Book of abstracts

Meeting of the

EAPS Working Group on

Register-Based Fertility Research

17-18 November 2025

University of Antwerp, Belgium

Contact: meeting2025@uantwerpen.be

Conference Organizers:
Karel Neels, Jonas Wood, Jessica Nisén, Kelsey Wright, and Daniël van Wijk

TIMETABLE

MONDAY, 17th of November

8h30-8h50: Coffee

8h50-9h00: Opening

9h00-10h30: Session 1: Trends in Fertility [Chair: Kelsey Wright]

Stable intentions in times of declining births: Trends in fertility intentions and Total Fertility Rates in Germany, 2021-2024	Carmen Friedrich and Martin Bujard
Mapping the Fertility Decline in Turkey: A Register-Based Analysis of Spatial and Structural Shifts (2009–2024)	Alanur Çavlin and Faruk Keskin
Can the stagnation of incomes explain recent fertility trends in Europe?	Daniël van Wijk, Tomáš Sobotka, and Kryštof Zeman
25 years of abortions in 6 countries of Europe	Ágnes Szabó Morvai, Martin Bujard, Flavia Cavallini, Mathias Hübner, Jessica Nisén, Jitka Slabá, Csaba Tóth, and Sofia Trommlerova

10h30-11h00: Coffee Break

11h00-12h30: Session 2: Population heterogeneity and Fertility [Chair: Trude Lappegård]

Educational disparities in couples and transitions to parenthood during the fertility decline of the 2010s	Glenn Sandström and Gunnar Andersson
Unequal rebound: Educational gradients in fertility decline and mean age at birth in Denmark	Peter Fallesen, Laust Hvas Mortensen, and Ilya Kashnitsky
Refugee childbearing and its relationships with social inequality	Ben Wilson, Alice Goisis, and Alícia Adserà
Keep the baby or not? A quantitative analysis of abortion decisions in Hungary using survey and register data	Zsuzsanna Makay and Laura Szabó

12h30-14h15: Lunch

14h15-15h45: Session 3: Childbearing, Labour and Earnings [Chair: Jonas Wood]

Parental Leave Patterns in the Population of Fathers in Male Same-Sex Couples in Denmark, Norway, and Sweden	Maaike van der Vleuten, Ylva Moberg, and Marie Evertsson
“All by myself?” Single mothers’ poverty risks and income changes around childbirth	Denise B. Musni and Christine Schnor
The Cost of Family Complexity: How Multipartnered Fertility Shapes Earnings Trajectories in the Netherlands	Stefano Arnolfo, Nicole Hiekel, and Aart C. Liefbroer
Firm-Specific Variation in Motherhood Penalties: Evidence from Dutch Administrative Data	Pascal Achard and Sander Wagner

15h45-16h15: Coffee Break

16h15-17h15: Session 4: Cross-cutting: New approaches in fertility research [Chair: Jessica Nisen]

ODISSEI: Update regarding infrastructure funding for the distributed fertility network	Tom Emery
Are births predictable with register data? Evidence from the Predicting Fertility data challenge	Elizaveta Sivak and Gert Stulp
Quantifying the association between postponement of parenthood and cohort completed fertility using multistate shared frailty models and dynamic microsimulation	Karel Neels

17h15-18h30: Session 5: POSTER SESSION with pre-dinner nibbles [Chair: Gunnar Anderson]

Mapping Early Mid-Life Trajectories and Ultimate Childlessness: A Multichannel Sequence Analysis in Finland and Belgium	Alice Rees and Marika Jalovaara
Job mobility and entry into parenthood: A longitudinal study on Finnish women	Wioletta Grzenda and Jessica Nisén
No worries? Expectations about the future and fertility intentions	Bernhard Riederer
Vaccinated vs. Unvaccinated: Women with Diverging Fertility Patterns	Eva Waldaufová, Jitka Slabá, Anna Šťastná, Kryštof Zeman, and Jitka Jírová

19h00: Conference dinner

(While the reservation is arranged by the organisers, attendees will be responsible for covering the cost of their own meals and drinks.)

TUESDAY, 18th of November

8h30-9h00: Coffee

9h00-10h30: Session 6: Urban-Rural differences, Housing and Fertility [Chair: Daniël Van Wijk]

From the desire to have children to having children: Urban-rural differences in realisation	Bernhard Riederer
Local House Prices and First Births in Belgium: Subgroup Variation by Education and Migration Background	Jonas Wood
Changes in homeownership and in the entry into parenthood in the Nordic countries	Jessica Nisén, Lars Dommermuth, Sofi Ohlsson-Wijk, and Peter Fallesen
The relationship between home ownership and the transition to first birth among coresidential couples in Finland	Erik Carlsson and Jessica Nisén

10h30-11h00: Break

11h00-12h30: Session 7: (New) determinants of fertility trends [Chair: Karel Neels]

Deroutinization of Labor and Second Birth in West Germany: The Moderating Role of Childcare	Honorata Bogusz, Anna Matysiak, and Michaela Kreyenfeld
Radicalized political climate and fertility	Chiara L. Comolli, Gunnar Andersson, Gerda Neyer, and Oskar Lindstrom
Unpacking Trends in Religious Affiliation, Cohort Fertility and Period Fertiliy using Register Data	Linus Andersson, Julia Hällstrand, Marika Jalovaara, and Jan Saarela

12h30-12h45: Closing

ABSTRACTS

MONDAY, 17th of November

9h00-10h30: Session 1: Trends in Fertility

Stable intentions in times of declining births: Trends in fertility intentions and Total Fertility Rates in Germany, 2021-2024

Carmen Friedrich[1] and Martin Bujard[1,2]
[1]Federal Institute for Population Research (BiB), Wiesbaden, Germany, [2]Heidelberg University, Heidelberg, Germany

In the aftermath of the global COVID-19 pandemic, fertility rates in Europe reached historically low levels. Even in some Northern European countries, fertility rates dropped below 1.5 – an unprecedented development. Increased uncertainty during times of multiple crises – COVID-19, Russian war against Ukraine, inflation, and climate change – is being discussed as a cause. Against this backdrop, it is crucial to determine whether these period fertility trends are driven by timing effects or reflect potential changes in future childbearing intentions, particularly among the younger generation. Using recent data from three waves (2021-2024) of the German Family Demography Panel Study (FReDA), we analyse the development of fertility intentions using descriptive statistics and compare them with Total Fertility Rates (TFR) derived from birth statistics for the same period. Additionally, we analyse fertility intentions by estimating fixed effects regression models, with all models estimated separately for men and women and adjusted for age group, number of children, and partnership status. The results support the postponement hypothesis: the intended number of children remained relatively stable between 2021 and 2024 for both men and women (around 1.9 among 18-29-year-olds and around 1.8 among 30-39-year-olds), while the TFR declined sharply from 1.6 to 1.3. However, the share of individuals intending to have a(nother) child within the next three years decreased. Moreover, we find differences by gender and education: among men, this decline is observed across all educational levels. Among women, the decline is limited to those with higher education, whereas the probability of intending a(nother) child increased over time among women with lower education. Given that fertility intentions remained stable during the observed period and exceed actual period fertility, this suggests that the fertility decline in the early 2020s may have been driven by uncertainty and, consequently, a postponement of childbirth. The multiple crises have created a climate of uncertainty which may be leading individuals to postpone childbearing.

Mapping the Fertility Decline in Turkey: A Register-Based Analysis of Spatial and Structural Shifts (2009–2024)

Alanur Çavlin[1] and Faruk Keskin[1]
[1]Hacettepe University Institute of Population Studies

This paper presents one of the first register-based provincial analyses of fertility in Turkey, aiming to provide empirical insight into the country's recent and rapid fertility decline. While demographic studies in Turkey have historically relied on survey data and projections, this study leverages vital registration records from the Turkish Statistical Institute's Address-Based Population Registration System (ABPRS), spanning 2009 to 2024. This dataset enables a robust, spatially granular examination of fertility trends across all 81 provinces. Importantly, register-based analysis not only allows for provincial-level fertility tracking, but also makes it possible to examine whether interprovincial differences and similarities in fertility levels are shaped by underlying socioeconomic indicators at the provincial scale. Findings reveal a dramatic drop in the total fertility rate (TFR)—from 2.2 in 2014 to 1.5 in 2024—marking a clear structural shift in reproductive behavior. The analysis highlights regional convergence and divergence trends, and evaluates the long-term effects of two major societal shocks: the COVID-19 pandemic and the February 6, 2023 earthquakes. These shocks appear not to have caused merely temporary delays, but to have catalyzed permanent changes in birth timing and overall fertility behavior. Standard biodemographic measures, such as average age at first marriage (25.8 for women; 28.3 for men) and the marriage rate among women aged 15+ (60%), do not adequately explain the fertility collapse. In 2024, 71 out of 81 provinces fall below replacement level, and 26 fall below the "lowest-low" threshold of 1.3. Provinces such as Bayburt and Tunceli—small and non-metropolitan—now report among the lowest fertility levels nationally, suggesting spatial inequality in fertility decline. By adopting a register-based, comparative spatial approach, this study fills a critical empirical gap in Turkish fertility research and contributes to broader discussions on demographic transition, structural determinants of fertility, and the transformative power of longitudinal population data.

Can the stagnation of incomes explain recent fertility trends in Europe?	Daniël van Wijk[1] , Tomáš Sobotka[2], and Kryštof Zeman[2] [1]Netherlands Interdisciplinary Demographic Institute – NIDI, [2] Vienna Institute of Demography – VID / Austrian Academy of Sciences

Fertility rates declined in much of Northern, Western, and Southern Europe during the 2010s, whereas they remained stable or increased in many Central and Eastern European countries. In this study, we examine to what extent the unexpected fertility declines and divergent fertility trends across countries can be explained by differences in the income trajectories of young adults. We use country-level data on period total fertility rates (TFRs), also differentiated by age and birth order, and tempo- and parity-adjusted Total Fertility (TFRp*). We analyse how these fertility indicators were affected by real income, unemployment rates, consumer confidence, house prices and rent indices, and family spending policies, in 2007-2023. Within-between models show a strong positive association between changes in income and changes in fertility in 2007-2020, suggesting that the stagnation of young adults' incomes in much of Northern, Western, and Southern Europe can explain an important part of the fertility decline. Positive income effects are also found for tempo- and parity-adjusted fertility, for women over 30, and for higher-order births, indicating that stagnating incomes are not only linked with postponement of births, but also with declines in the period quantum of fertility. In addition, rising real rent prices were linked with declining fertility in this period. However, income trends no longer predict the period TFR well after 2020, suggesting that other explanations are needed for the fertility decline during and after the COVID-19 pandemic.

25 years of abortions in 6 countries of Europe	Ágnes Szabó-Morvai[1], Martin Bujard[2], Flavia Cavallini[3], Mathias Hübner[2], Jessica Nisén[4], Jitka Slabá[5], Csaba Tóth G.[1], Sofia Trommlerova[6] [1] ELTE KRTK, University of Debrecen, Hungary, [2] Federal Institute for Population Research, Wiesbaden, Germany, [3] IDEP, Università della Svizzera Italiana, Switzerland, [4] University of Turku, Finland, [5] Charles University, Czech Republic, [6] Comenius University Bratislava, Slovakia

In this article, we aim to summarize the past 25 years of induced abortions in the European Union. To our knowledge, no previous study has provided such a comprehensive overview of the evolution and drivers of abortion rates in Europe. A few studies, such as Bearak et al., have described global abortion trends, but they typically present aggregate figures and do not explore heterogeneity across population groups. Yet examining subpopulation trends is essential for drawing policy-relevant conclusions. Our analysis draws on data from EUROSTAT and the Human Fertility Database, supplemented with administrative country-level data from Finland, Spain, Germany, Hungary, Italy, Slovakia, and the Czech Republic. This broad data collection enables a detailed description of abortion rate trends across many EU countries. In addition to country-level changes, we present breakdowns by age, education, and parity. Abortion data are available from 1999 to 2023 for some countries, though coverage is shorter for others, and a few countries report no data at all. Alongside the abortion rate statistics, we summarize country-specific characteristics of abortion regulation, contraceptive availability, and prevailing norms and beliefs. Finally, we decompose abortion rates by age, parity, and education to assess the contribution of different population groups. This approach allows us to evaluate whether changes in abortion rates over the past decades stem primarily from shifts in population structure or from behavioral changes within groups.

11h00-12h30: Session 2: Population heterogeneity and Fertility

Educational disparities in couples and transitions to parenthood during the fertility decline of the 2010s	Glenn Sandström[1] and Gunnar Andersson[1] [1]Umeå and Stockholm University, Sweden

Over the past decades, women's education has started to outpace men's in almost all post-industrial societies. Due to the lack of information on cohabitation, research on educational dissimilarities between partners has often focused on married couples. In Sweden, register information on childless cohabitants only became available in 2011. There is yet no research on how socioeconomic dissimilarities between Swedish cohabiting partners impact their transition to parenthood, which is the parity transition that was driving the fertility decline of the 2010s. To assess the extent to which increased educational heterogamy among cohabiting couples has contributed to recent fertility developments, we focus on whether the share of heterogamous cohabiting couples has changed during the 2010s. Secondly, we assess how different types of socioeconomic pairings have been related to first birth hazards in Sweden between 2011 and 2023. To address this issue, we use register data for individuals of childbearing age during the period in question. This allows us to determine changes in education and couple formation and makes it possible to apply hazard models to determine how the risk of first birth covaries with educational heterogamy within the union. Our study demonstrates a decrease in the fraction of cohabiting unions where the man has higher education than his female partner and an increase in the fraction of homogamous unions where both partners are highly educated. Furthermore, our results show that unions with a highly educated woman have higher first birth rates than others, no matter if the union builds on educational homogamy or heterogamy. As a matter of fact, unions where the woman has higher education than her partner have retained higher fertility more than other parings and this pattern was gradually strengthened during our observation period. That the fertility among highly educated women have been the least affected by the general decline since 2010 indicates that female empowerment seems to be increasingly positively related to the propensities to become parents and certainly not a hindrance to it. Furthermore, the compositional changes in the educational pairings of Swedish couples have not contributed to the ongoing fertility decline, they have rather mitigated that decline.

Unequal rebound: Educational gradients in fertility decline and mean age at birth in Denmark	Peter Fallesen[1,2], Laust Hvas Mortensen[1,3], and Ilya Kashnitsky[4,5] [1]Research Unit, ROCKWOOL Foundation, Denmark, [2]Swedish Institute for Social Research, Stockholm University, Sweden, [3]Department of Public Health, University of Copenhagen, Denmark, [4]Statistics Denmark, Denmark, [5]Leverhulme Center for Demographic Research, Oxford University

This study examines period fertility trends in Denmark from 1980 to 2022, analyzing the sustained fertility decline since the late 2000s and rising maternal age at birth within the broader European demographic context. Using event-history regression methodology to estimate parity-specific indices of childbearing risks across calendar years and educational groups, we investigate the mechanisms driving Denmark's fertility patterns and their implications for future demographic change. Denmark's fertility decline aligns with European trends, though unlike many countries experiencing record-low fertility rates in recent decades, Denmark's lowest recorded total fertility rates occurred in the 1980s. However, the current decline represents a fundamentally different demographic shift. While the 1980s decline was primarily driven by birth postponement with limited impact on cohort fertility, the contemporary decline is characterized by sustained reductions in completed fertility, suggesting genuine quantum effects rather than temporary timing adjustments. Educational gradients play a central role in these fertility dynamics. The decline is primarily driven by reduced first birth rates, particularly among women with basic education, who experienced a 50% decline in first birth risk by 2021 relative to 2008 levels. In contrast, highly educated women maintained birth rates near 2008 levels. This educational stratification extends to higher-order births, with basic and intermediate educated groups experiencing significant declines in second birth progression rates compared to the advanced educated group. Compositional changes amplify these differentials. The basic educated population share declined from approximately 50% in 1980 to 13% in 2021, while advanced educated women increased from 18% to 55% of the age-standardized female population. Consequently, advanced educated women now account for over two-thirds of total fertility rate contributions, compared to one-fifth in 1980. Notably, the rising maternal age at first birth since 2000 is fully explained by educational expansion rather than within-group behavioral changes. Age-specific analysis reveals fertility declines concentrated among younger women,

predominantly those under 30. These findings suggest Denmark faces sustained cohort fertility decline while experiencing tempo effects from educational expansion-induced delays in parity transitions, indicating complex interactions between educational attainment, fertility timing, and quantum effects.

Refugee childbearing and its relationships with social inequality	Ben Wilson[1,2], Alice Goisis[3], and Alícia Adserà[4] [1]Stockholm University, [2]London School of Economics, [3]University College London, [4]Princeton University

In recent decades, many European countries have received large numbers of refugees and asylum seekers. As a result, there has been an ongoing interest in their integration and a parallel interest in their fertility. Some research has studied the childbearing of refugees, often as part of a broader focus on immigrant fertility. Similar to other immigrants, refugees who arrive as children are more likely adapt to destination childbearing norms if they arrive at younger ages. Yet this is in contrast to refugees arriving as adults, who often have higher levels of completed fertility. In some contexts, this is because refugees' childbearing trajectories are relatively unaffected by migration. However, this may not be the case for all refugees, in particular those who are separated from their partner before, during, or after migration. Research rarely examines how childbearing differs for refugees, let alone for different types of refugee. At the same time, we lack knowledge about the linkages between refugees' fertility and their social mobility, despite theories predicting that it may be difficult for (some) refugees to balance family careers with work, education and other aspects of integration. In this study, we respond to these gaps by carrying out a case study of Sweden, which is one of the few contexts that enables a comprehensive study of refugee childbearing – by gender, country of birth, and refugee status. Using longitudinal data for the whole population, we first demonstrate heterogeneity in the fertility of refugees, followed by an analysis of the linkages between childbearing and inequalities in health, housing and income after arrival. Provisional results suggest that female refugees who have become parents early in life are more likely to have lower earnings, but that this is not the case for males. In this paper, we will present more detailed and comprehensive results, demonstrating intersectional heterogeneities in refugee fertility and

Keep the baby or not? A quantitative analysis of abortion decisions in Hungary using survey and register data	Zsuzsanna Makay[1] and Laura Szabó[1] [1]Hungarian Demographic Research Institute

Research on abortion decisions following unintended pregnancies is often qualitative, with few studies employing statistical data—likely due to the sensitivity of the topic and challenges in surveying women who have had abortions (Ekstrand et al., 2009; Kimport et al., 2011). This study addresses this gap using quantitative data from Hungary. We utilize the Hungarian Birth Cohort Study from 2018, a longitudinal survey initiated during women's seventh month of pregnancy. The survey included 8,800 pregnant participants and asked about their pregnancy intention prior to conception. We focus on a subsample (26%) who reported having had no intention to become pregnant. Remarkably, despite the unplanned nature of their pregnancies, all women in this subsample carried their pregnancies to live birth, as confirmed by a follow-up survey conducted six months postpartum. To complement this, we incorporated official abortion statistics documenting women with unintended pregnancies who chose to terminate. By synthesizing the two data sources — inferring proportions of unintended pregnancies ending in birth or abortion from prior studies (Makay & Kapitány, 2021) — we constructed a representative sample of women experiencing unintended pregnancies in Hungary. Our study investigates how demographic and individual factors influence the decision to continue or terminate an unplanned pregnancy. We examine variables such as age, socioeconomic status, partnership status, and previous reproductive history to understand their role in these choices. A key limitation however is the restricted information available in the official abortion register data, which contrasts with the rich demographic and background variables available in the survey dataset. This discrepancy highlights a common methodological challenge in linking administrative and survey data, where administrative sources provide exhaustive and accurate event records but limited contextual detail, while surveys offer depth but may be subject to response biases. By integrating these complementary data sources, we aim to leverage their respective strengths and provide a comprehensive understanding of abortion decision-making.

14h15-15h45: Session 3: Childbearing, Labour and Earnings

Parental Leave Patterns in the Population of Fathers in Male Same-Sex Couples in Denmark, Norway, and Sweden

Maaike van der Vleuten[1,2], Ylva Moberg[2], and Marie Evertsson[2]
[1]The Netherlands Interdisciplinary Demographic Institute-KNAW/University of Groningen, The Hague, the Netherlands, [2]The Swedish Institute for Social Research, Stockholm University, Stockholm, Sweden

The transition to parenthood is critical in producing and amplifying gender inequalities in work and family life for different-sex couples. However, quantitative research on gay fathers is scarce, mainly due to the lack of large-scale longitudinal data. Using population register data from Denmark, Norway, and Sweden (1990–2021), we present population descriptives and parental leave arrangements for fathers who transition to parenthood, based on the largest dataset on gay fathers to date. Across the entire population in these three countries, we identify only a little over 300 male married/registered couples with children, pointing to their difficulty in becoming parents. Results show that gay fathers are typically older and higher earners when they have children, likely due to the lengthy and expensive path to parenthood. Institutional barriers seem to influence gay fathers' leave uptake in three ways. First, fathers in same-sex couples take less leave than the average mother in different-sex couples, but more than the average father in different-sex couples, in all three countries. Second, male couples divide their parental leave equally when they have equal access to parental leave rights, which is the case in Sweden. In Denmark and Norway, biological fathers take significantly more leave than non-biological fathers, who must cohabit with their child for 2.5 and 5 years before gaining parental rights. Third, in cases where the child's biological mother is present, she often takes most of the leave, particularly in Denmark and Norway, where leave cannot be shared among more than two parents. These patterns underscore the ways in which legal frameworks shape not only who can become a parent but also the division of parental responsibilities within same-sex families.

"All by myself?" Single mothers' poverty risks and income changes around childbirth

Denise B. Musni[1] and Christine Schnor[1]
[1]Centre for Demographic Research (DEMO) – University of Louvain, Louvain-la-Neuve, Belgium

We examined the poverty risks and income trajectories of women in Belgium who had their first child while single, distinguishing between women who conceived spontaneously and those who conceived via medically assisted reproduction (MAR). Over the last decade in Belgium, rates of childbearing while single remained stable, and a small but increasing number of single women bore children conceived through MAR. Childbirth is associated with income loss for women, and for single mothers, (re-)partnering may help recover such losses. While previous studies investigated the "motherhood penalty" comparing partnered and single women, few studies examined heterogeneity among single mothers. Little is known about the motherhood penalty for single women who conceived via MAR—often from high SES backgrounds and assumed to be well-prepared for (single) parenthood. It is also unknown whether partnership improves the economic situation of MAR-conceiving single mothers who may have already planned to raise their child alone. Combining Belgian birth records, population registers, and tax declarations, we analyzed a sample of 17,430 women who had their first child while single from 2010 to 2014. Through mixed-effects logistic and linear regression, we modeled (a) their risk of falling below the poverty threshold, (b) changes in their individual income, and (c) changes in their equivalized household income, in the two years before and the five years after childbirth. We then modeled how getting into a partnership post-birth relates to their poverty risks and income trajectories. In the year after childbirth, all single mothers faced higher poverty risks and a drop in household income. Spontaneous conceivers consistently had higher poverty risks than MAR conceivers, but their individual and household incomes grew faster over time. MAR conceivers experienced flatter income trajectories. Partnering post-birth was linked to lower poverty risks and around 30% increase in household income for both single mother groups, yet 70% of MAR conceivers remained single up to five years after childbirth. For spontaneous conceivers, partnership is linked to a 3% reduction in post-birth individual income, while partnership had no statistically significant impact on the individual income of MAR conceivers.

The Cost of Family Complexity: How Multipartnered Fertility Shapes Earnings Trajectories in the Netherlands	Stefano Arnolfo[1, 2], Nicole Hiekel[1], and Aart C. Liefbroer[2,3,4] [1]Max Planck Institute for Demographic Research, [2]University Medical Center Groningen, [3]VU University Amsterdam, [4]Netherlands Interdisciplinary Demographic Institute

The economic consequences of fertility outside stable nuclear families, especially in contexts where a growing share of children are born to successive partners. Childbearing across partnerships, also known as multipartnered fertility (MPF), is part of Europe's demographic landscape. It reflects shifts in the stability and number of unions across the life course and in the partnership context of childbearing and contributes to increasing levels of family complexity. Using Dutch administrative data, we estimate the earnings penalties associated with having a child with a new reproductive partner and compare them to continued fertility within stable unions. We analyze men and women living in the Netherlands who had their second or third child between 2006 and 2016, and use fixed effects models within an event study framework to examine how parity progression with the same and with a different reproductive partner influences personal income around birth. We further examine how pre-birth income levels modify this association and the role of different fertility schedules. Our findings show that women face a sharp decline in income around the birth of their second child and a slow recovery in the following period. However, penalties are larger if the child is born to a different reproductive partner. The difference between MPF and continued fertility with the same partner is more pronounced in the middle of the income distribution, while it is smaller among lower- and higher-earning women. These penalties are only partially explained by different fertility schedules between MPF and childbearing with the same reproductive partner. By contrast, the birth of a third child has minor consequences for women, with only a moderate decline in personal income, irrespective of the reproductive partner's rank. For men, we found strong variation in income trajectories around the birth of the second or third child by pre-birth income levels. However, the magnitude of changes in income around birth for men is much smaller than for women regardless of the childbearing context, even after accounting for different fertility schedules.

Firm-Specific Variation in Motherhood Penalties: Evidence from Dutch Administrative Data	Pascal Achard[1] and Sander Wagner[2] [1]ENSAE Paris / CREST, [2] University of Oxford / Leverhulme Centre for Demographic Science

This study investigates how the earnings penalties associated with motherhood vary across firms using rich, whole-population administrative data from the Netherlands (2006–2019). While previous research has documented large and persistent effects of childbirth on women's labour market outcomes, less is known about how these penalties differ across workplaces—an important yet understudied dimension of inequality. We construct a sample of over 380,000 first-time mothers employed in 2,237 Dutch firms with at least 30 births during the study period. Leveraging employer-employee linked registers, we estimate firm-specific motherhood penalties in annual earnings, labour force participation, hours worked, and hourly wages. Our methodology builds on a high-dimensional extension of the event-study framework introduced by Kleven et al. (2019), allowing us to estimate firm-level deviations from the average penalty up to nine years post-birth. We find striking variation across firms. Mothers in high-penalty firms (10th percentile) experience average ten-year earnings reductions of 52%, compared to 20% in low-penalty firms (90th percentile). Most of this variation is driven by differences in reductions in hours worked and labour force participation. Hourly wage penalties are comparatively small and, in some firms, even positive. Correlational analyses show that firms with more highly educated and higher-paid workforces exhibit smaller penalties, while those with more part-time workers show larger reductions in hours and wages. Gender composition also matters: firms with more male employees tend to have larger participation penalties but smaller penalties in hours and wages for those who remain employed. Our findings highlight the critical role of firm context in shaping maternal labour market trajectories. Our estimates provide a new lens for research on the labour market consequences of fertility, using employer-employee linked administrative data: firm-level variation in motherhood penalties is substantial—on par with or exceeding cross-country differences. This underscores the value of employer-linked data in fertility studies and calls for greater attention to the workplace as a locus of gender inequality.

16h15-17h15: Session 4: Cross-cutting: New approaches in fertility research

ODISSEI: update regarding infrastructure funding for the distributed fertility network

Tom Emery[1]
[1]Erasmus University Rotterdam and ODISSEI

This presentation introduces a new model for conducting distributed analyses across national statistical offices (NSOs) through Trusted Research Environments (TREs), using the emerging TRELISS Net architecture. The TRELISS Net framework enables researchers to perform cross-national analyses without requiring any transfer of microdata across borders, by sending secure, auditable API calls to remote TREs where data remain under national control. In this model, analytical code—rather than data—travels. Researchers submit standardized scripts or pre-approved statistical models through a central orchestration layer, which executes these scripts within each participating TRE's secure environment and returns only aggregated or disclosure-controlled results.TRELISS Net builds upon principles from federated analytics and remote computation frameworks such as DataSHIELD, Federated Learning, and the EOSC Interoperability Framework. Each TRE implements a local execution node connected to its existing secure infrastructure (e.g., CBS Remote Access in the Netherlands, Statistics Denmark's Research Platform, or SSB's Microdata portal). These nodes expose a restricted API endpoint capable of receiving containerized analytic requests (e.g., via Docker or Singularity) that comply with the host TRE's security and disclosure policies. The orchestration layer handles authentication, logging, and harmonized metadata exchange, ensuring compliance with GDPR and national statistical legislation. Applied to register-based fertility research, this system directly reflects and automates many steps in the current workflow of the Working Group—such as distributing harmonized code templates, running identical models across country datasets, and collecting comparable summary outputs. The presentation will discuss the technical, legal, and organizational enablers of this system, including metadata harmonization, container security, query governance, and cross-institutional authentication. It will also outline how TRELISS Net could be scaled to other NSOs to support comparative fertility and family research—enabling, for the first time, real-time, multi-country statistical analysis across secure environments. Participants will be invited to reflect on how this distributed infrastructure could enhance the activities of the Register-Based Fertility Research Working Group, and identify priorities for the first multi-country pilot.

Are births predictable with register data? Evidence from the Predicting Fertility data challenge

Elizaveta Sivak[1] and Gert Stulp[1]
[1]Department of Sociology, University of Groningen

Accurate predictions of life outcomes can inform social theory and policy. Yet, in contrast to predictive success in fields like biology, social science predictions often perform poorly. Why are life outcomes so difficult to predict? One common explanation is small sample sizes of social datasets. We examine this in the context of fertility by studying the predictability of having a child within three years under conditions that are close to the best currently possible. We use full-population data from the Dutch registers and high-quality LISS survey data in the Predicting Fertility data challenge. LISS data includes a wider range of theoretically relevant variables, including subjective measures such as fertility intentions. Administrative data provide vast, high-resolution coverage of life-course trajectories but lack subjective measures. This unique framework enables us to leverage the strengths of these datasets to assess the current predictability and contrast them to learn more about what limits predictability and gain insights about fertility behaviour. Over 150 people participated in the data challenge and submitted over 70 models, ranging from traditional machine learning approaches to state-of-the-art foundational models. Despite the administrative data's scale and detail, predictive performance remained modest: even the best models fell substantially below the theoretical upper limit of predictability caused by randomness inherent in conception and fetal survival. Survey-based predictions performed slightly better. Analysis of the most important predictors across survey- and register-based models suggests that this difference may reflect the absence of certain key variables in administrative data. Still, the improvement was small, indicating that register data likely captures most major determinants of fertility. These results suggest that accurately predicting individual fertility remains highly uncertain, even in the short term and with extensive data. Modest predictive accuracy is unlikely to stem primarily from limited sample size, but may reflect the inherent unpredictability of life outcomes.

Quantifying the association between postponement of parenthood and cohort completed fertility using multistate shared frailty models and dynamic microsimulation	Karel Neels[1] [1]University of Antwerp, Belgium

The economic consequences of fertility outside stable nuclear families, especially in contexts where a growing share of children are born to successive partners. Childbearing across partnerships, also known as multipartnered fertility (MPF), is part of Europe's demographic landscape. It reflects shifts in the stability and number of unions across the life course and in the partnership context of childbearing and contributes to increasing levels of family complexity. Using Dutch administrative data, we estimate the earnings penalties associated with having a child with a new reproductive partner and compare them to continued fertility within stable unions. We analyze men and women living in the Netherlands who had their second or third child between 2006 and 2016, and use fixed effects models within an event study framework to examine how parity progression with the same and with a different reproductive partner influences personal income around birth. We further examine how pre-birth income levels modify this association and the role of different fertility schedules. Our findings show that women face a sharp decline in income around the birth of their second child and a slow recovery in the following period. However, penalties are larger if the child is born to a different reproductive partner. The difference between MPF and continued fertility with the same partner is more pronounced in the middle of the income distribution, while it is smaller among lower- and higher-earning women. These penalties are only partially explained by different fertility schedules between MPF and childbearing with the same reproductive partner. By contrast, the birth of a third child has minor consequences for women, with only a moderate decline in personal income, irrespective of the reproductive partner's rank. For men, we found strong variation in income trajectories around the birth of the second or third child by pre-birth income levels. However, the magnitude of changes in income around birth for men is much smaller than for women regardless of the childbearing context, even after accounting for different fertility schedules.

17h15-18h30: Session 5: POSTER SESSION

Mapping Early Mid-Life Trajectories and Ultimate Childlessness: A Multichannel Sequence Analysis in Finland and Belgium	Alice Rees[1] and Marika Jalovaara[2] [1]UCLouvain, [2]University of Turku (UTU)

The transition to adulthood has become increasingly diverse, with delays in residential independence, changing partnerships, and economic uncertainty contributing to varied life course trajectories including the entry into parenthood. Yet, little is known about how these multidimensional trajectories relate to ultimate childlessness across different institutional contexts. This paper identifies typical early mid-life trajectories of partnership, income, and residential independence among men and women in two contrasting welfare regimes: Finland and Belgium, and explores how these are associated with remaining childless. Using linked register and census data for cohorts born in 1974–75, followed from their early 30s to mid-40s, we apply multichannel sequence and cluster analysis to identify typical life course patterns across three domains. We then use linear regression models to assess how remaining childless, education and place of residence are associated with the degree of alignment with each trajectory type, as measured by representativeness scores (Helske et al., 2024). Five trajectory types were identified in each country, including patterns of early and stable partnerships and others marked by delayed transitions. Remaining childless was mostly associated with later residential independence and the near absence of partnership formation. In Finland, a distinct cluster highlights how being single after a separation is also associated with childlessness. In contrast, stable marriage pathways were strongly associated with parenthood. The study demonstrates how the interplay of partnership, residential independence and income trajectories, shaped by education and institutional context, produces distinct pathways associated with childlessness in early mid-life.

Job mobility and entry into parenthood: A longitudinal study on Finnish women	Wioletta Grzenda[1] and Jessica Nisén[2] [1]SGH Warsaw School of Economics, Poland , [2]INVEST Research Flagship, University of Turku, Finland

The entry into parenthood continues to be delayed across countries. In Europe, the age at first birth reached 29.8 in 2023. A large body of literature has studied the connections between the labour market attachment and the entry into parenthood. Existing research shows that, at the individual level, attachment to the labour market is positively associated with the entry into parenthood for women in an increasing number of countries. However, previous research has rarely explored how fertility decisions may be associated with transitions between employers. We assess this gap in the literature with a focus

on the entry into parenthood. We have two competing hypotheses, of which the first one assumes that a higher number of chances across employers signals career advancement and a better employer-employee match, which we expect to be positively associated with the risk of having a first child. Alternatively, a higher number of changes between employers could indicate an unstable labour market attachment and therefore lead to a lower risk of having a first child. We use Finnish full-population register data for women born in 1979, with annual measures for employment relationships and first births. We employ an event history model for the hazard of a first birth, and follow women from age 18 up to age 39. We measure job mobility as a time-varying indicator of the cumulative number of new employment relationships that a woman has had so far. According to our findings, women with a history of more employment relationships generally have a higher risk of entering a first birth. Additional results show that the positive relationship is stronger at older ages and for the highly educated, and that a job change around the time of a birth is connected to a higher risk of having a child. We interpret these findings as supporting the idea that women who are more advanced in their careers are more willing to commit to parenthood. At the same time, the process of acquiring a better job may lead to the postponement of parenthood, even in a country such as Finland with strong work-family reconciliation policies.

Vaccinated vs. Unvaccinated: Women with Diverging Fertility Patterns	Eva Waldaufová[1], Jitka Slabá[1], Anna Šťastná[1],Kryštof Zeman[2], and Jitka Jírová[3] [1]Charles University, [2] Vienna Institute of Demography, [3]Institute of Health Information and Statistics of the Czech Republic

The COVID-19 vaccination prompted widespread speculation about its effects on fertility. This study explores fertility patterns among vaccinated and unvaccinated women in Czechia, using individual-level data from the National Health Information System. By linking the register of COVID-19 vaccination with the maternity register, we analyse fertility behaviour within selected female birth cohorts (1976–1991) with childbirth records from 1994 to 2022. Vaccination status is defined as receiving at least one dose of a COVID-19 vaccine. Fertility is observed both before and after vaccination, including the pre-pandemic period, allowing us to assess whether differences between vaccinated and unvaccinated women existed independently of the pandemic or vaccination itself. We constructed three types of age-specific fertility rates: (1) Unconditional ASFR (uASFR), based on total cohort exposure; (2) Vaccination-conditional ASFR (vASFR), where fertility rates are calculated separately for vaccinated and unvaccinated women, using subgroup-specific population exposure; and (3) Parity-and-vaccination conditional ASFR (vPASFR) , which further adjusts exposure to include only women at risk of a given parity at each age. The results consistently show that women vaccinated against COVID-19 had higher fertility levels than unvaccinated women, especially before the pandemic and in early pandemic years. uASFR trends reveal a general postponement of childbearing in younger cohorts. However, vASFR shows that vaccinated women had earlier and more intense childbearing patterns—suggesting a selection effect, where women who chose vaccination may already have at least partly completed their fertility plans. Importantly, vPASFR values reveal higher probabilities of first births among vaccinated women across all ages. In contrast, unvaccinated women show higher probabilities of second and third births, typically at younger ages, indicating potential socio-economic differences between groups. These patterns suggest that observed fertility differences are likely driven by structural factors (e.g., parity, timing, socio-economic status) rather than by vaccination effects per se. Our findings emphasize the need to account for demographic and behavioural heterogeneity when interpreting post-pandemic fertility trends. While age-specific fertility rates differ between vaccinated and unvaccinated women, the differences appear rooted in pre-existing structural disparities. Without controlling for these, any direct association between COVID-19 vaccination and fertility remains inconclusive.

No worries? Expectations about the future and fertility intentions	Bernhard Riederer[1] [1]Vienna Institute of Demography/Austrian Academy of Sciences

Recent decades have witnessed the increasingly universal postponement of parenthood up to ages 30-35, leading to a further compression of the reproductive age range, particularly among women. Although intuition suggests that postponement to advanced ages will affect completed fertility, the association is difficult to quantify. Models of fecundability often refer to patterns in natural fertility populations, characterized by early parenthood and frequent parity progression, and where (first) birth probabilities at more advanced ages refer to an increasingly selective subset of individuals which may not apply in a context of generalized postponement. Using population-wide register data for the Belgian 1970-1972 birth cohort, this paper combines multistate models of family formation with dynamic microsimulation to quantify the associations between first birth postponement, the proportion of women entering parenthood, progression to higher-order births and finally completed fertility using a range of hazard models that incorporate individual-level shared frailties to adequately manage selection in different scenarios of fertility postponement. Our results indicate that generalized postponement leads to an upward adjustment of birth probabilities at older ages due to differential unfolding of selection, which is insufficient to compensate, however, for the strong negative effect of age on first birth probabilities, parity progression and completed fertility when fertility is postponed beyond ages 33-35. We discuss the implications of our models and findings for the trend of continued fertility postponement and declining period fertility in European countries.

TUESDAY, 18th of November

9h00-10h30: Session 6: Urban-Rural differences, Housing and Fertility	
From the desire to have children to having children: Urban-rural differences in realisation	Bernhard Riederer[1] [1]Vienna Institute of Demography/Austrian Academy of Sciences
Demographic research has repeatedly found urban-rural differences in fertility. In Europe, cities are usually characterized by lower fertility rates, a higher age of mothers at (first) birth, and a higher proportion of late fertility than rural regions. Previous analyses of childbearing intentions, however, indicate that they are not (or not much) lower in cities than in rural areas. The desired number of children in rural regions in Austria, for instance, has gradually converged to the initially lower number of desired children in urban areas during the last decades. However, the number of children women desire is usually higher than the realized number of children. The realization of short-term childbearing intentions has been shown to be also more likely in rural regions than in urban regions in Europe. In cities, the realization of existing desires to have children has more often been postponed or abandoned. Previous research, however, has been usually restricted to periods of 3-4 years. The combination of survey data with individual level register data allows to go beyond this short-term perspective. For the present study, Austrian Microcensus data from 2016 has been linked with data from different registers available at the Austrian Microdata Center (AMDC). My analyses reveal pronounced urban-rural differences in the realisation of the self-reported desired number of children. I also examine the relevance of structural factors (e.g. housing) and differences in population composition (education, migrant background etc.) for the realisation of childbearing desires and urban-rural differences. Specific focus has been directed at women age 35+ as late motherhood is becoming increasingly important in general, and especially in cities. In addition, the available observation window (2016-2023) allowed for insights regarding consequences of recent crises for the development of births. Finally, the presentation will also include a short outlook on future opportunities for fertility research. The establishment of the Austrian Socio-Economic Panel (ASEP) will allow to analyse interactions between different areas of life, corresponding changes in the desire to have children, and childbearing during the reproductive lifespan.	
Local House Prices and First Births in Belgium: Subgroup Variation by Education and Migration Background	Jonas Wood[1] [1]University of Antwerp, Belgium
This study on local housing prices and first birth hazards in Belgium between 2012 and 2020 addresses three questions: (1) Are changes in local housing prices linked to shifts in first birth hazards? (2) Do these associations differ by educational attainment and migration background? (3) Can these differences be explained by variation in homeownership rates across these groups? The study uses linked Belgian census and register data covering the full legally resident population from 2012 to 2020. Municipality fixed effects hazard models are estimated, incorporating controls for calendar time trends both across and within municipalities. Findings show that increases in local house prices are negatively associated with first birth hazards among young adults aged 18–34. A clear positive educational gradient emerges: individuals with lower educational attainment are more negatively affected by rising housing costs. Migration background also moderates the relationship, though with no consistent pattern across origin groups. While homeownership buffers against the negative effects of price increases, and in some age groups entails higher first birth hazards in times of rising house prices, it does not account for the observed educational or migration-based disparities in the nexus between house prices and the transition to parenthood. This study extends the housing–fertility literature by providing new evidence from Belgium, a context with more moderate housing price shifts than some other countries which have received more attention, and by highlighting the role of educational and migration-based differentiation beyond the renter–owner divide.	

Changes in homeownership and in the entry into parenthood in the Nordic countries	Jessica Nisén[1], Lars Dommermuth[2], Sofi Ohlsson-Wijk[3], and Peter Fallesen[4,5] [1]INVEST Research Flagship Centre, University of Turku, Finland, [2]Statistics Norway, Norway, [3]Department of Sociology, Stockholm University, Sweden, [4]ROCKWOOL Foundation, Denmark, [5]Swedish Institute for Social Research, Stockholm University, Sweden

Since 2010, fertility levels have unexpectedly fallen in all Nordic countries, reaching some of the lowest recoded fertility rates in 2022 and 2023. While previous evidence points to a general trend, some differences across socioeconomic groups are apparent, including steeper declines among those with weaker labor market prospects. The causes of these fertility declines remain elusive, except that they are driven by fewer people entering parenthood. This study aims to investigate the potential role of housing among young adults in explaining these changes. We hypothesize that changes in housing tenure (i.e., homeownership), associated with a weakening relative income position of young adults and increased house prices, may have contributed to the fertility decline across countries. Such an impact may be expected to be stronger in countries considered strong homeownership societies, such as Finland and Norway. Using harmonized Nordic individual-level register data for the period 2005–2019, we assess whether the decline in first births was due to declining homeownership, changing fertility behavior within housing tenure groups, or both. We apply discrete-time event history models and multivariate decomposition of the first birth rate. Our preliminary results show that homeownership among young adults generally declined in the Nordic context in the 2010s, with the partial exception of Sweden. Our preliminary results for Finland and Sweden show that the probability of entering parenthood declined regardless of tenure status in the 2010s, though the decline among renters in Finland was visible already since 2005. Consistent with the homeownership trend, the decline in first births between 2015–2019 and 2010–204 was to a modest extent attributable to declining homeownership in Finland but not in Sweden. In relatively terms, the decline in first births was more pronounced among women who rented than among those who lived in owner-occupied dwellings. We conclude that delayed entry into homeownership may have been a partial driver of Finland's strong fertility decline. By the time of the EAPS meeting, we expect to have extended the analysis of first births to four Nordic countries.

The relationship between home ownership and the transition to first birth among coresidential couples in Finland	Erik Carlsson[1] and Jessica Nisén[1] [1]University of Turku

The steep fertility decline observed in many developed countries over the past 10–15 years has coincided with rising housing prices and growing challenges for young adults in getting established in the housing market. Yet relatively little research has explored the role of housing in the recent fertility decline. This study investigates the relationship between housing tenure (owner-occupied vs. rented) and fertility, examining potential mechanisms and differences across population subgroups. Using Finnish register data and event history analysis, we analyze the transition to first birth among women with a coresident male partner. Preliminary results indicate that first-birth transition rates have declined more among renters than homeowners and that this pattern is most pronounced in large and medium-sized cities. We plan to expand the analysis by examining the following additional research questions: (1) Are renters who are unemployed or have low incomes especially disadvantaged in terms of first-birth rates? (2) Among homeowners, are first-birth rates lower among those with larger debts relative to income? (3) Does the relationship between tenure type and first-birth rates vary by the tenure type that the individual lived in during childhood (since this may influence normative preferences for the appropriate housing conditions for childbearing)? The expected results will contribute new knowledge about the relationship between housing and fertility in the Nordic context, insights that are also relevant for other countries experiencing similar trends of falling fertility and rising housing prices.

11h00-12h30: Session 7: (New) determinants of fertility trends	
Deroutinization of Labor and Second Birth in West Germany: The Moderating Role of Childcare	Honorata Bogusz[1], Anna Matysiak[1], and Michaela Kreyenfeld[2] [1]Interdisciplinary Centre for labor Market and Family Dynamics, Faculty of Economic Sciences, University of Warsaw, [2]Hertie School, Einstein Center Population Diversity
Technological change and globalization have transformed the structure of labor markets in advanced economies, creating a divide between highly skilled workers engaged in abstract tasks—who are increasingly in demand—and those performing routine tasks, for whom demand has declined. To date, only a limited number of studies have explored the fertility implications of these long-term structural shifts. This study contributes to the literature by examining the relationship between changing labor demand and second birth rates, while also considering the moderating role of childcare availability. We draw on data from the Employment Survey of the German Federal Institute for Vocational Education and Training and the Bundesagentur für Arbeit, which provide detailed information on abstract and routine tasks performed by workers in West Germany. Using these sources, we construct measures of regional abstract and routine task intensities and track how they evolved over time to capture changes in labor demand across regional labor markets. Additionally, we develop occupation-level measures of task intensity and link them to individual fertility and employment histories derived from a 2 percent random sample of women in the German Pension Fund. Our findings show that women in routine occupations were least likely to have a second child in regions that experienced the sharpest declines in routine employment, compared to those in regions with more stable routine job availability. Women in highly abstract occupations were generally more likely to have a second child than their counterparts in routine jobs, but their likelihood of doing so did not vary with the degree of abstract job expansion in their region. Moreover, childcare availability did not moderate this relationship.	
Radicalized political climate and fertility	Chiara L. Comolli[1], Gunnar Andersson[2], Gerda Neyer[2], and Oskar Lindstrom[2] [1]University of Bologna, [2]Stockholm University Demography Unit
The timing of fertility declines in developed societies during the last decade prompted scholars to associate it with the Great Recession of 2008. However, the persistence of fertility declines during the 2010s suggests that other medium-to-long-term developments, maybe triggered by the crisis but non-economic in nature, may have influenced fertility behavior. Here, we investigate how the polarization of the local political climate and growing support for right-wing populist parties in the community may have negatively affected childbearing trends. Our analysis focuses on Sweden, where the vote share of the radical right party, the Sweden Democrats, increased sixfold between 2006 and 2018, while fertility rates have declined by more than 20 percent between 2006 and 2024. We use the 2001-2022 population register data to construct complete individual-level fertility histories and link women to the Sweden Democrats' share of votes in their municipality of residence in the elections that were held in 2006, 2010, 2014, and 2018. We estimate discrete-time event history models for first, second, and third childbirth risks, controlling for individual-level demographic and socioeconomic known determinants of fertility behavior, and for observed and time-invariant unobserved municipality characteristics. Preliminary results demonstrate that the increase in support for the Sweden Democrats in the local municipality influenced the average woman's risk of having a first child in a negative direction. The negative association was strongest for highly educated women and 1.5 generation foreign women.	

Unpacking Trends in Religious Affiliation, Cohort Fertility and Period Fertility using Register Data	Linus Andersson[1,2,3], Julia Hällstrand[4], Marika Jalovaara[1], and Jan Saarela[3] [1]University of Turku, [2]University of Stockholm, [3]Åbo Akademi, [4]University of Helsinki

The relationship between long-term trends in religiosity and trends in fertility is a seminal topic across the social sciences and remains of interest in the context of the ongoing fertility decline. While religious individuals tend to have higher fertility than those who are religiously unaffiliated, these fertility differentials are based on disparate measures across time and place. Both fertility and religious affiliation have declined across the OECD. This raises the question of whether trends in fertility are influenced by the decline in the religious share of the population, or if trends in fertility are impacted by a decline in fertility rates among both the religious and non-religious populations. This basic but essential question has remained largely unexamined, partly owing to a lack of data covering fertility rates of religiously affiliated and unaffiliated over time within a single context. This study takes a first step by producing empirically derived boundaries to the potential impact of religious change on fertility decline. We curate a novel set of register data on religious membership and childbearing spanning five decades for the full population of Finland from 1972 to 2023. Using multi-state models, forecasting, and counterfactual estimates, we estimate that the decline in completed fertility for the 1955–1992 birth cohorts can be attributed to at most 18% to secularization—the decline in religious affiliation—and 82% to the decrease in fertility rates among both religiously affiliated and unaffiliated individuals in Finland. However, religiously affiliated and unaffiliated individuals show similar trends in terms of decline in ASFR during the ongoing fertility decline (2010-2023).