatively low cohort fertility, Uruguay showed a slight decrease in mothers' fertility among the 1960-65 cohort. Consequently, the evolution of completed fertility conditional on the timing of first births in Uruguay produced a convergence with Chile regarding fertility quantum and with Ecuador regarding the magnitude of the postponement effect.

Figure 11. Curves of the logarithm of completed cohort fertility of women conditional on age at first birth, values of completed fertility of mothers (CFM), and slope coefficients from estimated log-linear regressions ($ß_1$), 1940-1945 and 1960-1965 cohorts, by country



Note: all estimated $β_1$ coefficients were significant at the 99% level of confidence.

Source: Own computations using data from 2010 Census for Ecuador, 2011 CASEN for Chile, and 2011 Census for Uruguay.

The present study evidenced a stronger link between age at first birth and completed fertility in Latin American countries compared to European ones (see Billari & Borgoni, 2005; Kohler et al., 2002). Significant postponement effects in Europe were found in the lowest-low countries from Southern Europe. Existing barriers to reconcile work and family hinder the progression to higher parities after the transition to parenthood. In Spain, for instance, a one-year increase in age at first birth lowered the lifetime fertility of women born in 1945-1958 by about 4.6%, whereas the postponement effect in Sweden was about

2.8%.[24] Results from the present study revealed that in Chile, Ecuador, and Uruguay, a one-year increase in the age at first birth predicted a decline in fertility quantum for the 1960-1965 cohorts by about 4.3%, 5.4%, and 5.1%, respectively.

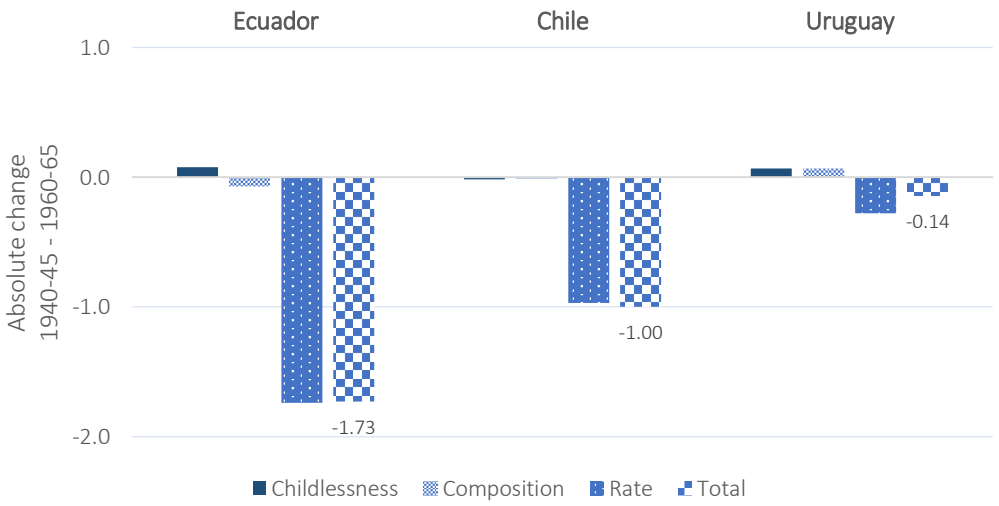
Thus far, the role of changes in the distribution of mothers by age at first birth has not been considered while examining the overall fertility changes in Ecuador, Chile, and Uruguay or the effects of variations in the proportion of childless women within each cohort. As illustrated above, age at first birth changed very little across cohorts, and therefore a constant shape assumption held when analyzing changes between 1940-1945 and 1960-1965 cohorts. The following subsection uses decomposition techniques to quantify the effect of changes in childlessness, distribution of mothers by age at first birth, and the number of children ever born conditional on age at first birth, on observed changes in completed cohort fertility in examined countries.

The contribution of changes in childlessness, timing of first births, and completed fertility of mothers to the overall decline in cohort fertility

The decomposition reveals that the limitation of subsequent fertility after the onset of the first birth (rate effect) accounts for almost the entire reduction in completed fertility between cohorts 1940-1945 and 1960-1965 (Figure 12). While the tiny childlessness and composition effects observed in Chile pushed cohort fertility in the same direction as the rate effect (i.e., decreasing fertility intensities), in Ecuador, the effect of a slight increase in the mean age at first birth was canceled out by decreasing childlessness. In Uruguay, the reduction of 0.14 in completed cohort fertility would have been higher had it not been for a decrease in the proportion of childless women and the decrease in first birth timing within the 1960-1965 cohort. More women entering motherhood and having children at a younger age contributed to boosting cohort fertility in Uruguay, but these effects were reversed through the increasing limitation of subsequent childbearing.

[24] The strength of the association in European countries weakened with successive cohorts but differences between European countries remained.

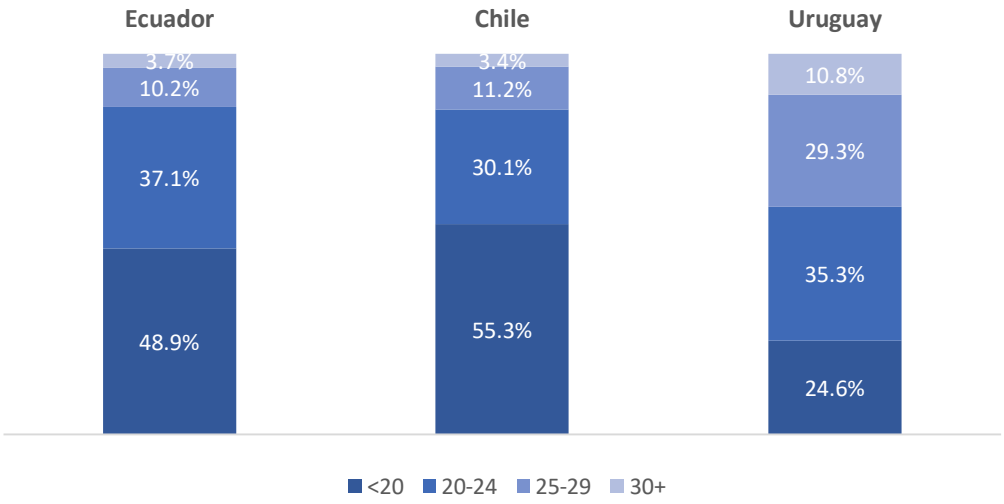
Figure 12. Decomposition of fertility change between 1940-1945 and 1960-1965 cohorts into childlessness, composition (distribution of mothers by age at first birth) and rates (completed fertility conditional on age at first birth), by country



Source: Own computations using data from 2010 Census for Ecuador, 2011 CASEN for Chile, and 2011 Census for Uruguay.

Which age groups contributed the most to fertility decline within the fertility intensities component? As described in the methodological section, the rate effect can be further decomposed into changes in completed fertility for each age-specific group at first birth between the 1940-1945 and 1960-1965 birth cohorts. Results show that the decline in completed fertility among mothers below 20 represented about half of the changes in cohort fertility attributed to the rate effect in Chile (55%) and Ecuador (49%). In Uruguay, the contribution of mothers in this age group was substantially lower (25%) (Figure 13). Due to a significant reduction in completed fertility among the early starters and a higher concentration of first births at younger ages, the main contribution to fertility intensities in Chile and Ecuador came from mothers below 25 years of age. In both countries, the impact of changes among mothers at older ages was marginal (around 3%). In contrast, Uruguay showed remarkable contributions to fertility decrease from mothers starting childbearing at ages 25-29 (30%) and 30+ (11%).

Figure 13. Relative contribution to the total rate effect of reductions in completed fertility of mothers by age at first birth between cohorts 1940-1945 and 1960-1965, by country



Source: Own computations using data from 2010 Census for Ecuador, 2011 CASEN for Chile, and 2011 Census for Uruguay.

The potential effects of postponement of the first birth on the reduction of completed cohort fertility

The postponement of first births could play a critical role in fertility decline in the examined countries, even if the strength of the tempo-quantum link remains unchanged. As shown in Figure 14, a rise in the mean age at first birth to approximately 26 years old (GBR 1960-1969) would leave countries with relative low cohort fertility (such as Chile and Uruguay) close to an average of two children per woman; a rise in the mean age at first birth to 28 years (Spain 1966) would push the completed fertility of Chile and Uruguay under that threshold.[25] The impact of this change might also be higher if accompanied by an increasing number of childless women.

As completed fertility among the early starters of the 1960-1965 cohort in Chile is lower than that of Uruguay, moving towards an age schedule of first births like that of the United States 1962 cohort could have a higher impact in Chile. However, an extreme postponement scenario would produce similar results in both Chile and Uruguay because

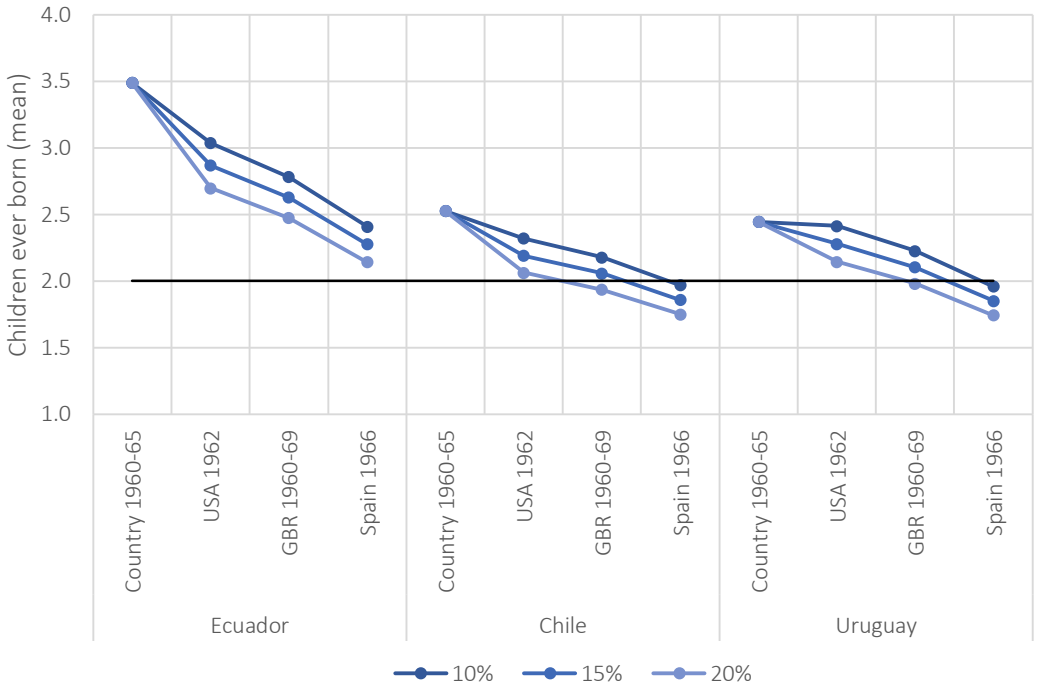
[25] United States and Great Britain could be considered medium term scenarios, likely to be observed in the initial phases of the postponement transition. Spain, on the other hand, is a distant scenario, more likely to see several decades ahead.

teenage fertility would have minimal impact, and both countries have similar predicted quantum for late starters (aged 25 and over).

In the case of Ecuador, the transition towards a late fertility regime could have a significant impact on completed fertility and to a greater extent than in Chile and Uruguay. If childlessness remains at 10% (i.e., close to the observed figure in the 1960-1965 cohort), having the age schedule of first births of the 1960-1969 cohort in Great Britain or the 1966 cohort in Spain would depress cohort fertility by 20% and 30%, respectively. However, because fertility intensities after the first birth are still relatively high, completed fertility would continue to be above two children per woman, even in an extreme scenario.

The composition effect of postponement on fertility levels could be attenuated by an upsurge of fertility intensities in older ages at first birth, as observed in Great Britain and France (see Figure 10).

Figure 14. Completed cohort fertility for 1960-1965 cohorts using selected age schedules of first birth and different share of childlessness (10%, 15%, and 20%) by country



Source: Own computations using data from 2010 Census for Ecuador, 2011 CASEN for Chile, and 2011 Census for Uruguay.

Discussion

The negative association between age at first birth and completed fertility is a stable pattern in reproductive behavior. However, this association tends to diminish in the framework of overall fertility decline. This study provides new evidence for this argument in three Latin American countries with different fertility transitions.

In Ecuador, despite some attenuation of the timing-quantum link, the sharp decline in fertility intensities affected a much broader number of women. This pattern of decline may be characteristic of a fertility regime that departs from distinctly high fertility levels - the emergence of norms and behaviors associated with the limitation of childbearing impacts a wide range of fertility schedules. Chile, on the other hand, showed a significant weakening of the timing effect on completed fertility of mothers during its transition towards lower cohort fertility, as a result of a significant decline in lifetime fertility among younger mothers. Finally, the pattern identified in Uruguay differs from the other two countries in that it demonstrates stable features over time: differences between early and late starters of childbearing in the 1960-65 cohort remained as high as in the past. All

examined countries displayed a stronger age-effect on completed fertility than comparable cohorts from low fertility countries in Europe.

The limitation of subsequent childbearing after women's entry into motherhood was the primary driver of cohort fertility decline in Latin America, in the context of a stable mean age at first birth and decreasing childlessness. Societal changes and public policies in the region have fueled the diffusion of 'stopping' and 'spacing' norms and behaviors rather than impacting the occurrence and the timing of first birth. Further work might be needed to understand the processes of parity progression after the first birth among Latin American cohorts.

Increased use of effective contraception among mothers has been critical in this process (Cavenaghi & Diniz Alves, 2009; Guzmán et al., 2006). National family planning programs in Latin America were implemented in the 1960s (Mundigo, 1992; Weinberger, 1992), but their features, scope, and effectiveness varied among countries. The spread of female sterilization played a significant role in several countries that experienced a rapid decline from very high to medium/low fertility levels, as in Ecuador (Cavenaghi & Diniz Alves, 2009; UN Population Division, 2020). Chile and Uruguay, however, offered a different outlook regarding contraceptive use. In Chile, family planning was introduced in the framework of public health policies implemented to reduce infant and maternal mortality, producing a higher use of the IUD and oral contraception methods (Castro, Díaz, Galán, López, & Matamala, 2007). Due to its early demographic transition and already low fertility levels, family planning services were not a public priority in Uruguay until the mid-1990s; since then, oral contraception and male condoms have been the most widely used methods of preventing pregnancy (UN Population Division, 2020; Varela, 2007).

This study provides compelling evidence of the prevalence of early childbearing among Latin American women. As previous research has indicated, the postponement of childbearing in Latin American countries emerged with subsequent cohorts and increased heterogeneity in age at first birth between socioeconomic groups (Lima et al., 2018; Rosero-Bixby, Castro-Martín, & Martín-García, 2009). In Uruguay, for instance, women born in the second half of the 1960s were found to be the forerunners of a shift towards a later transition into motherhood (Nathan, 2015a), and adolescent fertility experienced a dramatic decrease after 2015 (Cabella, Nathan, & Pardo, 2019). Future work on the timing-quantum link of fertility should focus on women born after 1970 to capture the impact of the emerging delay in childbearing, particularly in Southern Cone countries (Lima et al., 2018; Nathan, 2015b; Nathan et al., 2016; Pardo & Cabella, 2018; Rosero-Bixby et al., 2009).

Postponement of childbearing is likely to produce a further decrease in completed cohort fertility in Latin America through the timing-quantum interaction effects, in line with results reported by Goldstein, Lutz, & Scherbov (2003) and Kohler et al. (2002) for European countries. The potential reduction in cohort fertility could further weaken the timing-quantum link through the increasing control of unplanned births among the early starters and the higher propensity of progressing to second and higher-order births among the late starters.

As pointed out by Morgan and Rindfuss (1999), the inverse association between age at first birth and completed fertility is unlikely to disappear, at least as long as those individuals expected to have high fertility are self-selected into an early age at first birth. Despite existing evidence of a weakening in the association across populations, a strong selection effect - due to divergent reproductive behavior among socioeconomic groups - might inhibit a further attenuation of the timing-quantum link in Latin America. The differences between socioeconomic groups within countries and cohorts are crucial in fertility change in the region, as persistent inequalities have influenced reproductive behavior for several decades. The analysis of the timing-quantum link by educational groups may, therefore, be the natural next step for further research.

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References

Andersson, G., Rønsen, M., Knudsen, L. B., Lappegård, T., Neyer, G., Skrede, K., … Vikat, A. (2009). Cohort Fertility Patterns in the Nordic Countries. *Demographic Research*, *20*(14), 313–352.

Balakrishnan, T. R., Rao, K. V., Krotki, K. J., & Lapierre-Adamcyk, E. (1988). Age at first birth and lifetime fertility. *Journal of Biosocial Science*, *20*(2), 167–174.

Batyra, E. (2016). Fertility and the changing pattern of the timing of childbearing in Colombia. *Demographic Research*, *35*(46), 1343–1372.

Berrington, A. (2017). Childlessness in UK. In M. Kreyenfeld & D. Konietzka (Eds.), *Childlessness in Europe: Contexts, Causes, and Consequences* (pp. 57–76). Springer, Cham.

Berrington, A., Stone, J., & Beaujouan, E. (2015). Educational differences in timing and quantum of childbearing in Britain: A study of cohorts born 1940−1969. *Demographic Research*, *33*(26), 733–764.

Billari, F. C., & Borgoni, R. (2005). Assessing the use of sample selection models in the estimation of fertility postponement effects. *Statistical Methods and Applications*, *14*(3), 389–402.

Bumpass, L. L., Rindfuss, R. R., & Janosik, R. B. (1978). Age and Marital Status at First Birth and the Pace of Subsequent Fertility. *Demography*, *15*(1), 75–86.

Cabella, W., Nathan, M., & Pardo, I. (2019). La caída de la fecundidad en Uruguay entre 2015 y 2018. In M. de S. P. y U. de la R. Fondo de Población de las Naciones Unidas (Ed.), *Descenso acelerado de la fecundidad en Uruguay entre 2015 y 2018. Tres estudios para su análisis* (pp. 33–70). Montevideo: UNFPA, MSP y UNiversidad de la República.

Cabella, W., & Pardo, I. (2014). Hacia un régimen de baja fecundidad en América Latina y el Caribe , 1990-2015. In S. Cavenaghi & W. Cabella (Eds.), *Comportamiento reproductivo y fecundidad en América Latina: una agenda inconclusa* (pp. 13–31). Rio de Janeiro: ALAP, Serie e-investigaciones 3.

Casterline, J. B., & Odden, C. (2016). Trends in Inter-Birth Intervals in Developing Countries 1965–2014. *Population and Development Review*, *42*(2), 173–194.

Castro, A. (2017). Social classes and fertility decline in Latin America, 1920-1970. In *IUSSP XXVIII IPC*. Cape Town.

Castro, R. (2015). Late-entry-into-motherhood women are responsible for fertility recuperation. *Journal of Biosocial Science*, *47*(2), 275–279.

Cavenaghi, S., & Diniz Alves, J. E. (2009). Fertility and contraception in Latin America: historical trends, recent patterns. In *Demographic transformations and inequalities in Latin America: Historical trends and recent patterns* (pp. 161–192). ALAP, Serie Investigaciones 8.

Chackiel, J. (2004). La transición de la fecundidad en América Latina 1950-2000. *Papeles de Población*, *10*(41), 9–58.

ECLAC. (2012). *Social panorama of Latin America* (Vol. 1). Santiago de Chile: ECLAC-UNFPA.

Esteve, A., Garcia-Roman, J., Lesthaeghe, R., & Lopez-Gay, A. (2013, February). The "Second Demographic Transition" Features in Latin America: the 2010 Update. Barcelona: Centre d'Estudis Demografics.

Esteve, A., Lesthaeghe, R., & López-Gay, A. (2012). The Latin American Cohabitation Boom, 1970 – 2007. *Population and Development Review*, *38*(1), 55–81.

Goldstein, J., Lutz, W., & Scherbov, S. (2003). Long-term population decline in Europe: The relative importance of tempo effects and generational length. *Population and Development Review*, *29*(4), 699–707.

Guzmán, J. M., Rodríguez, J., Martínez, J., Contreras, J. M., & González, D. (2006). The Demography of Latin America and the Caribbean since 1950. *Population (English Edition)*, *61*(5), 519–620.

Gyimah, S. O. (2003). A Cohort Analysis of the Timing of First Birth and Fertility in Ghana. *Population Research and Policy Review*, *22*(3), 251–266.

Heaton, T. B., Forste, R., & Otterstrom, S. M. (2002). Family transitions in Latin America: First intercourse, first union and first birth. *International Journal of Population Geography*, *8*(1), 1–15.

Kitagawa, E. M. (1955). Components of a Difference Between Two Rates. *Journal of the American Statistical Association*, *50*(272), 1168–1194.

Kneale, D., & Joshi, H. (2008). Postponement and childlessness - Evidence from two British cohorts. *Demographic Research*, *19*(58), 1935–1968.

Knodel, J. (1987). Starting, stopping, and spacing during the early stages of fertility transition: the experience of German village populations in the 18th and 19th

centuries. *Demography*, *24*(2), 143–162.

Kohler, H.-P., Billari, F. C., & Ortega, J. A. (2002). The Emergence of the Lowest-Low Fertility in Europe during the 1990s. *Population and Development Review*, *28*(4), 641–680.

Kohler, H.-P., Skytthe, A., & Christensen, K. (2001). *The Age at First Birth and Completed Fertility Reconsidered: Findings from a Sample of Identical Twins* (MPIDR Working Paper) (Vol. WP-2001-00).

Lima, E. E. C., Zeman, K., Sobotka, T., Nathan, M., & Castro, R. (2018). The Emergence of Bimodal Fertility Profiles in Latin America. *Population and Development Review*, *4*(1), 723–743.

Marini, M., & Hodsdon, P. J. (1981). Effects of the Timing of Marriage and First Birth of the Spacing of Subsequent Births. *Demography*, *18*(4), 529–548.

Medina, J. C. (2019). *The relation between age at first birth and complete fertility: An analysis using US data*. Lund University. Retrieved from https://lup.lub.lu.se/student-papers/search/publication/8966135

Morgan, S. P. (1996). Characteristic Features of American Fertility. *Population and Development Review*, *22*, *Supple*(1996), 16–63.

Morgan, S. P., & Rindfuss, R. R. (1999). Reexamining the Link of Early Childbearing to Marriage and to Subsequent Fertility. *Demography*, *36*(1), 59–75.

Morgan, S. P., & Taylor, M. G. (2006). Low Fertility at the Turn of the Century. *Annual Review of Sociology*, *32*, 375–399.

Mundigo, A. (1992). Los programas de planificación familiar y su función en la transición de la fecundidad en América Latina. *Notas de Población*, *55*, 11–40.

Nacionales, N., Regulaci, S., & Fertilidad, D. E. L. A. (2014). *Normas nacionales sobre regulación de la fertilidad 1*. Santiago de Chile: Ministerio de Salud de Chile. Retrieved from https://www.minsal.cl/wp-content/uploads/2015/09/2018.01.30_NORMAS-REGULACION-DE-LA-FERTILIDAD.pdf

Nathan, M. (2015a). La creciente heterogeneidad en la edad al primer hijo en el Uruguay: un análisis de las cohortes de 1951 a 1990. *Notas de Población*, *100*, 35–60.

Nathan, M. (2015b). La lenta transición hacia un régimen de fecundidad tardía en Uruguay: los cambios en la edad al primer hijo entre 1978 y 2011. *Revista Latinoamericana de Población*, *9*(17), 37–60.

Nathan, M., & Pardo, I. (2019). Fertility Postponement and Regional Patterns of Dispersion in Age at First Birth: Descriptive Findings and Interpretations. *Comparative Population Studies*, *44*, 37–60.

Nathan, M., Pardo, I., & Cabella, W. (2016). Diverging patterns of fertility decline in Uruguay. *Demographic Research*, *34*(20), 563–586.

Nicoletti, C., & Tanturri, M. L. (2008). Differences in delaying motherhood across European countries: Empirical evidence from the ECHP. *European Journal of Population*, *24*(2), 157–183.

Pardo, I., & Cabella, W. (2018). A Bimodal Pattern in Age at First Birth in Southern Cone. *Population Review*, *57*(2), 1–22.

Pullum, T. W. (2004). Natality. Measures Based on Censuses and Surveys. In J. S. Siegel & D. A. Swanson (Eds.), *The Methods and Materials of Demography* (pp. 407–428). San Diego, California: Elsevier Academic Press.

Reher, D., & Requena, M. (2014). Was there a mid-20th century fertility boom in Latin America? *Revista de Historia Económica*, *33*(3), 319–350.

Rios-Neto, E. L. G., Miranda-Ribeiro, A., & Miranda-Ribeiro, P. (2018). Fertility Differentials by Education in Brazil: From the Conclusion of Fertility to the Onset of Postponement Transition. *Population and Development Review*, *44*(3), 489–517.

Rodríguez, J. (2013). *High adolescent fertility in the context of declining fertility in Latin America*. New York: United Nations, Department of Economic and Social Affairs, Population Division, Expert Paper No. 2013/14.

Rodríguez, J., & Cavenaghi, S. (2014). Adolescent and youth fertility and social inequality in Latin America and the Caribbean: What role has education played? *Genus*, *70*(1), 1–25.

Rosero-Bixby, L., Castro-Martín, T., & Martín-García, T. (2009). Is Latin America starting to retreat from early and universal childbearing? *Demographic Research*, *20*(9), 169–194.

Rybińska, A., & Morgan, S. P. (2019). Childless Expectations and Childlessness Over the Life Course. *Social Forces*, *97*(4), 1571–1602.

Sobotka, T. (2017). Post-Transitional Fertility: the Role of Childbearing Postponement in Fuelling the Shift to Low and Unstable Fertility Levels. *Journal of Biosocial Science*, *49*(S1), 20–45.

Sobotka, T., Zeman, K., Lesthaeghe, R., & Frejka, T. (2011). Postponement and Recuperation in Cohort Fertility: New Analytical and Projection Methods and their Application. *European Demographic Research Papers*, *36*(2–3), 417–452.

Tomkinson, J. (2019). Age at first birth and subsequent fertility: The case of adolescent mothers in France and England and Wales. *Demographic Research*, *40*(27), 761–798.

Trussell, J., & Menken, J. (1978). Early Childbearing and Subsequent Fertility. *Family Planning Perspectives*, *10*(4), 209–218.

UN Population Division. (2020). World Contraceptive Use 2020. (POP/DB/CP/Rev2020). New York: United Nations, Department of Economic and Social Affairs, Population Division.

Van Bavel, J. (2004). Detecting Stopping and Spacing Behaviour in Historical Demography. A Critical Review of Methods. *Population (English Edition)*, *59*(1), 117–128.

Varela, C. (2007). Fecundidad: Propuestas para la formulación de políticas. In J. J. Calvo & P. Mieres (Eds.), *Importante pero Urgente. Políticas de población en Uruguay* (pp. 13–20). Montevideo: Rumbos, UNFPA.

Weinberger, M. B. (1992). Cambios en la combinación de métodos anticonceptivos durante la transición de la fecundidad: América Latina y el Caribe. *Notas de Población*, *55*, 41–78.

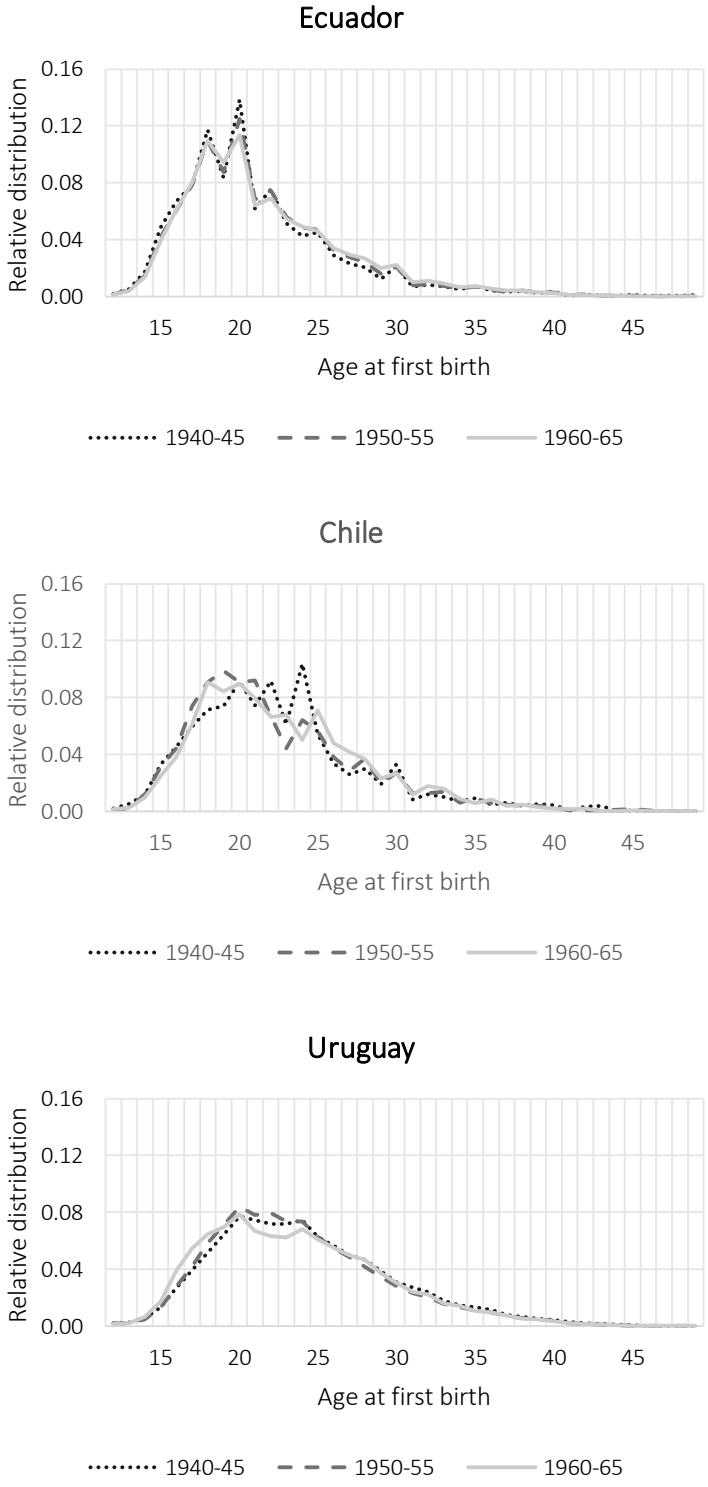
Appendix

Table A-1. Relative distribution of women by age at first birth, country, and cohort

		1940-1945	1950-1955	1960-1965
Ecuador	<20	42.0%	39.9%	40.3%
	20-24	37.0%	37.2%	35.1%
	25-29	13.0%	14.7%	15.6%
	30-34	4.9%	5.1%	5.9%
	35+	3.2%	3.1%	3.1%
	All	100.0%	100.0%	100.0%
Chile	<20	30.2%	35.5%	31.3%
	20-24	42.2%	35.8%	35.3%
	25-29	16.2%	18.0%	22.0%
	30-34	7.0%	7.3%	8.1%
	35+	4.3%	3.4%	3.2%
	All	100.0%	100.0%	100.0%
Uruguay	<20	20.5%	22.1%	25.6%
	20-24	37.0%	38.9%	34.0%
	25-29	25.4%	24.2%	25.0%
	30-34	11.4%	10.1%	10.7%
	35+	5.6%	4.8%	4.8%
	All	100.0%	100.0%	100.0%

Source: Own computations using data from 2010 Census for Ecuador, 2011 CASEN for Chile, and 2011 Census for Uruguay.

Figure A-1. Relative distribution of the age at first birth of mothers, by country and cohort



Source: Own computations using data from 2010 Census for Ecuador, 2011 CASEN for Chile, and 2011 Census for Uruguay.

Conclusiones

El objetivo de esta tesis consistió en estudiar las características del patrón de cambio hacia un régimen de fecundidad tardía en el Cono Sur, la región que ha liderado las transformaciones recientes en el calendario reproductivo entre los países latinoamericanos.

En primer lugar, se analizó la evolución anual de la edad media al nacimiento del primer hijo y su nivel de heterogeneidad en 21 países pertenecientes a 8 regiones del mundo, haciendo foco en las diferencias observadas entre países del Cono Sur y los de las regiones más avanzadas en la transición del aplazamiento de la fecundidad. En segundo lugar, se examinaron los cambios en la edad de entrada a la maternidad por nivel educativo para las cohortes 1950-1980 en Argentina, Chile y Uruguay, en el contexto de diferencias en el ritmo de avance del proceso de expansión educativa. Por último, se analizaron los cambios en la relación entre la edad al primer nacimiento y la paridez media final, revisando su impacto en la caída de la fecundidad de cohorte. La estrategia metodológica utilizada combinó fuentes y métodos estándar en el análisis demográfico, destacándose la aplicación de tablas de fecundidad, de técnicas de estandarización y descomposición, y el cálculo de medidas de estadística descriptiva.

Los resultados del Capítulo 1 apoyan la hipótesis de una creciente heterogeneidad en la edad al primer nacimiento en el transcurso de la transición del aplazamiento, y destacan la relevancia de los patrones geográficos distintivos, asociados con las características sociohistóricas e institucionales de los países o regiones. Los países del Cono Sur presentan, al inicio del cambio hacia un modelo de fecundidad tardía, una edad media al primer nacimiento más baja que la de los países desarrollados en esa etapa de la transición, así como mayores niveles de heterogeneidad en la edad al primer nacimiento.

Asimismo, y a partir del análisis de la distribución de las tasas específicas de fecundidad del primer nacimiento por país y región, se identificaron cuatro patrones básicos de dispersión: tres son una variante del modelo habitual de distribución normal, asociado a una creciente diversidad en el calendario de ocurrencia de los eventos del curso de la vida, pero en un contexto de desplazamiento del primer nacimiento hacia edades más avanzadas. El cuarto grupo, integrado por países anglosajones y los del Cono Sur, es el que presenta una mayor heterogeneidad en la distribución de la edad al primer hijo y curvas que se apartan del patrón de distribución unimodal. Dos procesos subyacentes explican la aparición de este patrón: la persistencia de altas tasas de fecundidad a edades tempranas, a menudo observada en mujeres de estratos sociales bajos, y el aplazamiento de los primeros nacimientos liderado por las mujeres de estratos socioeconómicos más aventajados.

Este modelo de polarización social del calendario de entrada a la maternidad en los países del Cono Sur se encuentra fuertemente asociado al nivel educativo, tal como pudo constatarse a partir de los resultados obtenidos en el Capítulo 2. En línea con los estudios realizados previamente en América Latina, se evidenció que las cohortes más jóvenes de nivel educativo alto (enseñanza terciaria completa) retrasan la llegada del primer hijo, mientras que las de educación baja (secundaria incompleta) adelantan este evento. En el caso de aquellas de nivel medio (secundaria completa), se observaron diferencias entre los países del Cono Sur. Las cohortes más jóvenes de nivel medio en Uruguay tienden a retrasar la entrada a la maternidad, mientras que en Chile se comportan de manera más próxima a las de educación baja. Argentina, por su parte, no presenta cambios sustantivos en la edad al primer nacimiento entre las mujeres de nivel medio. Asimismo, al comparar a las mujeres de nivel alto, se constatan edades más tardías de entrada a la maternidad entre las uruguayas que entre sus pares de los otros dos países, que podrían estar asociadas a las altas tasas de participación laboral femenina entre las más educadas y las características de la oferta universitaria uruguaya, que genera carreras más largas y dilatadas en el tiempo. Por ese motivo, y a pesar de ser el país más rezagado en el nivel de avance de la expansión educativa, la edad mediana al primer hijo en Uruguay es la mayor de la región del Cono Sur.

La expansión educativa contrarrestó parcialmente la bifurcación del calendario reproductivo entre mujeres de diferentes niveles educativos en el Cono Sur. En el caso de Chile, el fuerte aumento de la proporción de mujeres con secundaria completa y más entre las cohortes 1950 y 1980 pudo neutralizar el efecto de adelantamiento de la maternidad registrado al interior de los grupos educativos e incidir marcadamente en el retraso de la edad al primer hijo. En el caso de Uruguay, que experimentó en el mismo período una expansión educativa más modesta que la de Chile, el "efecto composición" actuó mitigando ese patrón, pero no contrarrestándolo completamente. No obstante, vale destacar que el aumento de la proporción de madres a edades tempranas podría haber sido mayor en ausencia de los cambios observados en la composición educativa de las mujeres uruguayas. En definitiva, tomando en cuenta el ritmo de avance de la expansión educativa en los países del Cono Sur, no se constata una asociación clara entre dicho proceso y la transición hacia un régimen de fecundidad tardía. Este hallazgo pone de manifiesto que hay otros factores de tipo contextual e institucional mediando dicha relación y operando sobre la conducta reproductiva de los individuos.

El capítulo 3 se centró en el análisis de la relación entre la edad al primer nacimiento y la fecundidad final de cohorte en América Latina. Con datos de tres países, correspondientes a tres tipos de trayectorias de descenso de la fecundidad en la región (Chile, Ecuador y Uruguay), se examinó en qué medida se produjo un cambio en la fuerza de la relación

entre edad al primer nacimiento y la paridez media final. En términos generales, se observa que, en el marco de la disminución de los niveles de fecundidad de cohorte, dicha relación tiende a debilitarse por una mayor limitación de la paridez entre las mujeres que tuvieron su primer hijo a edades tempranas.

En este sentido, se mostró que el principal factor que impulsó el descenso de la fecundidad de cohorte en la región fue el control de la descendencia, en un contexto de estabilidad o incluso rejuvenecimiento de la edad media al primer nacimiento, y de disminución de la nuliparidez. Tal como se discutió en el apartado final de ese capítulo, la fecundidad de cohorte podría sufrir una caída todavía más pronunciada de consolidarse el cambio hacia un modelo de fecundidad tardía los países del Cono Sur y América Latina.

La tesis abordó algunos de los temas críticos relativos a los cambios en el calendario del primer nacimiento en el Cono Sur. De esta manera, se ha intentado contribuir a la comprensión de las señas particulares de la transición hacia un régimen de fecundidad tardía en la región en su etapa inicial o de despegue. Se evidenció que esta transición se inició con altos niveles de heterogeneidad en el calendario de entrada a la maternidad y que el efecto de la expansión educativa ha estado limitado por factores contextuales e institucionales, en un continente caracterizado por las desigualdades sociales. Si bien se trata de una región que presenta especificidades con relación al resto de América Latina, el modelo de transición que exhibe el Cono Sur no deja de estar marcado por algunos rasgos típicamente latinoamericanos, entre ellos las inequidades sociales y económicas al interior de cada país.

Ahora bien, durante los últimos años los países del Cono Sur han experimentado un descenso sostenido de la tasa de fecundidad adolescente hasta alcanzar valores mínimos históricos. Esta novedad, que se inició casi a finales de la década anterior en Chile y a partir de 2015 en Argentina y Uruguay, representa un quiebre con respecto a una tendencia histórica y estable niveles de elevados de fecundidad adolescente en la región (Cabella, Nathan, & Pardo, 2019; Dirección General de Población, 2021; Rodriguez Vignoli & Roberts, 2020). ¿Podría ser éste un punto de inflexión en la transición de la fecundidad en América Latina, que abra paso a un nuevo período de régimen de fecundidad tardía y muy baja, con los países del Cono Sur nuevamente a la cabeza del cambio reproductivo en América Latina? Dado que se trata de un fenómeno reciente y muy repentino, es también un llamado a repensar la agenda de investigación sobre fecundidad y comportamiento reproductivo en América Latina.

Si se estuviera efectivamente en presencia de nuevas cohortes de mujeres que, además de protagonizar un descenso de la maternidad adolescente, mantuvieran o profundizaran las pautas de retraso de la fecundidad que se viene desarrollando en las cohortes

precedentes, la región del Cono Sur estaría efectivamente encaminándose hacia la consolidación de un régimen de fecundidad tardía. ¿Qué ocurrirá con la polarización social y la heterogeneidad del calendario reproductivo en este contexto? En la medida que la maternidad temprana deje de ser una característica prominente de trayectoria reproductiva de los sectores más desventajados, se podría estar frente a un quiebre del patrón de polarización de la edad de entrada a la maternidad característico de esta región.

Es altamente factible que el aplazamiento de la maternidad hasta edades avanzadas de la etapa reproductiva continúe profundizándose en los próximos años, en el marco de la consolidación de transformaciones más profundas en materia de dinámica familiar e igualdad de género. Junto con ello, en los próximos años seguirán creciendo en importancia social y académica las consecuencias demográficas y médicas del retraso de la maternidad, hasta ahora minimizadas por el protagonismo que la maternidad temprana ha tenido para investigadores, operadores de salud y decisores de políticas públicas en la región.

Es probable que el retraso de la maternidad produzca una mayor caída del nivel de fecundidad en la región como resultado de la interacción *timing-quantum*, tal como sucedió en los países desarrollados (Beaujouan, Zeman, & Nathan, 2023; Goldstein, Lutz, & Scherbov, 2003; Kohler, Billari, & Ortega, 2002). Asimismo, aunque no contamos con evidencia contundente al respecto de la evolución de la nuliparidez en el Cono Sur, existen indicios de un potencial aumento para los próximos años (Pardo, Cabella, & Nathan, 2020).

Esta etapa que comienza es más el resultado del acceso a una nueva generación de anticonceptivos de larga duración y de emergencia, sumado a la legalización de la interrupción voluntaria de los embarazos que entró en vigencia en Uruguay, primero, y Argentina, después, que el resultado de cambios estructurales en materia de desarrollo social y atenuación de las desigualdades socioeconómicas. En ese campo, no obstante, el factor que posiblemente ha jugado un rol clave es el cambio hacia una mayor igualdad de género en la esfera pública, y aumento de la autonomía social y económica femenina. Por otra parte, no se pueden obviar los cambios radicales en el terreno de las interacciones sociales y la dinámica de formación de parejas a partir del creciente protagonismo del mundo virtual y la comunicación mediante 'redes sociales', reconfigurando el espacio de encuentro entre personas, el ejercicio de la sexualidad, y la difusión de intereses y aspiraciones de vida.

Esta es, sin dudas, una fase completamente novedosa para el régimen de fecundidad latinoamericano, que parece encaminarse hacia un modelo en el que la fecundidad temprana ya no será uno de sus rasgos centrales. Los países del Cono Sur se presentan como los pioneros de este cambio de régimen, pero la rápida caída reciente de la

fecundidad adolescente en países como Brasil y Costa Rica sugieren que este nuevo patrón se extiende con rapidez en el continente.

Referencias

Beaujouan, É., Zeman, K., & Nathan, M. (2023). Age at First Birth and Completed Fertility across the 1940–1969 Birth Cohorts. *Demographic Research*, *48*(15), 387–420. https://doi.org/10.4054/DemRes.2023.48.15

Cabella, W., Nathan, M., & Pardo, I. (2019). La caída de la fecundidad en Uruguay entre 2015 y 2018. In M. de S. P. y U. de la R. Fondo de Población de las Naciones Unidas (Ed.), *Descenso acelerado de la fecundidad en Uruguay entre 2015 y 2018. Tres estudios para su análisis* (pp. 33–70). Montevideo: UNFPA, MSP y UNiversidad de la República.

Dirección General de Población. (2021). *La natalidad y fecundidad en Argentina entre 1980 y 2019*. Retrieved from https://www.argentina.gob.ar/sites/default/files/2021/09/natalidad_y_fecundidad_en_argentina.1980_a_2019.dnp_resumen_ejecutivo_nacional_final.pdf

Goldstein, J., Lutz, W., & Scherbov, S. (2003). Long-term population decline in Europe: The relative importance of tempo effects and generational length. *Population and Development Review*, *29*(4), 699–707. https://doi.org/10.1111/j.1728-4457.2003.00699.x

Kohler, H.-P., Billari, F. C., & Ortega, J. A. (2002). The Emergence of the Lowest-Low Fertility in Europe during the 1990s. *Population and Development Review*, *28*(4), 641–680.

Pardo, I., Cabella, W., & Nathan, M. (2020). Las trayectorias de las mujeres sin hijos en Uruguay. *Revista Brasileira de Estudos de População*, *37*, 1–26.

Rodriguez Vignoli, J., & Roberts, A. (2020). *El descenso de la fecundidad adolescente en Chile: antecedentes, magnitud, determinantes y desigualdades* (Serie de Estudios No. 12). Santiago.