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MPIDR Working Paper WP 2025-001 I January 2025
https://doi.org/10.4054/MPIDR-WP-2025-001

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Economic Uncertainty and Men's Fertility: Analysing the 2010s Fertility Decline in Finland by Field of Education and Employment Characteristics

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Abstract

In the Nordic countries, the total fertility rate (TFR) fell sharply in the 2010s, and increasing disparities in childbearing outcomes across different levels and fields of education have been documented in previous research. However, the role of economic uncertainty in shaping these fertility trends is not well understood. This study examines the male fertility decline in Finland during the 2010s, focusing on how fertility levels and trends vary by field of education and the economic uncertainty associated with these fields. Using full population register data, the analysis explores total fertility rates (TFR) and the expected shares of men having a first birth (TFRp1) across 122 detailed education groups. We find that fertility declines were stronger in fields with initially lower fertility levels, such as ICT, arts, and humanities, and weaker in fields like health, teaching, and agriculture. Weighted linear regression was used to analyse the association between characteristics reflecting uncertainty and the fertility decline. Fields with higher unemployment, lower income, and lower occupational match saw sharper fertility declines. Additionally, as unemployment decreased and income grew during the 2010s, fertility declines were less pronounced in fields that experienced stronger improvements in these areas. The predictive power of the uncertainty variables increased in the 2010s. The uncertainty model accounted for approximately half of the TFR decline and two-thirds of the TFRp1 decline across different fields. The study highlights the growing disparities in fertility patterns by educational field, underlining the increasing importance of economic security in shaping men's fertility.

Keywords: men's fertility, Finland, unemployment, income, occupational match, occupation specificity

Acknowledgements:

J.H. was supported by the Strategic Research Council (SRC) of the Academy of Finland, FLUX consortium (Family Formation in Flux – Causes, Consequences, and Possible Futures), decision numbers 364374 and

364375, and the European Research Council under the European Union's Horizon 2020 research and innovation programme (grant agreement No 101019329). J.N. was supported by the Academy of Finland, grant nos. 332863 and 320162 (INVEST Research Flagship), the Strategic Research Council (SRC) of the Academy of Finland, FLUX consortium (Family Formation in Flux—Causes, Consequences, and Possible Futures), decision number 345130, and the Rockwool Foundation (Determinants of later and forgone parenthood in the Nordic countries). M.M. was supported by the Strategic Research Council (SRC), FLUX consortium, decision numbers 364374 and 364375; by the National Institute on Aging (R01AG075208); by grants to the Max Planck – University of Helsinki Center from the Max Planck Society (5714240218), Jane and Aatos Erkko Foundation (210046), Faculty of Social Sciences at the University of Helsinki (77204227), and Cities of Helsinki, Vantaa, and Espoo; and the European Union (ERC Synergy, BIOSFER, 101071773). Views and opinions expressed are, however, those of the author only and do not necessarily reflect those of the European Union or the European Research Council. Neither the European Union nor the granting authority can be held responsible for them. The data underlying this article were provided by Statistics Finland (license number TK/780/07.03.00/2020-4). Individual-level register data from Statistics Finland are not freely available.

Introduction

A long-standing area of interest in demographic research is the relationship between economic uncertainty and fertility, often explored via the links between fertility, and employment and education. While female fertility has traditionally attracted more scholarly attention, an established finding in male fertility research is that men who are employed are more likely to become fathers (Alderotti et al. 2021), and the eventual number of children tends to be higher among men with higher levels of socioeconomic status (Kravdal and Rindfuss 2008; Nisén et al. 2018; Trimarchi and van Bavel 2018). This suggests that economic security, traditionally tied to the male breadwinning role, plays a crucial role in shaping fertility patterns among men. However, much of the existing research focuses primarily on employment and income effects, leaving other dimensions of economic uncertainty, such as the alignment of occupation and field of study, underexplored. The field of education plays a crucial role in shaping both economic outcomes and fertility decisions, offering an opportunity to deepen our understanding of how economic factors are associated with fertility among men.

Finland's fertility decline in the 2010s is puzzling and presents a particular interesting case study. The female total fertility rate (TFR) fell sharply from 1.87 in 2010 to an all-time low of 1.35 in 2019 in Finland (Official Statistics of Finland (OSF) 2020), and the corresponding fall for men was 1.73–1.21 (authors' own calculation). The decline has been heavily concentrated among first births and is likely to turn into substantial declines in lifetime fertility for the 1980s cohort (Hellstrand et al. 2021). Initially, the fertility decline appeared to be triggered by the 2008 economic recession, when unemployment started rising and the rise in earnings slowed down (Kyyrä and Pesola 2020). However, the fertility decline accelerated even as the economy recovered (Comolli et al. 2020). It is likely that the pace of recovery and income growth varied across educational fields, which could help explain potential varying fertility declines by field of education.

It is of particular importance to explore educational fertility patterns during this period of decline, given the growing disparities in family formation observed over recent decades. While lifetime fertility has been relatively stable at near replacement level in Finland for the 1940–1970 cohorts, ultimate childlessness has been increasing. Ultimate childlessness rose significantly among the least educated men, from 24% for the early 1940s cohort to 36% for the late 1960s cohort. Meanwhile, among tertiary educated men, ultimate childlessness rose from 11% to a plateau at 22% (Jalovaara et al. 2019). Even more pronounced trends have been observed by the field of education, although the evidence here is limited (Lappegård, Rønsen, and Skrede 2011). Among Norwegian men with post-secondary or tertiary education, childlessness rose from 13% to 24% in arts and humanities for the above-mentioned cohorts, but remained relatively stable around 10% for men educated in agriculture, transport, sports, and protection (Lappegård, Rønsen, and Skrede 2011).

The question arises: has this growing inequality in fertility outcomes intensified in the 2010s, and has economic uncertainty become more significant in explaining fertility variation? This would contrast with recent theories, which suggest that perceived uncertainty, arising from expectations and perceptions of the future rather than one's objective economic situation, is more relevant to childbearing behaviour (Vignoli, Bazzani, et al. 2020). We focus on rarely-studied forms of objective uncertainty, arguing that individual-level factors like education level or income alone are insufficient, and that considering the role of the field of education is necessary to understand how uncertainty impacts fertility today. While the decline in first births has been observed across all education levels in the Nordic countries, it has accelerated particularly among the least-educated men and women (Comolli et al. 2020; Hellstrand, Nisén, and Myrskylä 2022). For Finnish women, the decline in first births was especially notable in educational fields associated with higher

economic uncertainty (Hellstrand, Nisén, and Myrskylä 2024). Currently, however, evidence on fertility trends among men across educational fields is lacking.

This study contributes to the growing body of research on education, economic uncertainty, and male fertility by exploring the fertility decline of the 2010s, focusing specifically on how fertility levels and trends vary by field of education and those of their characteristics that reflect economic uncertainty. The research questions were as follows:

1. How do fertility levels vary across field of education among men?
2. Does the strength of the fertility decline vary across different educational fields?
3. To what extent can the characteristics of the field reflecting economic uncertainty explain the levels and patterns of fertility in the 2010s?

Using Finnish full population register data, this study analyses completed fertility, ultimate childlessness, period total fertility rates and expected shares ever having a first birth between 2010 and 2019 for 122 detailed education groups. These detailed groups allow for an in-depth exploration of social inequalities in childbearing, and the recent fertility decline provides insights into the economic mechanisms driving the observed fertility declines. The Nordic register data are highly suitable for this aim, as they track the attainment of educational qualifications longitudinally and link individuals to their biological children. Notably, a common reason for why male fertility remains understudied are data limitations – males tend to underreport their number of children in surveys, especially when they do not live together with the child(ren) (Juby and Le Bourdais 1999). This issue is marginal in the Nordic registers, which provide high-quality data on men's fertility (Chudnovskaya and Ueda 2023).

This study is the first to produce fertility estimates by field of education for men in Finland. Compared to previous Nordic studies (Lappegård, Rønsen, and Skrede 2011; Gortfelder, Andersson, and Neyer 2024), we include more detailed categories of field of education. Linking the fertility declines to characteristics that closely reflect economic uncertainty adds to the ongoing discussion on economic uncertainty and fertility patterns, as well as how they change over time. The economic characteristics considered in the current study are unemployment, income, public sector work, as well as occupational specificity and occupational match of the field of study. The role of the occupational specificity of a degree and the extent to which a degree is likely to lead to a good match between skills and occupation in the labour market has mainly been examined in relation to labour market outcomes and job satisfaction (Somers et al. 2019), and, more recently, health outcomes (e.g. Zheng, Lu, and Yao 2024). However, these factors have received little

attention in fertility research so far. In the few studies on female fertility, childbearing was modelled using both field of education and occupation, but the match between them was not explicitly considered (Begall and Mills 2012), while the vertical mismatch (over/under-educated for the job) was examined only in relation to fertility intentions and not realised fertility (Zhang et al. 2023).

Background

The Nordic fertility regime

Finland is often situated within the Nordic fertility regime, characterised by a dual earner-dual caregiver model in which both men and women are encouraged to work and share child-rearing responsibilities (Esping-Andersen 1990; Andersson et al. 2009). This model is supported by policies such as affordable childcare and parental leave systems specifically designed to support families' well-being and the sharing of parental leave between both parents (Ellingsæter and Leira 2006; Gornick and Meyers 2009). Higher earnings have been shown to promote parenthood among both men and women in the Nordic countries (Jalovaara and Miettinen 2013; Andersson, Kreyenfeld, and Mika 2014), with both mothers and fathers playing a crucial role as breadwinners. However, compared to women, men still earn higher salaries on average (Cooke, Hägglund, and Icardi 2022), and the gender gap in earnings persists – particularly among parents (Nisén, Erlandsson, and Jalovaara 2024). Although men are increasingly involved in childrearing, the uptake of paid parental leave by fathers and daycare enrollment for young children in Finland is still comparatively low compared to other Nordic countries (Nordic Social Statistical Committee (NOSOSOCO) 2017), suggesting that Finnish men take on less responsibility for childcare.

In addition to gender equality, social equality is also a central policy goal in the Nordic countries (Korpi 2000; Ellingsæter and Leira 2006; Esping-Andersen 2009). Despite these ambitions, social inequalities in childbearing have been widening over time. In Finland, completed fertility varies significantly by education level: from just above 1.4 for the least-educated men (a drop of 0.1 children within a decade) to a relatively stable level just above 1.8 for the highest-educated men born in the late 1960s (Jalovaara et al. 2019). Levels of ultimate childlessness have been increasing over recent decades, reaching globally high levels – 27% among men and 21% among women in

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(Sobotka 2017).

While the fertility disparity between the least- and highest-educated men has been increasing, an important shift has occurred among women: the previously-observed positive educational gradient

in childlessness has turned negative among women (Jalovaara et al. 2019). As a result, both the least educated men and women are nowadays the most likely to remain childless in the Nordic countries, which contrasts with the evidence from most other countries, where women educated to higher levels are still the most likely to remain childless (Wood, Neels, and Kil 2014; Kreyenfeld and Konietzka 2017; Kuang et al. 2024). However, less is known about the potentially widening inequalities among those with an educational degree, and especially among men. This gap is an important area of research, as it may reveal how economic and social inequalities are shaping fertility decisions amidst changing family dynamics.

Educational Field and Fertility

Theoretical Explanations

The field of education adds an additional dimension of socioeconomic status beyond the mere level of education. Fields of education are closely linked to different occupation and labour market opportunities (Reimer, Noelke, and Kucel 2008), and they also reflect personal preferences and life style choices (Hoem, Neyer, and Andersson 2006a). This makes them particularly useful for studying changes in fertility over time. Different fields of education prepare individuals for different types of jobs across different sectors, influencing income potential and job stability, which in turn affect the likelihood of childbearing.

According to economic theories, income plays a crucial role in alleviating the direct costs of childbearing. A man with higher earnings is better equipped to support a family and is therefore more attractive on the mating market and more likely to have (more) children (Becker 1993; Oppenheimer, Kalmijn, and Lim 1997; Oppenheimer 1988). In addition to income, employment security influences the ability to economically support one's family (labelled economic parenting, see Lappegård, Rønsen, and Skrede (2011)). Secure employment refers to employment where the likelihood of finding a job is high and losing one is small. Such employment is found in high-demand sectors or sectors not threatened by downsizing in economic downturns. The public sector is considered secure employment, as it is less sensitive to fluctuations of the economy (Kopelman and Rosen 2016) and needs to provide services regardless of the business cycle. Employment in the public sector has been shown to be conductive for childbearing for women (e.g. Hoem, Neyer, and Andersson 2006a), although this could be in part related to the higher childbearing preferences of women choosing fields within health and teaching (Ohlsson Wijk 2015).

The public sector could also be considered conducive for childbearing due to its arrangements facilitating work-family reconciliation, such as employment with flexible working hours and the

ability to reduce working hours, flexible work arrangements, and practices favourable to parental leave arrangements (Lappegård, Rønsen, and Skrede 2011). The public sector provides regular work hours and less overtime, and pioneered parental leave and part-time arrangements in many countries (Hoem, Neyer, and Andersson 2006a; Feeney and Stritch 2017). Further, many fields in the public sector are heavily female-dominated, and female-dominated fields have developed good practices for practical parenting. As the expectations for men's caregiver roles increase, these practices may be hypothesised to become more relevant to the childbearing decisions of men and couples over time.

Previous research on fertility has paid little attention to how different fields of education vary in how closely they are linked to specific occupations, and this can be hypothesised to influence fertility decisions. Some fields lead directly to specific occupations (e.g. police and medical doctors), while others provide more general knowledge and may lack a clear job description (e.g. general education, arts and humanities, and general social sciences). A clear career trajectory can help family planning, as it provides a sense of future security and stability (Adserà 2004). When individuals choose a field with a more specific career path in mind, they may have a clearer vision of their future, which could lead to earlier job satisfaction and financial stability. It has been argued that perceptions of the uncertainty of the future have become more important to individuals' fertility decisions in contemporary society (Lappegård et al. 2022).

Occupational match reflects how well one's job aligns with the specific qualifications acquired through one's field of study (Solga and Konietzka 1999). Occupational match is crucial for understanding fertility decisions, as it reflects the job market in one's own field and directly influences job satisfaction, career stability, and income prospects (Somers et al. 2019). Employers are more likely to hire applicants whose education aligns with the job requirements, and salaries tend to be higher when occupation matches the skills acquired through education (Nordin, Persson, and Rooth 2010). A delay in finding a job that matches one's educational background may reduce job stability, career progression, and financial stability, and may therefore delay or diminish childbearing. Furthermore, a large proportion of people working outside their field of study may increase uncertainty about job prospects for those within the field.

Finally, field of education may influence fertility outcomes not only through labor market characteristics but also due to self-selection into different fields of study based on individual traits and lifestyle preferences (Hakim 2003). These traits and preferences might be related to childbearing as well. This is often exemplified by the fact that women educated in caring and teaching have the highest fertility regardless of country context (Hoem, Neyer, and Andersson

2006b; Begall and Mills 2012; Michelmore and Musick 2014; Oppermann 2017). It is suggested that individuals with a greater interest in caring for other individuals choose fields like health and teaching and have higher childbearing due to their nurturing characteristics. The same could in theory apply for men, but the empirical evidence is limited. Alternatively, family-oriented men might prefer fields with greater breadwinning potential, in line with traditional father roles (Riggs 1997). Additionally, social norms within educational and occupational settings may shape childbearing attitudes, with a higher share of one's gender in a field reinforcing gendered expectations (West and Zimmerman 1987). Therefore, male-dominated fields might promote behaviour closely linked to male identity, such as fatherhood. Furthermore, some fields, such as priests (Philipov and Berghammer 2007) or men educated in agriculture (Niska, Vesala, and Vesala 2012), may uphold more traditional family values. The latter may have an incentive to have offspring due to the long-standing tradition of family-based ownership of farms in the Nordic countries (Rantamäki-Lahtinen, Sipiläinen, and Yigit 2022).

Field of Education and Male Fertility: Empirical Findings

The few previous empirical findings on field of education and male fertility originate from the Nordic context (Lappegård, Rønsen, and Skrede 2011; Gortfelder, Andersson, and Neyer 2024) . The lowest levels of childlessness (around 10% or more) are found among men in security and protection, teaching, and medicine, and, in Norway, additionally also in agriculture. Average levels of childlessness (around 15% or more) were found in business, finance, law, and some fields of engineering (Lappegård, Rønsen, and Skrede 2011; Gortfelder, Andersson, and Neyer 2024). These fields offer high income prospects and flexible working hours but vary in job security, as some are more sensitive to changes in business cycles. Relatively higher levels of childlessness were found in social and natural sciences (around 20% or more), with the highest rates in arts and humanities (around 25%, and up to 35% in humanities in Sweden). Social and natural sciences consist of a mix of public and private sector employment, with many fields having a fairly gender-balanced distribution. Arts and humanities, however, tend to have less clear job prospects, unstable jobs, and low income.

Variation in levels of childlessness by field of education has intensified considerably in recent decades, especially in Norway. In the early 1940s cohort, childlessness ranged from 8% in teaching, health, and welfare to 13% in humanities and arts. Concurrently, childlessness levels have remained relatively stable in fields like sports, transport, protection, and agriculture; they have increased modestly in teaching, health, welfare, engineering, construction, business, finance, and law. The strongest increases in childlessness were observed in science, computing, social science, journalism,

humanities, and arts. In Sweden, childlessness has risen mainly in arts and humanities over recent decades. Ultimate childlessness and the mean number of children are correlated, and the educational pattern in childlessness generally holds true for completed fertility as well (Gortfelder, Andersson, and Neyer 2024). In Norway and Sweden, however, the average levels of childlessness are much lower than in Finland (Jalovaara et al. 2019).

When considering occupational groups rather than fields of education, the highest first birth risks have been found among men working as police officers and detectives, and the lowest in library, filing, mail carriers, and sorting clerks in Sweden (Ohlsson Wijk 2015). Relatively high risks were also found among men working in health and teaching, particularly those working with children. In Denmark, the highest childbearing risks were found in the metal industry and production, while the lowest were found in libraries, beauty and personal services, restaurants, job centres, higher education, and media (Andersson and Neyer 2012). In Denmark, greater male dominance in the industry was associated with higher childbearing risks, whereas this pattern was less clear in Sweden (Andersson and Neyer 2012; Ohlsson Wijk 2015). A limitation of focusing on occupational groups is that some occupations, especially those with younger employees, may represent temporary employment during early career stages rather than being inherently unfavourable to childbearing. Additionally, unemployment risks cannot be included in such analyses, as focusing on occupation includes only those who are employed.

However, there is a lack of studies that quantify the role of economic uncertainty and test the relative importance of economic factors in explaining fertility patterns by field of education. This study seeks to address this gap by assessing the relative importance of various economic characteristics – and the changes in these factors over time – in explaining fertility variation and decline in the 2010s by field of education.

Data and methods

Categorisation of Fields

We used register data from Statistics Finland covering men born in Finland and aged 15–49 years in 2000–2019, and permanently living in Finland at the end of the year. Using these individual-level register data, we identified highly detailed groups of educational fields for each year during the analysis period. For each group, we calculated age-standardised fertility indicators, which were used in aggregate-level regression analysis. ISCED 2011 classification was applied to categorise education levels and broad field of education. Education levels were classified as follows: primary (ISCED 0–2), secondary (ISCED 3–4), lower tertiary (ISCED 5–6), and higher tertiary (ISCED 7–

8). We considered the highest obtained degree, and when individuals had obtained multiple degrees at the same level, we used the most recent one. Additionally, we utilised a 6-digit code provided by Statistics Finland to form more specific groups beyond the ISCED 2011 classification. This allowed us to differentiate, for example, between police officers, firefighters, and other security within the broader field of protection of persons and property.

We identified in total 122 groups of education, as shown in Appendix Figure A 3: 42 groups at secondary level, 38 groups at lower tertiary level, 41 groups at higher tertiary level, and one group consisting of those with only primary education and not included in the regression analysis. Men educated in engineering, agriculture, natural sciences, and ICT constitute approximately half of all men, and around 21% are educated in general education and broad programmes. Business, law, and social sciences account for 11%, and services make up 9%, followed by health, welfare, and teaching (6%), and arts and humanities (4%). Among the detailed groups beyond general education, the largest include those educated within building, electricity, and mechanics at secondary level, and ICT and business at the tertiary level. For a more detailed description of the Finnish education system, see (Hellstrand, Nisén, and Myrskylä 2024).

Fertility Outcomes

The primary outcomes of interest are the fertility levels in 2010 and 2019, as well as the change in fertility in the 2010s by field of education. The total fertility rates (TFR) were calculated using 5-year age-specific fertility rates, and the share expected to ever have a first birth (TFRp1) using 5-year age-specific first birth rates (first births per number of childless men) and a lifetable approach. To match the calculations of these rates, age was defined at the end of the year and rates were based on individual transitions from one year to another. To increase the stability of rates, we grouped observations from 2009–2011 (the fertility peak) and 2017–2019 (latest available years). We compare period- and cohort-based levels by exploring mean completed fertility and levels of childlessness at age 45 for cohorts born in 1960–1974.

Independent Variables in Regression Models

The independent variables in the regression models capture characteristics of the field that reflect economic uncertainty: unemployment (i.e. percentage of the labour force without a job), income (mean annual income subject to state taxation among the employed, on log scale), the share of the employed workers in the public sector, and occupational match (the percentage of the employed individuals working in jobs that match their field of study). To identify job match, we used Statistics Finland's code of occupation, which includes detailed job titles among the employed, and

assessed this match based on how directly the connection between education and work could be identified. In some fields, the determination is straightforward; it is considered a match when police officers work in the police force. In other fields, we allow a wide range of occupations, such as men educated in political sciences working as political and societal researchers, planners, and experts, developers of administration and industries, press officers, journalists, and so on.

The independent variables were calculated for age group 25–29 in 2010 and 2018, capturing uncertainty early in the career and at or before prime childbearing age. For smaller fields, or fields where graduation occurs relatively late, we calculated the independent variables for the age group 25-34 to obtain more reliable estimates. This applies to 19% of the fields at the upper secondary level, 39% of the fields at the lower tertiary level, and 63% of the fields at the higher tertiary level. As these are smaller groups, their weight on the results is smaller. We performed sensitivity analyses, controlling for age of measurement and excluding the fields where characteristics were measured at age 25-34, but the results did not change substantially (results not shown).

Additionally, we considered income at older ages, 45-49, as well as occupation specificity as an indicator of the degree to which a field of education leads directly to a specific occupation. Occupation specificity was divided into three categories: low, medium, and high, largely based on the classification by Hoem, Neyer, and Andersson (2006a). Low specificity includes fields that involve broad studies with no direct connection to specific occupations, such as general education, arts and humanities, and general social sciences. Medium specificity involves more specialised studies that can still lead to a variety of potential occupations. Examples include natural sciences, media, general health programmes, personal services, business, and law. High specificity includes fields closely tied to specific occupations, such as engineering, agriculture, ICT, military and security, air and sea transportation, medical doctors, teachers, and psychology.

Methods

We first used scatter plots with weighted trend lines to illustrate the relationship between fertility patterns and the characteristics that reflect economic uncertainty. Weights were based on group size at age 30–34 in 2018. Next, we applied weighted multivariate linear regression to standardised data in order to analyse the associations between the characteristics reflecting uncertainty (unemployment, income, public sector work, occupational match, and occupation specificity) and the fertility decline across fields. Standardised data allowed us to compare the predictive power of each characteristic.

Results

Cohort Patterns in Completed Fertility and Ultimate Childlessness by Education Field

Figure 1 shows fertility variation by education level and field for Finnish male cohorts born in 1960-1975. At all levels, the lowest fertility and highest childlessness are found in natural sciences, arts and humanities, and general education, and the highest fertility and lowest childlessness occur in health, education, and agriculture. At the secondary level, mean total fertility ranges from 1.30 in natural sciences to 2.11 in education. At the higher tertiary level, it ranges from 1.64 in arts and humanities to 2.23 in health. Social sciences and ICT show relatively low fertility, while business, services, and engineering show average to higher fertility. Ultimate childlessness follows a similar pattern, ranging from 10% in services to 31% in arts and humanities at the higher tertiary levels. In natural sciences, ultimate childlessness exceeds 40% at both the secondary and lower tertiary levels.

Appendix Figure A 1 and Appendix Figure A 2 reveal further variations within specific fields. For example, in services at the secondary level, ultimate childlessness ranges from 11-12% among police officers, in security, and among firefighters, 20% in sports, 26-28% in transport services, 30-35% in tourism, hotels, and catering, and 71% in the extreme case of domestic services (e.g. cleaners). Men in religion and theology stand out with the highest fertility (2.42), contrasting sharply with fields like philosophy and ethics and language acquisition (around 1.20).

Fertility Trends by Field of Education in the 2010s

We examine trends in TFR and TFRp1 before and during the 2010s by broad field of education (Figure *2*). At the onset of the fertility decline, TFR ranged from 1.25 in general education to 2.0 in agriculture at the secondary level, and from around 1.8 in arts and humanities and natural sciences to around 2.5 in education, health, and welfare at the higher tertiary level. Engineering, services, and business showed relatively high fertility, while ICT and social sciences had lower fertility. This is consistent with the cohort fertility patterns observed above.

In the 2010s, fertility declined across all fields, with the largest decline in ICT (40%) and the smallest in agriculture and health and welfare (20%). The decline began earlier in health and welfare (in 2006), and later in agriculture (in 2013) at the secondary level. Trends in TFRp1 show higher first birth rates in education, health and welfare, agriculture, business, engineering, and services, and lower rates in general education, ICT, arts and humanities, and social and natural sciences. These differences widened during the 2010s decline. Among the higher tertiary educated, TFRp1 ranged from 0.72 in arts and humanities to 0.91 in education before the decline, and from 0.61 to 0.85 respectively by the end of the 2010s. Among the secondary educated, a bifurcation in

the levels emerged, as TFRp1 reached around 0.45 in general education, arts & humanities, and ICT and around 0.6 in agriculture, health, engineering, services, and business.

Fertility Changes in the 2010s by Detailed Education Field

Figure *3* shows the initial fertility levels in 2009–2011 and the relative changes in fertility during the 2010s by detailed field of education. Fields with lower initial fertility, such as art, music, ICT, tourism, and horticulture at secondary level, and philosophy, literature, and biochemistry at higher tertiary level, saw stronger declines. In contrast, fields with initial higher fertility, like police officers, firefighters, in military and defense, and in crop and livestock production at secondary level, and among subject teachers and in medicine at higher tertiary education, experienced smaller declines. A few fields, such as driving instructors, the inter-disciplinary field in engineering at secondary level, and bachelor's degree in business, saw small increases in TFRp1. Notably, within broad fields like services, men educated in security services experienced smaller declines, while those in personal services (e.g. tourism and catering) saw larger declines. The relative and absolute changes show consistent findings in the case of TFRp1, but for TFR, the changes in absolute terms are rather similar regardless of initial level (Appendix Figure A *3*). Table 1 shows descriptive statistics for both dependent and independent variables. The standard deviation in the TFR remained relatively constant throughout the 2010s, with even a slight decline in variation at the lower tertiary level. However, for first births, the standard deviation increased across all levels. This suggests that inequality in childlessness across educational fields is rising. The standard deviation in the independent variables typically increased, especially in the case of income and unemployment.

The Relationship Between Economic Uncertainty and Fertility Levels

Table 2 presents the relationship between indicators of economic uncertainty and the TFR and TFRp1 levels for the periods 2009-2011 and 2017-2019. The models use standardised data, although scatter plots based on unstandardised variables are shown in Appendix figures A4-6. For both TFR and TFRp1, across both periods, the likelihood of childbearing increases with lower unemployment, higher income, better occupational match (where one's education aligns with their occupation), and greater occupation specificity (such as medium and high specificity, as opposed to low specificity). There is no significant relationship between public sector employment and fertility among men. Notably, most men with secondary or lower tertiary education are employed in the private sector, but the lack of association also persists among men with higher tertiary education, where public sector employment is more common. Income at younger ages is a stronger predictor of fertility than income at older ages. Therefore, and to avoid multicollinearity, we only include income at younger ages in further modeling.

The relationships between TFR/TFRp1 and unemployment and income strengthen toward the end of the 2010s, as shown by the coefficients and R^2 values in the separate models. Conversely, the associations with occupational match and occupation specificity weaken somewhat. When all factors are combined in the full uncertainty model, accounting for the combined effects of multiple economic factors simultaneously, the strength of the associations is generally attenuated. However, unemployment and occupational match remain significant in both periods. Occupational specificity (high specificity as opposed to low specificity) is significant only in the TFRp1 model in 2010, and income only in 2018 (TFRp1). Stepwise inclusion of the variables in the models typically showed that the inclusion of occupational match and/or occupation specificity removed the statistical significance of income. Further, the inclusion of occupational match typically removed the significance of occupation specificity. The explanatory power for TFR remains around 65% throughout both periods; for TFRp1 it increases from 71% to 77%.

Changes in Economic Uncertainty and Fertility

To better understand the increasing importance of unemployment and income, we examine changes in predictor variables over time and their relationship with fertility changes (Tables 3 and 4). The models use independent variables in a) 2010, b) 2018, c) the change between the years, and d) in 2010 and the change between the years. Unemployment generally declined below initial level between the two time points, though the extent of this decline varied across fields, and some fields still had higher levels of unemployment in 2018 compared to 2010 (Appendix figure A6). Similarly, income improved overall, but the extent of the increase varied. The decline in TFR and TFRp1 was less pronounced in fields where unemployment decreased the most. Moreover, weaker declines in fertility were observed in fields where income rose more significantly.

The uncertainty levels in 2018 explain more of the decline in fertility than those from 2010 (Tables 3 and 4). The explanatory power was highest when both the initial levels and changes were included. In this model, initial unemployment levels, changes in unemployment, changes in income, and occupational match were all significant predictors for both TFR and TFRp1. Net of these factors, the decline in TFRp1 was more pronounced in fields with higher public sector employment, while the decline in TFR was stronger in fields with greater occupation specificity. According to our models, the uncertainty measures explain altogether roughly half of the decline in TFR. The measures play an even more significant role for TFRp1, with the model explaining about two-thirds of the decline.

We conducted sensitivity analyses by including the share of students within the models (Appendix Table A 2). A higher proportion of students was associated with a lower likelihood of childbearing. Including the proportion of students attenuated the relationship with occupational match and, in some cases, removed its statistical significance. However, this loss of significance occurred only when occupation specificity was also included in the model. Additionally, the statistical significance of education level in the TFR model was eliminated. Fields with a higher proportion of students exhibited stronger fertility declines. However, this association disappeared in the full model, and the results remained robust when the proportion of students was included (Appendix Table A 3).

Discussion

This study investigated the male fertility decline in Finland in the 2010s, focusing on how fertility trends varied by field of education and how economic uncertainty within these fields contributed to the decline. By examining changes in total fertility rates (TFR) and the expected share of men ever having a first birth (TFRp1) across 122 educational groups, we observed variation in the strength of the decline across fields. Stronger declines (around -30% or more) were found in fields with initially lower fertility levels, such as ICT, arts and humanities, and general education. Weaker declines (around -20% in TFR and -10% or less in TFRp1) were found in fields with initially higher fertility levels, like health, teaching, and agriculture. This implies that there has been a divergence in the levels of childlessness between men educated in different fields of education.

Male fertility by field of education showed patterns consistent with those observed in other Nordic countries (Lappegård, Rønsen, and Skrede 2011; Gortfelder, Andersson, and Neyer 2024). In addition, this study was able to quantify the role of factors reflecting economic uncertainty in fertility differences across fields and in the recent fertility decline in Finland. The decline in fertility in men was more pronounced in fields characterised by higher unemployment, lower income, and lower match between education and occupation. Additionally, stronger declines were observed in fields where unemployment remained high or even increased during the 2010s, and where income growth was weaker. These factors together explained approximately half of the decline in total fertility and two-thirds of the decline in first births. In the models predicting childbearing throughout the 2010s, the explanatory power of TFR remained around 65%, and for the TFRp1 it increased from 71% to 77%. Thus, the study indicates that objective economic uncertainty plays a significant role in explaining the fertility decline of the 2010s.

Fertility patterns in the Nordic countries have undergone significant changes in recent decades, with increasing disparities in childbearing outcomes by education level. Patterns in women's childlessness by level of education have reversed and are becoming more similar to those of men: levels of lifetime childlessness are currently highest among those with low education among both men and women (Jalovaara et al. 2019). Moreover, widening social inequalities in childbearing have also been observed in men, both when looking at differences by level of education, and particularly so by field of education (Lappegård, Rønsen, and Skrede 2011). The current study shows that these disparities have continued to widen throughout the fertility decline of the 2010s, especially in the case of childlessness, which poses a policy challenge in the context of the Nordic countries' goals for gender and social equality (Rønsen and Skrede 2010).

The fertility patterns by educational field among men found in this study were largely similar to the patterns for females in our previous study (Hellstrand, Nisén, and Myrskylä 2024). Both men and women saw larger fertility declines in fields such as ICT, arts and humanities, and general education, and smaller declines in health, education, and agriculture. The size of these declines was associated with economic uncertainty in the respective field. However, there were some notable differences between genders: the uncertainty model explained a larger share of the declines in male fertility than in female fertility. Further, the association between weaker economic improvements and more pronounced fertility decline seemed stronger among men. Additionally, public sector employment was less strongly associated with fertility declines among men than women. This suggests that expectations towards economic and practical parenting remain gendered in Finland: the potential to provide economically for a family is still more important for men, while women continue to bear a larger responsibility of unpaid care work, which is often more compatible with public sector and female-dominated occupations.

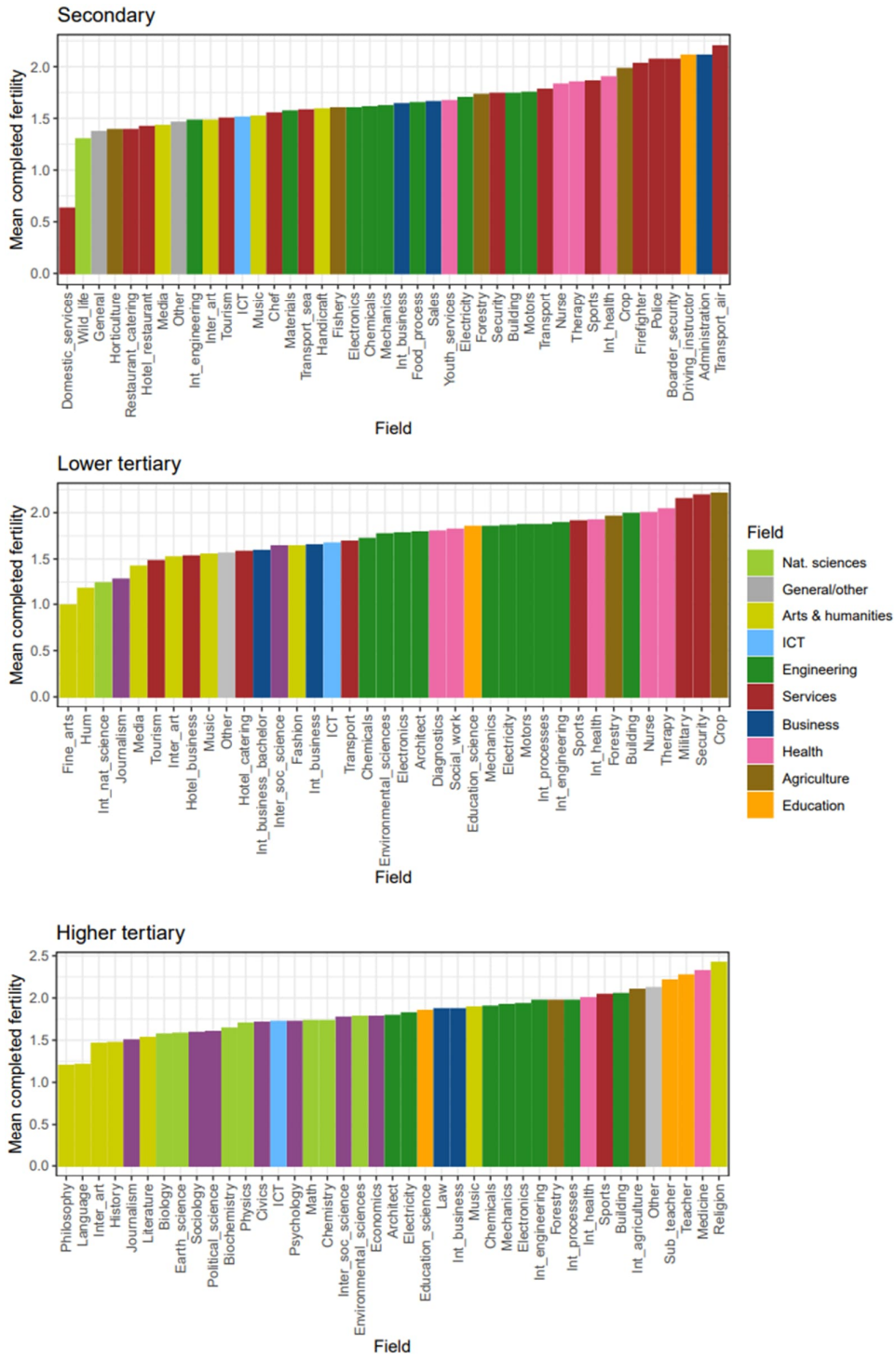
Recent theories have sought to explain the puzzling fertility changes in high-income countries, where some nations have experienced large fertility declines while others have seen increases (Vignoli, Bazzani, et al. 2020). These theories often emphasise the role of perceived uncertainty—particularly uncertainty beyond one's direct control (Neyer et al. 2022; Vignoli, Guetto, et al. 2020)—as a key driver of fertility behaviour. According to these frameworks, fertility changes are not always driven by individual economic circumstances but by broader perceptions of an uncertain future. As a result, it is not necessarily those facing the highest objective economic uncertainty that are likely to see the largest falls. However, this study highlights that objective economic conditions still play a significant role in shaping fertility. The results indicate that economic uncertainty contributed strongly to the fertility decline in the 2010s in Finland. Although the economy

improved towards the end of the decade, fertility declined more sharply in fields where economic conditions improved less. Those exposed to greater uncertainty in their field may also have become more sensitive to their circumstances (Hellstrand, Nisén, and Myrskylä 2024). A more competitive labour market has been suggested as one reason for the growing disparities (Blossfeld and Mills 2005; Lappegård, Rønsen, and Skrede 2011). To this, we could add rising living costs (Eurostat 2022; OECD 2023) and stagnation in income growth, especially among the lower paid (OECD 2020). Our results are broadly in line with those of a recent cross-country study, which found that the income requirements for entering parenthood have risen, although the evidence was more consistent for women than for men (van Wijk and Billari 2024).

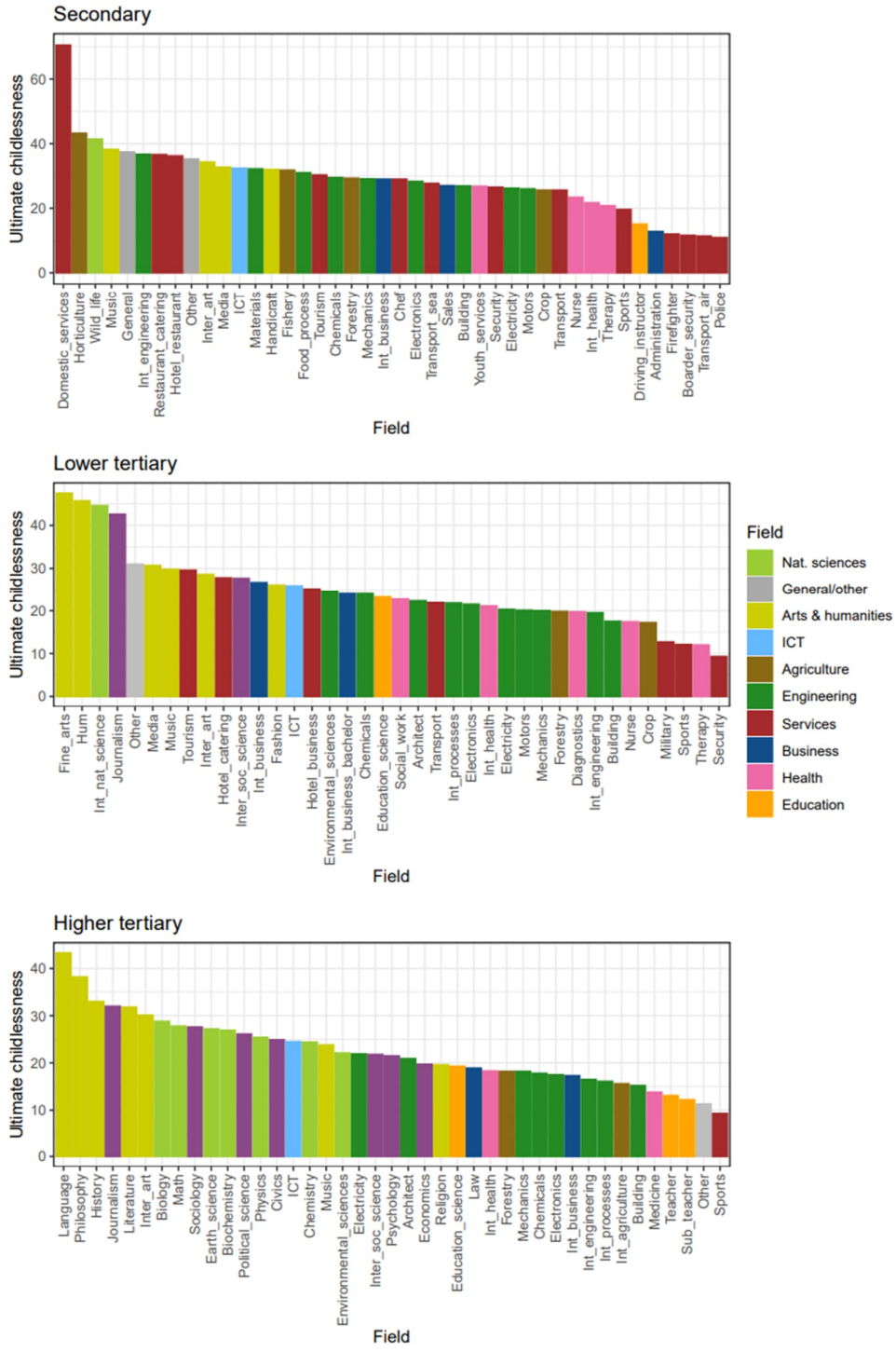
This study contributed to the discussion on field of education, economic uncertainty, and male fertility. It demonstrates that fields of education, in addition to the mere level of education, matter in explaining male fertility trends, especially in the context of the recent fertility decline in Finland. According to our findings, in a Nordic country such as Finland, a secure economic foundation is increasingly crucial for men's childbearing outcomes. The findings highlight the growing importance of economic security as a precondition for fertility. This underscores the need for greater policy support to address economic insecurity, particularly among young adults educated in fields with uncertain economic prospects.

Appendix tables and figures

Appendix Figure A 1: Mean completed fertility at age 45 by education level and field, male cohorts born in 1960-1974.



Appendix Figure A 2: Ultimate childlessness at age 45 by education level and field, male cohorts born in 1960-1974.



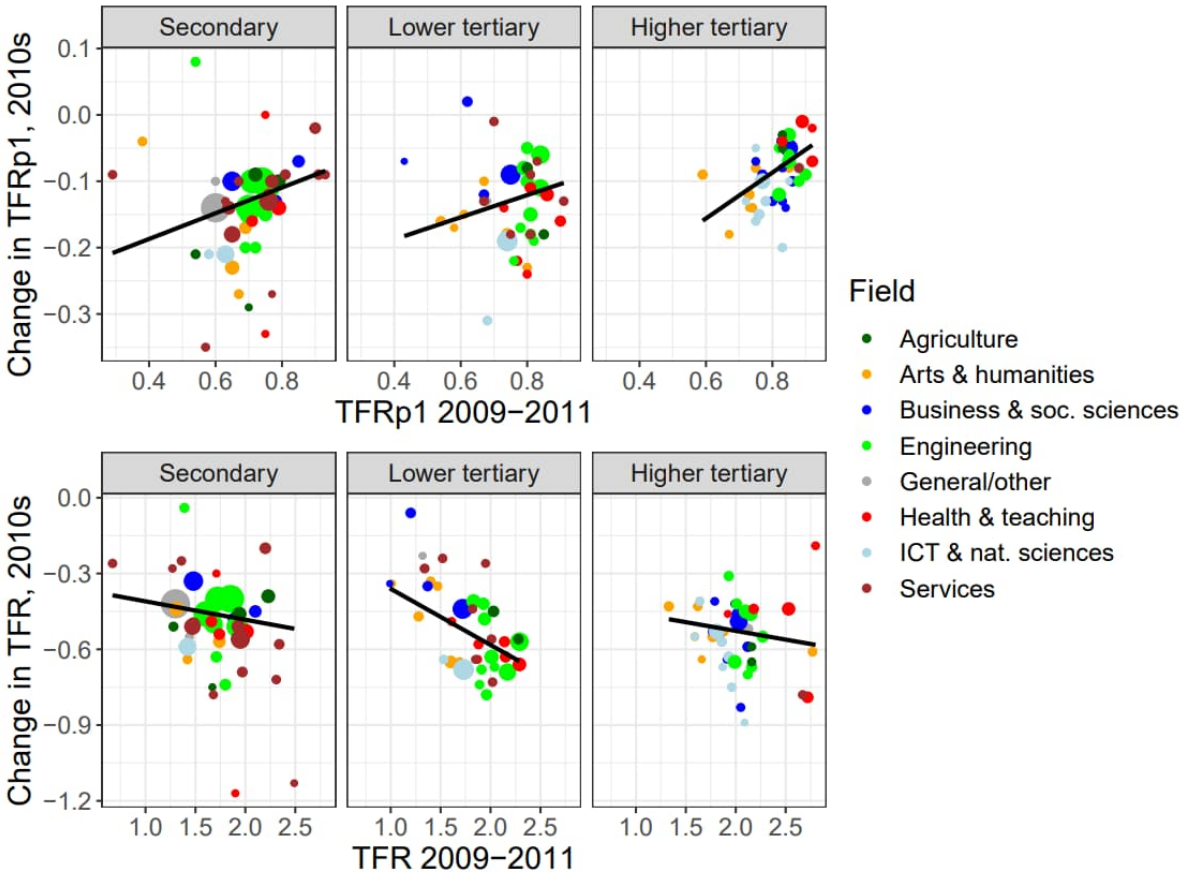
Appendix Table A 1: TFR by field of education in 2009–2011 and 2017–2019, and the change between these two periods.

		Ntotal	N30-34	TFR2009-11	TFR2017-19	Change	Change (%)
Arts & humanities							
Higher tertiary							
	Religion & theology	1154	235	2.77	2.16	-0.61	-22.0
	Music & performing arts	1603	265	1.88	1.35	-0.53	-27.9
	History & archeology	2457	440	1.77	1.22	-0.55	-30.9
	Philosophy & ethics	533	97	1.66	1.02	-0.64	-38.8
	Inter-disciplinary fields in arts	1503	228	1.62	1.19	-0.43	-26.8
	Literature & linguistics	787	155	1.59	1.04	-0.55	-34.6
	Language acquisition	1406	343	1.33	0.90	-0.43	-32.3
Lower tertiary							
	Fashion, interior & industrial design	1031	232	1.69	1.04	-0.65	-38.3
	Audio-visual techniques & media production	3409	878	1.60	0.95	-0.65	-40.7
	Music & performing arts	893	209	1.47	1.13	-0.35	-23.7
	Inter-disciplinary fields in arts	1308	223	1.40	1.07	-0.33	-23.4
	Humanities	1951	338	1.28	0.82	-0.47	-36.4
	Fine arts	625	115	1.01	0.67	-0.34	-33.3
Secondary							
	Handicrafts	4872	866	1.74	1.17	-0.57	-33.0
	Inter-disciplinary fields in arts	1551	275	1.42	0.79	-0.64	-44.7
	Music & performing arts	1522	260	1.40	0.81	-0.59	-42.2
	Audio-visual techniques & media production	7567	1468	1.31	0.87	-0.44	-33.7
Business, law & social sciences							
Higher tertiary							
	Inter-disciplinary fields in social sciences	1844	380	2.12	1.53	-0.59	-27.8
	Civics	900	174	2.05	1.22	-0.83	-40.5
	Inter-disciplinary fields in business	13852	3105	2.03	1.54	-0.49	-24.3
	Law	3711	714	2.02	1.56	-0.46	-22.6
	Economics	918	140	1.99	1.57	-0.42	-21.0
	Psychology	631	108	1.91	1.28	-0.64	-33.3
	Political sciences	1512	329	1.83	1.29	-0.54	-29.5
	Journalism & reporting, Library	651	143	1.79	1.37	-0.41	-23.2
	Sociology	1312	277	1.77	1.24	-0.53	-29.8
Lower tertiary							
	Inter-disciplinary fields in business: UAS	28745	4427	1.72	1.28	-0.44	-25.8

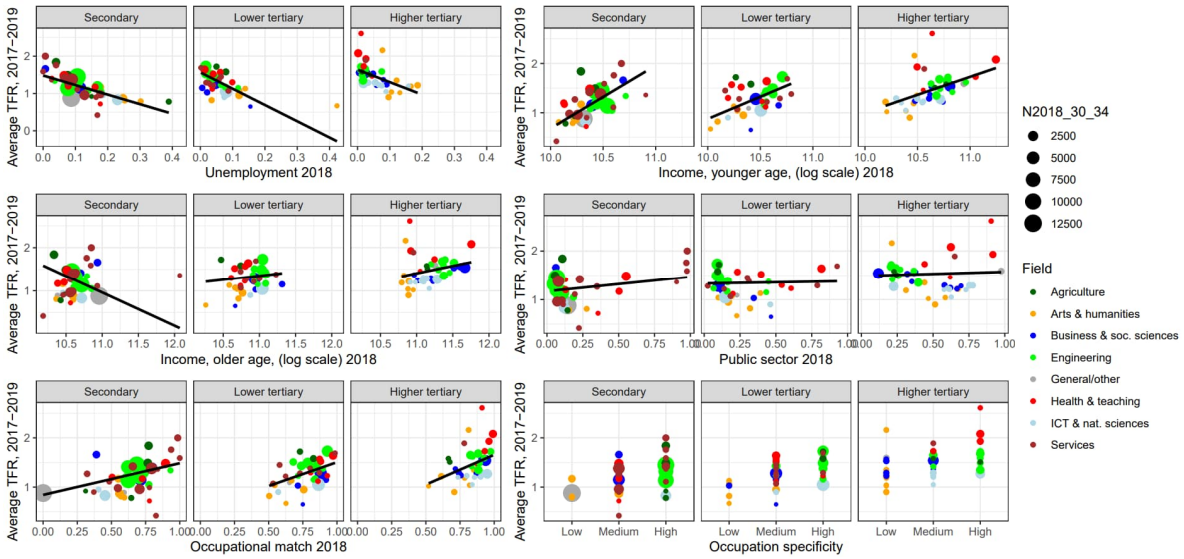
	Inter-disciplinary fields in social sciences	1844	345	1.37	1.03	-0.35	-25.2
	Inter-disciplinary fields in business: University	2821	384	1.20	1.15	-0.06	-4.6
	Journalism & reporting, Library	392	71	0.99	0.65	-0.34	-34.6
Secondary							
	Management & administration	5570	833	2.10	1.66	-0.45	-21.3
	Wholesale & retail sales	5483	1022	1.89	1.41	-0.48	-25.4
	Inter-disciplinary fields in business	28107	4062	1.48	1.15	-0.33	-22.1
Engineering, agriculture, ICT & natural sciences							
Higher tertiary							
	Building & civil engineering	3316	728	2.27	1.72	-0.55	-24.4
	Inter-disciplinary fields in agriculture	928	168	2.16	1.58	-0.59	-27.2
	Forestry	983	178	2.16	1.51	-0.65	-30.2
	Electronics & automation	1857	489	2.16	1.49	-0.67	-31.1
	Mechanics & metal trades	6052	1333	2.15	1.68	-0.46	-21.5
	Inter-disciplinary fields in manufacturing & processes	1485	277	2.12	1.42	-0.70	-33.0
	Inter-disciplinary fields in engineering	6039	1310	2.10	1.65	-0.45	-21.5
	Environmental sciences	503	88	2.09	1.20	-0.89	-42.5
	Chemical engineering & processes	2304	479	2.01	1.59	-0.42	-21.0
	Electricity & energy	7716	1284	1.99	1.35	-0.65	-32.4
	Chemistry	1157	220	1.96	1.21	-0.75	-38.1
	Architecture & town planning	1486	339	1.93	1.62	-0.31	-16.1
	Mathematics & statistics	2189	468	1.93	1.29	-0.63	-32.9
	Biology	824	117	1.87	1.20	-0.67	-35.7
	Physics	1935	367	1.86	1.29	-0.57	-30.6
	ICT	12872	2087	1.81	1.27	-0.53	-29.5
	Earth science	1059	219	1.64	1.23	-0.41	-24.9
	Biochemistry	479	116	1.59	1.05	-0.55	-34.3
Lower tertiary							
	Building & civil engineering	14992	3529	2.29	1.73	-0.57	-24.7
	Crop & livestock production	2464	350	2.28	1.72	-0.56	-24.8
	Mechanics & metal trades	15504	2870	2.17	1.49	-0.69	-31.6
	Architecture & town planning	1327	254	2.04	1.37	-0.67	-32.6
	Forestry	3292	583	2.03	1.58	-0.45	-22.2
	Electricity & energy	11269	1484	2.01	1.38	-0.63	-31.4
	Chemical engineering & processes	2997	532	1.96	1.17	-0.78	-40.0
	Electronics & automation	5816	1040	1.94	1.47	-0.48	-24.6
	Motor vehicles, ships & aircraft	4202	806	1.93	1.51	-0.42	-21.7
	Inter-disciplinary fields in manufacturing & processes	2368	336	1.91	1.23	-0.68	-35.5
	Environmental sciences	1126	239	1.89	1.15	-0.74	-39.0

	Inter-disciplinary fields in engineering	6394	1455	1.83	1.43	-0.41	-22.1
	ICT	27157	4998	1.73	1.05	-0.68	-39.5
	Inter-disciplinary fields in natural sciences	1635	254	1.53	0.90	-0.64	-41.6
Secondary							
	Crop & livestock production	9327	1269	2.23	1.84	-0.39	-17.4
	Forestry	9140	1415	1.94	1.49	-0.46	-23.5
	Motor vehicles, ships & aircraft	40860	5814	1.92	1.41	-0.51	-26.7
	Building & civil engineering, Architecture & town planning	68239	11240	1.85	1.45	-0.40	-21.6
	Chemical engineering & processes	3067	640	1.80	1.05	-0.74	-41.3
	Mechanics & metal trades	49081	7833	1.72	1.32	-0.40	-23.3
	Food processing	3553	585	1.71	1.08	-0.63	-36.8
	Electronics & automation	20729	1280	1.70	1.19	-0.51	-29.9
	Materials	19610	3539	1.68	1.18	-0.50	-29.7
	Fishery	554	90	1.67	0.92	-0.75	-45.1
	Electricity & energy	34142	9423	1.61	1.14	-0.46	-28.7
	Natural environments & wild life	1086	281	1.46	0.95	-0.50	-34.6
	ICT	25438	3088	1.42	0.83	-0.59	-41.5
	Inter-disciplinary fields in engineering	2498	302	1.39	1.34	-0.04	-3.2
	Horticulture	1540	285	1.28	0.78	-0.51	-39.4
Health, welfare & teaching							
Higher tertiary							
	Teacher: crafts, music, study adviser, other	751	150	2.80	2.61	-0.19	-6.7
	Teacher (without subject specification)	3475	643	2.72	1.93	-0.79	-28.9
	Medicine	4478	1108	2.53	2.08	-0.44	-17.6
	Inter-disciplinary fields in health & welfare	1823	365	2.18	1.73	-0.44	-20.3
	Education science	595	87	1.92	1.46	-0.46	-24.1
Lower tertiary							
	Nursing & midwifery	5901	1186	2.29	1.64	-0.66	-28.7
	Social work & counseling	2866	572	2.15	1.52	-0.63	-29.2
	Therapy & rehabilitation	2203	512	2.14	1.57	-0.57	-26.6
	Teaching & education science	1656	307	1.88	1.30	-0.58	-31.0
	Medical diagnostic and treatment technology	811	168	1.87	1.23	-0.64	-34.4
	Inter-disciplinary fields in health & welfare	1070	174	1.61	1.12	-0.49	-30.6
Secondary							
	Nursing & midwifery	9942	1736	2.01	1.48	-0.53	-26.5

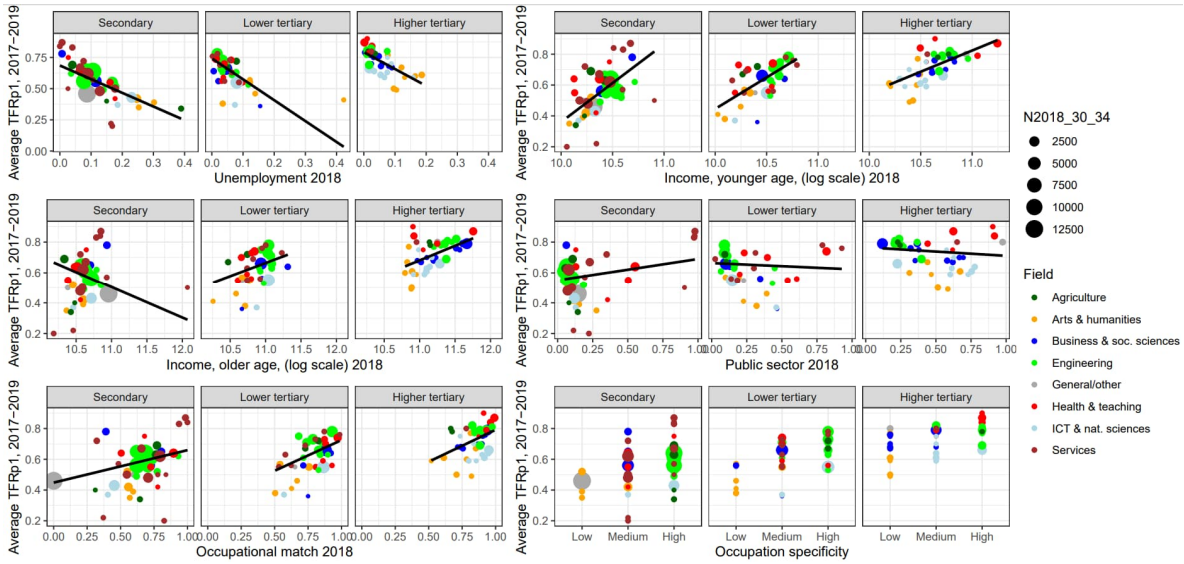
	Inter-disciplinary fields in health & welfare	742	98	1.90	0.72	-1.17	-61.8
	Therapy & rehabilitation	3041	598	1.74	1.20	-0.54	-30.9
	Driving instructor	643	100	1.71	1.41	-0.30	-17.7
	Child care & youth services	3097	614	1.66	1.17	-0.49	-29.5
Services							
Higher tertiary							
	Sports	969	206	2.67	1.89	-0.78	-29.3
Lower tertiary							
	Protection of persons & property	1596	223	2.02	1.29	-0.73	-36.0
	Sports	1159	244	2.01	1.45	-0.56	-27.8
	Military & defense, other security	2313	162	1.95	1.69	-0.26	-13.2
	Hotel & business	872	159	1.85	1.22	-0.64	-34.5
	Transport services	1055	200	1.82	1.38	-0.44	-24.1
	Hotel & catering	1680	221	1.52	1.28	-0.24	-15.9
	Travel, tourism & leisure	1193	254	1.34	1.07	-0.28	-20.5
Secondary							
	Transport services: air	443	83	2.49	1.36	-1.13	-45.4
	Fire fighter	1865	377	2.34	1.76	-0.58	-24.9
	Military & defense, other security	1327	221	2.31	1.59	-0.72	-31.1
	Police officer	2601	607	2.20	2.00	-0.20	-9.0
	Sports	2417	425	1.97	1.27	-0.69	-35.2
	Transport services: other	23333	3876	1.95	1.38	-0.56	-29.0
	Protection of persons & property	6484	1197	1.93	1.42	-0.51	-26.6
	Travel, tourism & leisure	873	172	1.68	0.90	-0.78	-46.5
	Restaurant & catering	5636	1138	1.48	0.98	-0.50	-33.9
	Hotel, restaurant & catering	13220	2404	1.47	0.96	-0.51	-34.6
	Transport services: sea	1318	215	1.36	1.11	-0.25	-18.1
	Chef	3451	121	1.27	0.99	-0.28	-22.1
	Domestic services	1285	205	0.67	0.42	-0.26	-38.0
General/other							
Higher tertiary							
	Other	2460	483	2.12	1.59	-0.52	-24.7
Lower tertiary							
	Other	691	95	1.32	1.09	-0.23	-17.6
Secondary							
	Other	1110	166	1.44	0.89	-0.55	-38.3
	General education	124430	13019	1.30	0.88	-0.42	-32.2
Primary							
	General education	235864	17763	1.46	0.99	-0.47	-32.1



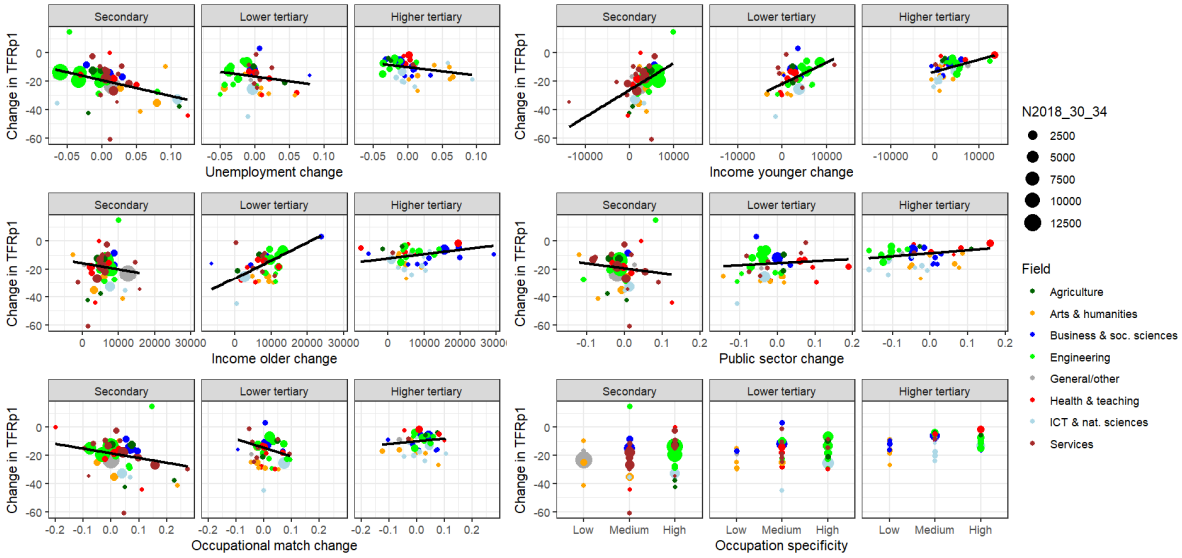
Appendix Figure A 3: Top panels: TFRp1 in 2009–2011 and absolute change in TFRp1 in the 2010s by level and field of education. Bottom panels: TFR in 2009–2011 and absolute change in TFR in the 2010s by level and field of education.



Appendix Figure A 4: Uncertainty measures and average TFR in 2017-2019.



Appendix Figure A 5: Uncertainty measures and average TFRp1 in 2017-2019.



Appendix Figure A 6: The change in uncertainty measures and the change in TFRp1 in the 2010s.

Appendix Table A 2: Regression models estimating the TFRp1 and TFR in 2018. The models are weighted by size of the field in 2018.

	Separate models		Uncertainty model	Uncertainty model + students	Uncertainty model – occupation specificity	Uncertainty model – occupation specificity + students
TFRp1 2017-2019	Est.	R^2	Est.	Est.	Est.	Est.
Intercept			-0.11	-0.07	0.06	-0.04
Unemployment 2018	-0.63***	0.58	-0.50***	-0.51***	-0.50***	-0.52***
Income younger 2018	0.64***	0.58	0.20*	0.19*	0.22**	0.18*
Income older 2018	-0.02	0.34				
Public sector 2018	0.06	0.34	0.05	0.06	0.03	0.05
Occupational match 2018	0.27***	0.53	0.18***	0.09	0.22***	0.10*
Occupation specificity (Ref: Low)		0.51				
Medium	0.77***		0.14	0.06		
High	0.95***		0.19	0.03		
Education level (Ref: Secondary)		0.34				
Lower tertiary	0.62***		-0.16	0.08	-0.20	0.07
Higher tertiary	1.25***		0.12	0.16	0.03	0.15
Proportion students 2018	-0.37***	0.53		-0.21**		-0.21**
R^2			0.77	0.79	0.76	0.79
Adjusted R^2			0.75	0.77	0.75	0.77
TFR 2017-2019	Est.	R^2		Est.	Est.	Est.
Intercept			0.22	0.26	0.33***	0.21*
Unemployment 2018	-0.65***	0.39	-0.53***	-0.55***	-0.51***	-0.54***
Income younger 2018	0.67***	0.41	0.13	0.12	0.19*	0.15
Income older 2018	-0.23	0.19				
Public sector 2018	0.14	0.18	0.12	0.13	0.10	0.13
Occupational match 2018	0.34***	0.44	0.28***	0.17*	0.29***	0.15*
Occupation specificity (Ref: Low)		0.38				
Medium	0.85***		-0.02	-0.12		
High	1.14***		0.17	-0.01		
Education level (Ref: Secondary)		0.17				
Lower tertiary	0.40*		-0.51***	-0.23	-0.55***	-0.22
Higher tertiary	0.94***		-0.35	-0.30	-0.46*	-0.31
Proportion students 2018	-0.46***	0.42		-0.25**		
R^2			0.66	0.69	0.65	0.68
Adjusted R^2			0.64	0.66	0.64	0.66

In the separate models for each variable, educational level is included in the model, but its coefficients are not shown.

Appendix Table A 3: Regression models estimating the change in TFR the 2010s. The models use independent variables in 2010, 2018, the change between the years, and in 2010 and the change between the years. The models are weighted by the size of the field in 2018.

TFR change	Separate models Est.	R^2	2010 + change Est.	2010 + change, + students
Intercept			0.56*	0.53
Unemployment 2010	-0.19	0.05	-0.35***	0.34***
Unemployment 2018	-0.59***	0.28		
Unemployment change	-0.37***	0.27	-0.28***	-0.29***
Income younger 2010	0.44***	0.12	-0.07	-0.09
Income younger 2018	0.51***	0.22		
Income younger change	0.46***	0.24	0.27**	0.29**
Income older 2010	-0.17	0.04		
Income older 2018	-0.06	0.03		
Income older change	0.15	0.05		
Public sector 2010	-0.07	0.03	-0.12	-0.13
Public sector 2018	-0.04	0.03		
Public sector change	0.09	0.03	0.09	0.11
Occupational match 2010	0.23***	0.18	0.25***	0.27**
Occupational match 2018	0.20***	0.15		
Occupational match change	-0.18*	0.06	-0.06	-0.06
Occupation specificity (Ref: Low)		0.10		
Medium	0.54**		-0.16	-0.14
High	0.53**		-0.50*	-0.47
Education level (Ref: Secondary)		0.03		
Lower tertiary	-0.18		-0.76***	-0.82***
Higher tertiary	0.20		-0.43	-0.37
Students 2010	-0.23***	0.11		0.07
Students change	0.08	0.03		0.03
R^2			0.51	0.52
Adjusted R^2			0.46	0.45

In the separate models for each variable, educational level is included in the model, but its coefficients are not shown. There was no change in Occupation specificity and Education level between the two time points.

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FIGURES AND TABLES

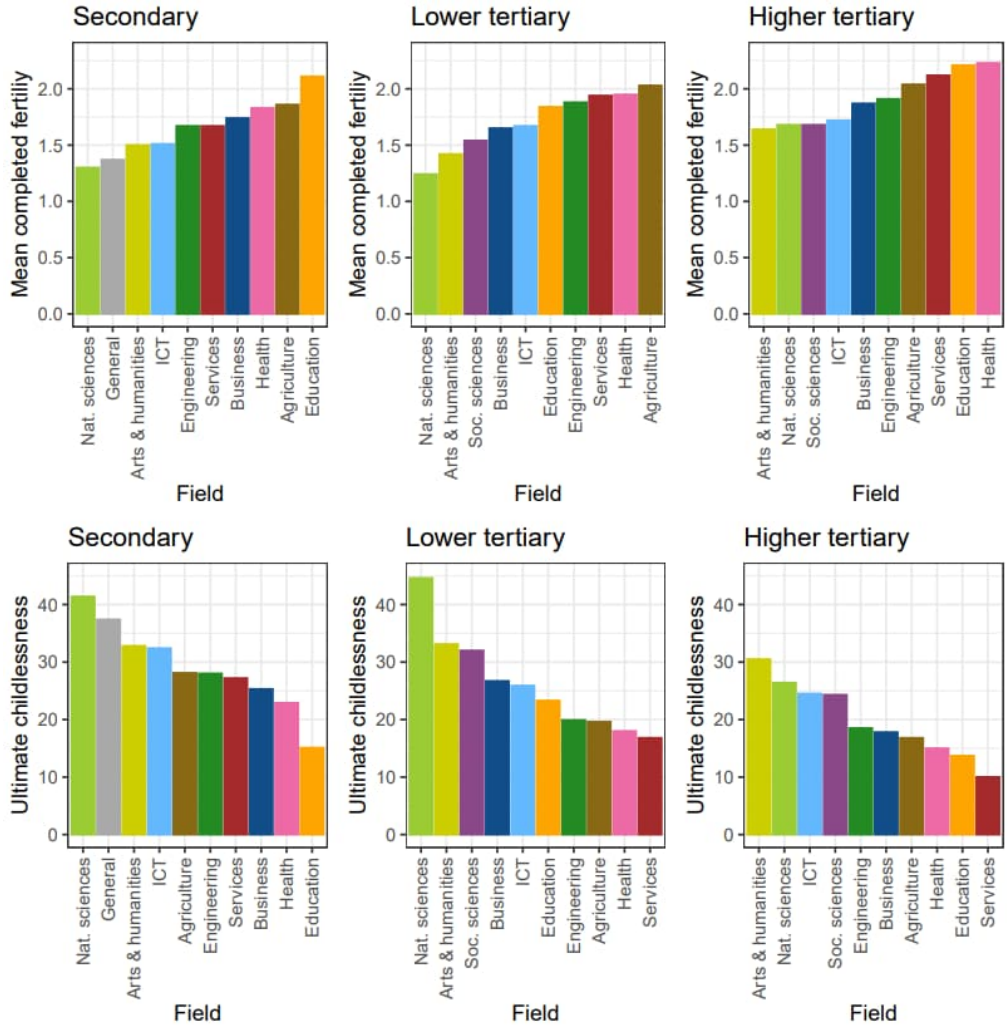

Figure 1: Mean completed fertility and ultimate childlessness at age 45 by education level and field, male cohorts born in 1960-1974.

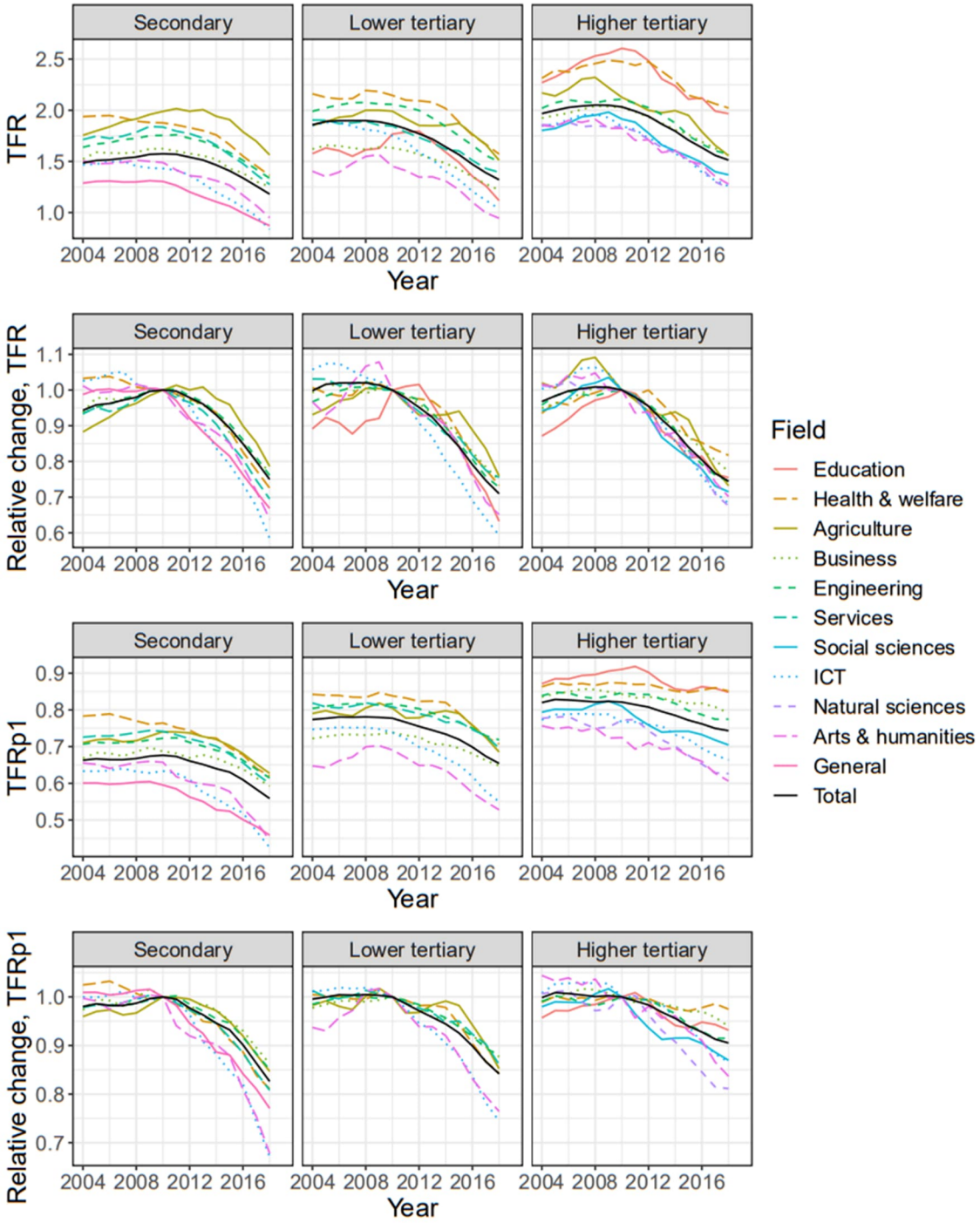

Figure 2: TFR and TFRp1 (three-year moving averages) by level and broad field of education in 2004–2019.

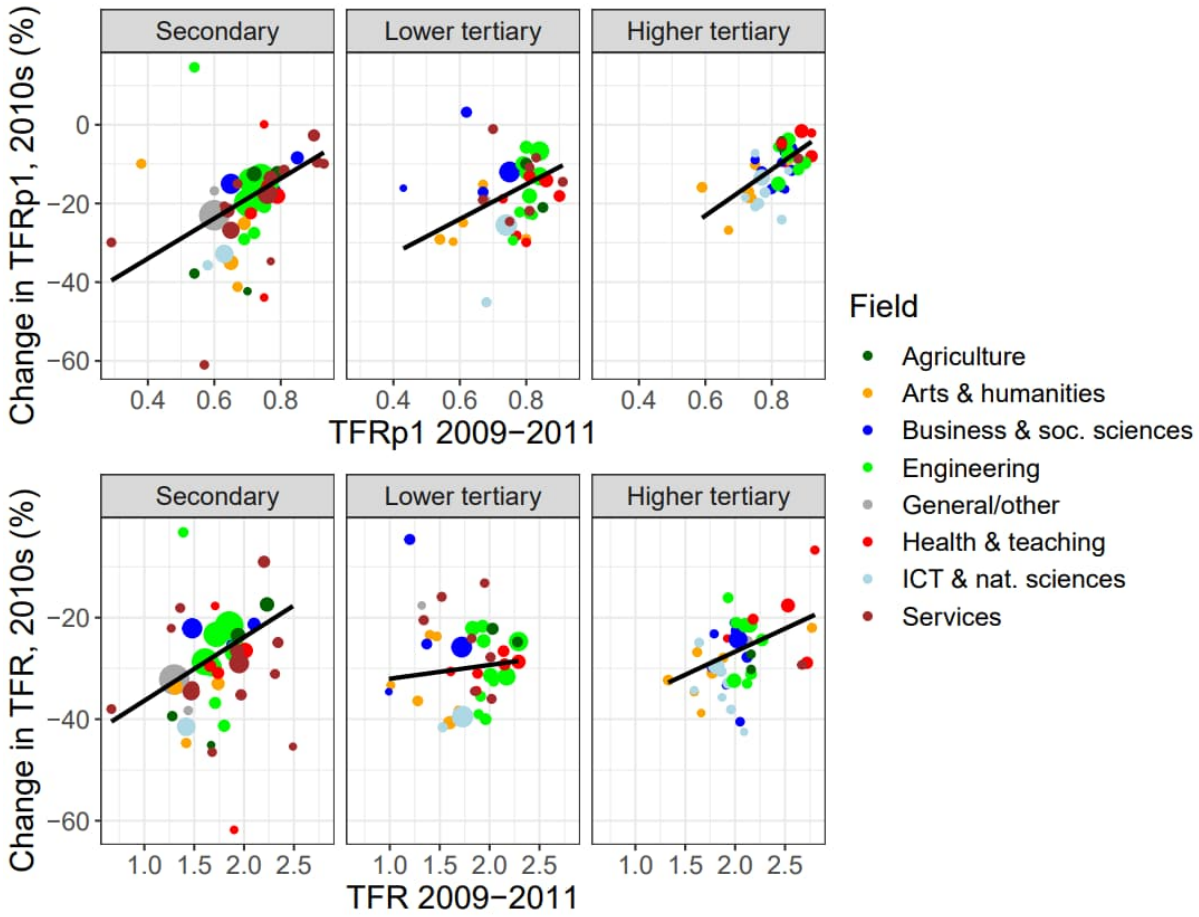

Figure 3: TFRp1 and TFR in 2009–2011 and relative change in TFRp1 and TFR in the 2010s by level and detailed field of education.

Table 1: Average and standard deviation of TFR and TFRp1, as well as uncertainty characteristics in 2010/2009-2011 and 2018/2017-2019. Weighted by group size at age 30-34 in 2018.

	Weighted average		Weighted standard deviation	
	2010/2009-2011	2018/2017-2019	2010/2009-2011	2018/2017-2019
TFR				
Higher tertiary	2.05	1.52	0.27	0.27
Lower tertiary	1.90	1.34	0.28	0.25
Secondary educated	1.67	1.21	0.26	0.25
TFRp1				
Higher tertiary	0.83	0.75	0.06	0.09
Lower tertiary	0.78	0.66	0.06	0.09
Secondary educated	0.70	0.57	0.07	0.09
Unemployment				
Higher tertiary	4.1	3.5	2.4	3.8
Lower tertiary	6.3	5.1	3.8	3.7
Secondary educated	11.1	10.7	4.2	4.9
Income younger				
Higher tertiary	41 861	45 993	7 531	10 001
Lower tertiary	33 421	37 329	3 666	5 087
Secondary educated	29 571	33 459	2 734	3 687
Income older				
Higher tertiary	78 177	86 672	18 259	22 201
Lower tertiary	49 571	57 832	7 413	7 874
Secondary educated	36 674	43 965	6 060	8 105
Public sector				
Higher tertiary	38.4	33.4	23.7	27.1
Lower tertiary	18.7	16.9	17.8	19.8
Secondary educated	12.3	11.0	13.6	13.8
Occupational match				
Higher tertiary	87.2	88.8	7.3	8.6
Lower tertiary	80.7	82.9	9.7	9.9
Secondary educated	56.0	56.9	26.2	26.4

Table 2: Regression models estimating the TFR and TFRp1 at two time points, 2009-2011 and 2017-2019. The models are weighted by the size of the field in 2018.

	TFR 2009-2011 Separate models Est.	R^2	Uncertainty model Est.	TFRp1 2009-2011 Separate models Est.	R^2	Uncertainty model Est.
Intercept			-0.08			-0.31
Unemployment 2010	-0.24*	0.28	-0.34***	-0.21*	0.39	-0.27***
Income younger 2010	0.57***	0.37	0.07	0.56***	0.49	0.15
Income older 2010	-0.27	0.27		-0.10	0.36	
Public sector 2010	0.19	0.27	0.09	0.15	0.37	0.08
Occupational match 2010	0.37***	0.54	0.31***	0.32***	0.61	0.22***
Occupation specificity (Ref: Low)		0.47			0.57	
Medium	0.80***		0.03	0.82***		0.24
High	1.16***		0.39	1.04***		0.45*
Education level (Ref: Secondary)		0.24			0.36	
Lower tertiary	0.62***		-0.13	0.75***		0.11
Higher tertiary	1.05***		-0.02	1.17***		0.19
R^2			0.65			0.71
Adjusted R^2			0.63			0.69
	TFR 2017-2019 Separate models Est.	R^2	Uncertainty model Est.	TFRp1 2017-2019 Separate models Est.	R^2	Uncertainty model Est.
Intercept			0.22			-0.11
Unemployment 2018	-0.65***	0.39	-0.53***	-0.63***	0.58	-0.50***
Income younger 2018	0.67***	0.41	0.13	0.64***	0.58	0.20*
Income older 2018	-0.23	0.19		-0.02	0.34	
Public sector 2018	0.14	0.18	0.12	0.06	0.34	0.05
Occupational match 2018	0.34***	0.44	0.28***	0.27***	0.53	0.18***
Occupation specificity (Ref: Low)		0.38			0.51	
Medium	0.85***		-0.02	0.77***		0.14
High	1.14***		0.17	0.95***		0.19
Education level (Ref: Secondary)		0.17			0.34	
Lower tertiary	0.40*		-0.51***	0.62***		-0.16
Higher tertiary	0.94***		-0.35	1.25***		0.12
R^2			0.66			0.77
Adjusted R^2			0.64			0.75

In the separate models for each variable, educational level is included in the model, but its coefficients are not shown. In this and all following tables, the significance levels at 0.001, 0.01, and 0.05 are depicted by ***, **, and * respectively.

Table 3: Regression models estimating the change in TFR during the 2010s. The models use independent variables in 2010, 2018, the change between the years, and in 2010 and the change between the years. The models are weighted by the size of the field in 2018.

TFR change	Separate models Est.	R^2	2010 Est.	2018 Est.	change Est.	2010 + change Est.
Intercept			0.92**	0.84**	-0.23	0.56*
Unemployment 2010	-0.19	0.05	-0.25*			-0.35***
Unemployment 2018	-0.59***	0.28		-0.51***		
Unemployment change	-0.37***	0.27			-0.24***	-0.28***
Income younger 2010	0.44***	0.12	0.18			-0.07
Income younger 2018	0.51***	0.22		0.17		
Income younger change	0.46***	0.24			0.35***	0.27**
Income older 2010	-0.17	0.04				
Income older 2018	-0.06	0.03				
Income older change	0.15	0.05				
Public sector 2010	-0.07	0.03	-0.24*			-0.12
Public sector 2018	-0.04	0.03		-0.12		
Public sector change	0.09	0.03			0.09	0.09
Occupational match 2010	0.23***	0.18	0.35***			0.25***
Occupational match 2018	0.20***	0.15		0.25***		
Occupational match change	-0.18*	0.06			-0.14	-0.06
Occupation specificity (Ref: Low)		0.10				
Medium	0.54**		-0.42	-0.27	0.47**	-0.16
High	0.53**		-0.51	-0.44	0.04	-0.50*
Education level (Ref: Secondary)		0.03				
Lower tertiary	-0.18		-0.85***	-0.96***	-0.27*	-0.76***
Higher tertiary	0.2		-0.76**	-0.91***	0.16	-0.43
R^2			0.29	0.42	0.4	0.51
Adjusted R^2			0.24	0.38	0.36	0.46

In the separate models for each variable, educational level is included in the model, but its coefficients are not shown. There was no change in Occupation specificity and Education level between the two time points.

Table 4: Regression models estimating the change in TFRp1 during the 2010s. The models use independent variables in 2010, 2018, the change between the years, and in 2010 and the change between the years. The models are weighted by size of the field in 2018.

TFRp1 change	Separate models Est.	R^2	2010 Est.	2018 Est.	change Est.	2010 + change Est.
Intercept			0.63*	0.50*	-0.52***	0.32
Unemployment 2010	-0.28**	0.25	-0.35***			-0.43***
Unemployment 2018	-0.65***	0.5		-0.55***		
Unemployment change	-0.34***	0.39			-0.21***	-0.26***
Income younger 2010	0.53***	0.33	0.23*			0.02
Income younger 2018	0.55***	0.41		0.20*		
Income younger change	0.43***	0.38			0.31***	0.20**
Income older 2010	0.01	0.18				
Income older 2018	0.07	0.18				
Income older change	0.15	0.21				
Public sector 2010	-0.08	0.18	-0.26**			-0.16*
Public sector 2018	-0.06	0.18		-0.13		
Public sector change	0.06	0.18			0.06	0.07
Occupational match 2010	0.21***	0.32	0.32***			0.23***
Occupational match 2018	0.18***	0.28		0.21***		
Occupational match change	-0.19*	0.22			-0.15*	-0.07
Occupation specificity (Ref: Low)		0.24				
Medium	0.45*		-0.45	-0.28	0.41*	-0.22
High	0.52**		-0.46	-0.39	0.08	-0.44*
Education level (Ref: Secondary)		0.18				
Lower tertiary	0.26		-0.46**	-0.51***	0.19	-0.39**
Higher tertiary	0.83****		-0.22	-0.28	0.80***	0.04
R^2			0.49	0.62	0.51	0.67
Adjusted R^2			0.46	0.59	0.46	0.63

In the separate models for each variable, educational level is included in the model, but its coefficients are not shown. There was no change in Occupation specificity and Education level between the two time points.