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Subnational spatial insights from the Belgian case

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Conflict of interest:

The authors declare no conflict of interest.

Acknowledgements:

This research was supported by the Research Foundation – Flanders (FWO) [project number G032715N]. We thank our colleagues from the Register-Based Fertility Research Network who provided insights that benefitted this study.

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Abstract
For a long time, high-income countries tended to report a negative association between female educational attainment and childbearing. Belgium was among the first countries that seemed to witness the emergence of a positive educational gradient in female fertility. It has been argued that –alongside other contextual correlates– this trend reflects the increasing availability of work-family reconciliation policies from which especially highly educated people benefit. In contrast to the sizable body of literature assessing varying educational gradients in female fertility across countries, subnational regional variation has hitherto received little attention. As a result, we study the Belgian case using unique microdata covering all residents in 2002-2005. The main focus is on the relevance of between-municipality variation in economic conditions and childcare services for understanding variation in second birth hazards by educational attainment. We show that a considerable part of the municipal variation in the educational gradient in second birth hazards reflects a positive link between fertility and childcare provisions as well as wealth for highly educated women, contrasting with lower educated groups. Our findings suggest that institutional support for families is relevant, but also incurs the risk of increased social polarization.

Keywords: Education – Fertility – Income – Childcare – Register Data

Acknowledgements
This research was funded by the Research Foundation Flanders (Grant No. G.0327.15N).

Introduction

Over the last century almost all societies around the globe have witnessed a massive expansion of formal education. At the same time, throughout the twentieth century, high-income countries tended to exhibit negative female gradients in fertility by level of education, with fertility outcomes of highly educated women often far below replacement level (Wood et al., 2014; Zeman et al., 2017). However, recent research provides mounting evidence that the long-standing negative relationship between women's socio-economic position and childbearing is subject to shifts (Kravdal, 1992; Kravdal & Rindfuss, 2008; Neels & De Wachter, 2010; Sobotka et al., 2017; Wood et al., 2014)[2]. Parallel to the emergence of this new evidence, new theoretical frameworks have been presented which argue that increases in fertility among women with high socio-economic positions are linked to improvements in gender equality (e.g. Esping-Andersen & Billari, 2015; Goldscheider, Bernhardt, & Lappegard, 2015) or enhanced possibilities to outsource household and childrearing tasks (Brewster & Rindfuss, 2000; Raz-Yurovich, 2014, 2016; Rindfuss et al., 2007).

In order to improve our understanding of the relationship between female educational attainment and fertility outcomes, this paper focusses on Belgium. We chose Belgium for our study as existing evidence suggests that it belongs to a set of vanguard countries with respect to shifts in the relationship between female educational attainment and fertility outcomes (Neels & De Wachter, 2010; Sobotka et al., 2017; Wood et al., 2014). A growing body of empirical evidence exhibits less negative or even positive female educational gradients in fertility in many high-income countries. However, cross-national pan-European or broader comparative research identifies the Belgian case, typically alongside Nordic countries, as a context with a clear and relatively early shift in the female educational gradient in fertility, resulting in little educational

[2] This in contrast to the situation among men, where at least new findings for Scandinavian countries suggest that the relationship between fertility and income has been positive and stable over the cohorts born since the 1930s (Andersson et al. 2016).

variation in female fertility levels around the turn of the century (Neels & De Wachter, 2010; Sobotka et al., 2017; Wood et al., 2014). This Belgian position stems predominantly from a strong positive educational gradient in second births, which is accompanied by a weak positive educational gradient in childlessness and a weak U-shaped educational pattern in the progression to third births (Wood et al., 2014).

It has been argued that the relatively positive relationship between female educational attainment and fertility outcomes in Belgium might be related to the country's extensive policies supporting the reconciliation of work and family, and that especially highly educated people are benefiting from these policies (Klüsener et al., 2013; Van Lancker, 2017; Van Lancker & Ghysels, 2012; Wood, 2019). Over the last decades, Belgium has continuously been one of the top-ranked countries worldwide in formal childcare provision, and was one of the first countries to be included in a short list of nations that meet the Barcelona target of 33 per cent childcare enrolment for children aged 0-3 (Population Council, 2006). In addition, Belgium is also a forerunner country with respect to the subsidized outsourcing of household work, with a system of service vouchers that subsidizes more than 70 per cent of the cost of outsourcing housework (Marx & Vandelannoote, 2015; Raz-Yurovich, 2014).

In addition to its vanguard position with respect to shifts in the educational gradient in fertility and the availability of outsourcing policies, Belgium is also an interesting case to improve our understanding of the recent shifts in the relationship between educational attainment and fertility for two other reasons. The first is that large-scale highly detailed data are available. The second is that Belgium exhibits strong subnational variation in population composition, wealth, and childcare services (Klüsener et al., 2013; Wood & Neels, 2019). This supports us to explore how variation in such local contextual conditions is linked to variation in fertility by education. The main aim of our study is to investigate the compositional and regional dimensions of variation in the educational gradient in Belgian fertility. Previous research has mostly focused

on changing educational gradients over time within a single country (Kravdal, 1992; Kravdal & Rindfuss, 2008) or cross-national comparisons (Klesment et al., 2014; Wood et al., 2014), whereas subnational regional differences in the educational gradient in fertility have hitherto received less attention, often due to the lack of appropriate data. Our study uses a unique dataset of all women legally residing in Belgium between 2002-2005 combined with municipality-level data on income and formal childcare coverage. In our analysis we will focus on second births as fertility variation among high-income countries is mainly shaped by variation in the transition to second births (Frejka, 2008; Frejka & Sobotka, 2008) and Belgium exhibits a pronounced positive educational gradient in second births (Wood et al., 2014).

Understanding the underlying mechanisms that have fostered the observed shifts in fertility outcomes in Belgium is likely to provide important insights for the large number of high-income societies which are confronted with a substantial gap between the numbers of intended and realized children particularly among highly educated groups (Testa, 2012). As Belgium's family and labor market policies constitute a mixture of liberal and corporatist elements, it might have appeal as a role model for countries from a large variety of welfare state regimes.

Background and Theoretical Considerations

The association between female education and second births has been studied extensively in a large number of high-income countries, and a considerable degree of variation between countries is found. Most research documents lower second birth intensities for highly educated women in German-speaking countries (Klesment et al., 2014) and many Central and Eastern European countries (Klesment et al., 2014; Muresan & Hoem, 2010; Perelli-Harris, 2008; Wood et al., 2014). This contrasts with the non-negative or even positive associations in Nordic European countries (Norway: Kravdal and Rindfuss (2008); Sweden: Hoem and Hoem (1989), Olah (2003); Finland: Vikat (2004)), some Western European countries (Belgium: Neels

(2006); France: Köppen (2006); United Kingdom: Kulu and Washbrook (2014)), and Australia (Evans and Gray (2016), Wood et al., 2014).

In attempts to explain spatial and temporal variation in the educational gradient in second births, researchers have considered varying economic, socio-cultural and policy contexts across the developed world (Ahn & Mira, 2002; Brewster & Rindfuss, 2000; Matysiak & Vignoli, 2008). These strands of literature tend to focus on contextual factors that facilitate the combination of work and family life and thus stimulate childbearing among highly educated women. In addition to literature putting forward changing gender roles as one of the main drivers of these changes (Esping-Andersen & Billari, 2015; Goldscheider et al., 2015; McDonald, 2000), the rise of reconciliation and outsourcing policies has also been suggested to be responsible (Brewster & Rindfuss, 2000; Raz-Yurovich, 2014). For the Belgian case this implies that the emergence of a positive educational gradient in second births might be related to the above-discussed forerunner status in the implementation of extensive family and labor market policies supporting the reconciliation of family and career goals (Klüsener et al., 2013; Neels & De Wachter, 2010).

Educational attainment and Fertility in High-income Countries

In many high-income countries declining fertility levels since the 1960s coincided with educational expansions and increasing female labor force participation. As a result, for decades most scholars supported the assumption that fertility and female educational attainment are negatively associated due to high opportunity costs (Becker, 1981), post-materialist attitudes (Lesthaeghe & Van de Kaa, 1986) and/or pursuing a career as a way to reduce uncertainty (Friedman et al., 1994). Later contributions highlighted the fact that education has a substantive negative effect on the timing of fertility which is likely to deflate period fertility levels (Neels & De Wachter, 2010; Neels et al., 2017; Ni Bhrolchain & Beaujouan, 2012). Recent evidence

of positive educational gradients in higher-order births in high-income countries enticed scholars to consider contextual factors that enhance work-family compatibility and thus particularly stimulate childbearing among highly educated women (Raz-Yurovich, 2016; Wood & Neels, 2019). In addition, contemporary contributions also increasingly take into account continued income inequality which may negatively affect fertility among low and medium educated women (e.g. Adsera, 2015). In line with these recent developments, we revisit three broad mechanisms through which female educational attainment is believed to affect fertility.

First, higher educated groups typically have more resources to handle the direct costs connected to childrearing (Becker, 1981). In the labor market, high educational qualifications yield higher earning potential. In addition, highly educated women are more likely to have a partner or relatives with more resources. High levels of resources may increase the demand for children. However, to the extent that highly educated parents have higher living-standards or more costly aspirations for their children, the absolute cost of childbearing may also be higher for highly educated groups. Classic economic approaches of education and fertility rely on this potential quantity-quality substitution to explain the absence of positive associations between income and fertility (Becker & Lewis, 1973). However, the continued and in part rising income inequality in many high-income countries and resulting concentration of poverty risks in lower status households may hamper the transition to higher order births particularly among low educated groups, which are increasingly selective groups in this respect (Adsera, 2011, 2015; Goos et al., 2009; OECD, 2015). Available literature for Western countries indicates persistent or even rising levels of inequality (Cantillon & Buysse, 2016; Milanovic, 2016), a concentration of individual unemployment and poverty risks in low status households (Cantillon & Buysse, 2016), but also that this inequality is further exacerbated by the gap between home owners and tenants (Kurz & Blossfeld, 2004; StatBel, 2014) and that social policy struggles to remediate these inequalities (Cantillon & Buysse, 2016; Iversen & Soskice, 2015; Najib, 2020).

Second, highly educated women have more *opportunities* in the labor market. As a result, early economic approaches to the education-fertility link asserted that highly educated women have less children due to the higher cost of time spent on non-market activities (Becker, 1981). In addition, better job opportunities for highly educated women may yield a stronger emphasis on a career as a means of uncertainty reduction and self-realization (Friedman et al., 1994). However, later contributions – taking into account wages over the life course – indicate that among highly educated groups, particularly at young ages considerable time investments are needed in order to enter a favorable career track with increasing returns over time (Liefbroer & Corijn, 1999; Wood & Neels, 2017). Hence, the negative impact of education on fertility through opportunity costs may be limited to the timing of the onset of childbearing. Furthermore, many developed welfare states have enacted a wide range of family policies comprising parental leave schemes and extensive formal childcare, and labor market policies such as flexible working schemes and subsidized domestic services, which yield an easier combination of work and family. These policies, often by design, are better tailored to highly educated career paths (Kil et al., 2018; Marx & Vandelannoote, 2014; Van Lancker & Ghysels, 2012; Wood, 2019).

Technological advancements such as the internet also increasingly allow companies to at least partly free their employees from the obligation to be present at a work place. Due to the enhanced teleworking opportunities, the private household regains importance for income-related activities, which potentially provides dual-earner couples more opportunities to combine family and career (see also Fox et al., 2019). Highly educated workers have generally been found to have easier access to and more control over flexible working hours (e.g. Golden, 2001). In addition, as parental leave entitlements are connected to previous labor force participation in many high-income countries, highly educated mothers benefit to a larger extent (Bártová, 2015; Kil et al., 2018). Similarly, highly educated groups are represented disproportionately among

the beneficiaries of (subsidized) childcare programs (Van Lancker, 2017; Van Lancker & Ghysels, 2012). Explanations for the latter include stronger labor force attachment and higher resources to manage the costs of formal childcare among highly educated women (Gabrielli & Dalla Zuanna, 2011; Hank & Kreyenfeld, 2003), but also a potentially stronger preference for and supply of informal childcare instead of formal arrangements among lower educated groups (Johansen et al., 1994; Mamolo et al., 2011). In addition, existing research demonstrates that it is particularly highly educated dual earner households that benefit from the availability of subsidized service vouchers to gain leisure time (Marx & Vandelannoote, 2014). In contrast, low educated groups experience fewer labor market opportunities, lower returns to career investments, and have also been found to benefit to a lesser extent from work-family reconciliation policies as these policies mostly benefit those who are already established in the labor force (Bártová, 2015; Kil et al., 2018; Liefbroer & Corijn, 1999; Van Lancker & Ghysels, 2012). In that sense, the emergence of a positive association between fertility and development might at least in part stem from an increasing polarization within society (Adsera, 2015; Najib, 2020).

Third, enrolment in higher education potentially reflects a higher interest in individual self-realization and post-materialist values. Although this mechanism has been put forward to explain lower fertility for highly educated women (Lesthaeghe & Surkyn, 1988; Lesthaeghe & Van de Kaa, 1986), post-materialist attitudes do not seem to be negatively correlated to ideal family sizes and available research finds no consistent evidence of lower fertility intentions for highly educated groups (e.g. Beaujouan et al., 2013; De Wachter & Neels, 2011; Ruokolainen & Notkola, 2002). This suggests that the idea that the choice for high education and possibly also a professional career conflicts with family formation is progressively outdated. Today, it still seems reasonable to assume that the choice to attend tertiary education reflects somewhat of an interest in higher-order needs such as self-realization. However the increased work-family

combination allows highly educated women to pursue a professional career as well as realize their fertility intentions (e.g. conforming to the two-child norm). It is likely that, in tandem with the rising share of women with tertiary degrees, highly educated women have become a less select group in terms of attitudes and willingness to sacrifice family formation for career goals, particularly in contexts that have succeeded in reducing the opportunity costs connected to childrearing.

Regional Variation

The idea that the impact of female education on fertility varies depending on the context considered is widely supported by scholars in demography (Kravdal, 1996; Liefbroer & Corijn, 1999; Rindfuss et al., 2010). The comparison between educational gradients in second births across high-income countries at least suggests that non-negative or even positive differentials occur in some highly-developed contexts with extensive work-family policies (Klesment et al., 2014; Wood et al., 2014), and a handful of cross-country assessments of the effects of such policies indeed indicate stronger positive effects among highly educated groups (Puur et al., 2016; Wood et al., 2016). However, influential literature reviews have drawn attention to the limited contribution of such cross-country associations (Gauthier, 2007; Neyer & Andersson, 2008), which may be driven by a limited number of vanguard countries with high work-family compatibility in Northern and Western Europe (Klüsener, 2016). Next to extensive work-family policies or access to market-based childcare, these forerunner countries are likely to differ from other highly developed parts of the world in many other socio-economic, political and cultural respects (Thevenon, 2008). In addition, variability in educational systems and distributional differences in educational attainment between countries suggest that the meaning of a particular level of education varies considerably across high-income countries. This motivated us to perform a regional analysis of one vanguard country to explore whether such patterns can also

be found within a country in which inhabitants are subject to the national context and educational attainment is captured similarly across the whole study area.

Local Opportunity Structures and Cultural Milieus

Local opportunity structures have been put forward as an explanation for regional fertility patterns (Basten et al., 2011; Campisi et al., 2020; Hank, 2001, 2002; Kulu, 2010; Kulu & Washbrook, 2014). Opportunity structures include both the indirect costs of childrearing through opportunity costs which depend on the amount of competing activities to childrearing (e.g. a professional career, leisure activities) and the availability of childcare services, as well as the direct costs of children such as the cost of commodities and services (Hank & Kreyenfeld, 2003; Kulu & Washbrook, 2014). With respect to the former, in areas with a high availability of childcare the opportunity costs of fertility will be lower, which in turn might especially support second births among highly educated. However, the potential impact of childcare provision need not be limited to the enhancement of work-family combination in a strictly economic sense. In addition, a context with extensive formal childcare may also enforce egalitarian gender role attitudes and norms supportive of developing a career in addition to family formation both for men and women (Fagnani, 2002; Sjöberg, 2004). This gradual acceptability of the work-family combination is likely to depend on a diffusion process in which change to norms occurs through social interaction and work-family behavior by others can provide role models (Baizan, 2009; Hank, 2002). The relationship between childcare accessibility and social acceptance in a locality is very likely to be self-enforcing as increasing demand for childcare can have a positive effect on the availability of childcare services. Although Belgium has a long-standing history in public childcare provision and in general exhibits favorable attitudes toward work-family combination and the use of formal childcare (Klüsener et al., 2013; Neels & Theunynck, 2012), there is considerable variability in formal childcare availability across the country (Wood & Neels, 2019). In addition, formal childcare

supply frequently cannot keep up with the growing demand (Hedebouw & Peetermans, 2009; Vande Gaer et al., 2013). This variation in formal childcare is expected to induce variability in the economic and social compatibility between work and family, which in turn may shape the educational gradient in second births.

With respect to the direct costs of children, we identify the wealth at the municipal level as a potentially important predictor for the local educational gradient in second births. Areas with high mean incomes and high housing prices yield high child-related costs connected to services and commodities, housing, and culturally entrenched norms and status symbols (e.g. expensive vacations and cars). It is likely that highly educated groups will more easily be able to afford such living conditions for themselves and their children. Highly educated groups have more wealthy networks and are more likely to be home owners, which yields considerable capital accumulation compared to home rental. As a result highly educated women may perceive the high living standard of wealthy municipalities as a precondition to childbearing. Low educated groups on the contrary are more likely to rent a dwelling and have less resources to cope with the higher costs in municipalities with high average income levels. Hence among low educated groups in wealthy municipalities, there may be a stronger tension between the high costs of living and conforming to costly social norms on the one hand, and childbearing on the other. Despite the fact that Belgium, generally, is a high-income country, it exhibits substantial regional variability in economic prosperity (StatBel, 2017) which is expected to affect the educational gradient in second births.

With respect to local opportunity structures and cultural milieus, it is also important to point out that Belgium is divided into a Dutch- and French-speaking part (Flanders and Wallonia) and a small German-speaking area which differ in family formation norms and attitudes (Klüsener et al., 2013), but also in economic conditions (StatBel, 2017) and childcare coverage

(Wood & Neels, 2019). We therefore have to carefully evaluate whether and to what degree our findings are driven by distinct differences between these regions.

Composition Effects and Selective Migration

Previous research identifies composition effects and selective migration as the two main confounders of regional effects on fertility (Hank, 2001, 2002; Kulu, 2010; Kulu & Washbrook, 2014). With respect to the former, differential compositions may cause fertility variations as various types of people live in different places. For instance, regional fertility disparities have been related to compositional differences with respect to education and marital status (Hank, 2001; Kulu, 2010). An important compositional factor in many high-income countries is the presence of ethnic minorities. Migrant populations in Belgium, especially non-European groups, on average exhibit higher fertility levels than natives while they attain lower levels of educational attainment (Baert & Cockx, 2013; Baert et al., 2016; Van Landschoot et al., 2014). This compositional effect may be partly responsible for stronger negative or attenuated positive educational gradients in second births in urban areas. Although second generation migrants typically attain higher levels of education than the previous generation and display lower fertility compared to their parents, a wide native-migrant gap persists, particularly when considering non-European migrant groups (Baert et al., 2016; Stonawski et al., 2016; Timmerman et al., 2003).

Selective migration has also been identified as a confounding factor in the assessment of how regional contextual conditions are linked to fertility. In addition to effects of local characteristics on second births among the resident population, particular local characteristics may also attract women who intend to have a second birth, which in turn inflates the fertility level of the receiving area (Hank, 2001; Kulu, 2010). Depending on the characteristics of the municipality, this selection may occur differentially across educational groups. With respect to

the provision of formal childcare, it is expected that this will attract groups with higher birth intentions. This selectivity is likely to be stronger for highly educated groups as work-family compatibility may be a stronger prerequisite for continued childbearing among this group (Wood & Neels, 2017;Wood, 2019). With respect to municipal wealth, it is also assumed that selective migration occurs differently between educational groups. Although moving to a wealthy area may reflect the choice to raise children under the highest possible living standard, this strategy may not be feasible for low educated groups (Brandén, 2013). As a result, migration to wealthy municipalities by low educated groups may be a search for upward social mobility. Given the higher costs related to childrearing in wealthy municipalities, this upward social mobility may come at the cost of lower fertility (Dalla Zuanna, 2007). Whereas selective migration has received considerable attention in research on regional differences in fertility (Hank, 2001, 2002; Kulu, 2010; Kulu & Washbrook, 2014), its importance for understanding regional variation in the educational gradient in fertility remains unclear.

Data and Methods

The 2001 Belgian census provides detailed information on all individuals legally residing in the country, including fertility histories, education, nationality and detailed information on household composition. The individual microdata from the 2001 census have been linked to data from the National Register, which provide information on changes in household composition in the period 2002-2005. This prospective research design allows to estimate the effect of the self-reported highest level of education in the 2001 census on monthly second birth hazards estimated using register data for the subsequent 4-year period. We combine the microdata with contextual-level information at the level of the Belgian municipalities (N=588)[3].

[3] One of the 589 municipalities ("Herstappe") is excluded due to missing data as a result of the limited population size (84 residents in 2002).

With respect to work-family compatibility, we use data on formal childcare coverage which represent the amount of full-time equivalent places in daycare (excluding after-school hours care) as a per cent of the population aged 0-3 in a given municipality in a given year and are collected by regional childcare offices. For the Flemish municipalities in the Northern region of Belgium this is "Kind & Gezin" [Child & Family][4], whereas childcare provisions in the Southern Walloon municipalities are coordinated by "L'Office de la Naissance et de l'enfance" [The Office of Birth and Childhood][5]. In the Brussels capital region, both institutions provide and coordinate childcare. Regarding municipalities' socio-economic status we obtained data on the median income after taxes per year derived from tax returns. This information was provided by Statistics Belgium[6] and originates from federal tax registers. All taxable sources of income are included in the measure. Both contextual variables used in this study exhibit considerable variation across Belgian municipalities[7], thus illustrating differentiation in work-family compatibility as well as wealth within the country.

In our analysis we estimate mixed effects discrete-time event history models of second birth hazards using a logit link function, which enables the interpretation of exponentiated parameters in terms of odds-ratios. We decided to exclude from the full sample of mothers aged 15-49 between 2002 and 2005, those mothers who declared to be in education in 2001 (2,034 women or 0.49 per cent). This was motivated by the observation that the fertility behavior of those enrolled in education has been documented to differ substantially (Lappegård & Ronsen, 2005; Neels et al., 2017). In addition, we also dropped all women for whom no educational attainment

[4] See https://www.kindengezin.be/algemeen/english-pages.jsp for more information.
[5] See http://www.one.be/presentation/about-us/ for more information.
[6] See https://statbel.fgov.be/en/themes/households/taxable-income for more information.
[7] With respect to the coverage of formal childcare in the 2001-2004 period, the lowest ranked municipalities exhibit average levels as low as 1.85 per cent, whereas the highest 2001-2004 coverage rate is 69 per cent. The average coverage rate was 24.38 per cent, with an 11.92 standard deviation. Similarly, the lowest income municipalities display a 2001-2004 average median income level of 13004, whereas the highest ranked municipality exhibits a medium income level of 25662, with a mean across municipalities of 19230 and standard deviation of 1995.

is available (10,054 women or 2.4 per cent), as well as first generation migrants (44,275 women or 11 per cent). The latter decision ensures that we focus on persons who are likely to have been socialized in Belgium, and whose fertility schedules are not affected by the frequently observed postponement of births due to international migration plans into a foreign country (Wilson, 2013). In total, our subset consists of 356,821 women aged 15-49 years at risk of a second birth between October 2002 and December 2005. These women are observed until they have a second birth, or until they are censored after December 2005, at the age of 50, or as a result of death or emigration. Our analyses use 11,602,755 person-months to estimate second birth hazards.

In the fixed part of the model, we include the following micro-level characteristics: (i) age at first birth, (ii) months since first birth, (iii) educational attainment in 2001, (iv) origin group. *Age at first birth* (time-constant) in years is included as a quadratic function to account for the lower second birth hazards among mothers who entered motherhood at relatively low or high ages. With respect to *months since the first birth* (time-varying), which is the baseline time variable, dummies for the first and second year are included in addition to a linear function. The dummies for the first two years of exposure capture the relatively low second birth hazards at such short durations since the first birth. The linear term captures a downward trend in birth hazards from the third year onward. Model tests indicated that a quadratic term was not needed, as the curvilinear pattern in probabilities is already mimicked by the logit link function. In addition, deviance tests indicate that this specification yields a better approximation of the observed second birth hazard functions compared to third or fourth-order polynomial specifications.

Educational attainment, self-reported in 2001 (time-constant), distinguishes low education (all levels below higher secondary education, ISCED-levels 0-2) from medium education (higher secondary education, ISCED-levels 3-4) and high education (all post-secondary levels of

education, ISCED-levels 5-6). Some authors have asserted that elevated second birth risks among highly educated mothers might be related to squeezing effects as highly educated women become mothers later and might thus have less to time to realize higher-order birth intentions (Kreyenfeld, 2002). This does not seem to be the case for Belgium in the 2002-2005 period, as variations in the functional form of the observed baseline hazard function for different educational groups are relatively limited[8].

While we only consider women born in Belgium, we still make a distinction by origin group (time-constant). For this we use information on the nationality at birth of both the parents. In case both parents were born with the Belgian nationality, an individual is considered to have a Belgian origin. In case one of both parents exhibits a foreign nationality at birth, the individual is categorized in that foreign origin category. In case parents exhibit different foreign nationalities at birth, the most distant country is considered as country of origin. It should be noted here that, as a result of the high degree of homogamy in terms of origin among parents with foreign birth nationalities at birth, the usage of a different algorithm (e.g. using the origin of the mother or father) would not entail major differences in the distribution of women by origin. The reference group of the constructed origin variable is (i) women with a Belgian background. We further distinguish women with (ii) a neighboring country background (United Kingdom, France, the Netherlands, Luxembourg, Germany), (iii) Southern European background, (iv) other European background, (v) Turkish or Moroccan origin, (vi) women with a background from a limited number of highly developed non-European countries (USA, Canada, Japan, Australia, New Zealand), and (vii) women with a background from another non-European country. In addition to the aforementioned micro-level characteristics, we include

[8] Despite the fact that, even in case of limited differences in the observed functional form, including an interaction between the baseline hazard function and level of education may contribute to the model fit, unfortunately the model did not reach convergence when including this interaction in an already demanding mixed effects discrete-time event history model. Hence no interaction between education and second birth schedules is included. The comparison of observed and estimated baseline hazard functions by level of education suggests that this model specification approximates the patterns appropriately for all three educational groups.

annual indicators at the municipal level for *childcare coverage* (time-varying) and *median income* (time-varying) in the model with a one-year time lag to approximate the time of birth decisions.

Next to the fixed effects, a random term is included for every combination of municipality and education. This entails (588*3) 1764 deviations from the main intercept which allow for municipality-specific educational gradients[9] in second births. The analytical strategy of this paper is to include covariates in the fixed effects part of the model in a stepwise manner and to assess to which degree the fixed part of the model can explain municipality-specific educational gradients in second births. Model one only includes age at first birth, years since the first birth and education, which allows us to document the regional variation in the educational gradient in second births in Belgium. Model two assesses to which degree variation can be explained by compositional differences in terms of the different origin groups. In the third model we add the municipality-level indicators for work-family compatibility and wealth to the model. The effect of childcare coverage and median income is allowed to vary by level of education, and changes in the random part of the model are informative on whether these contextual variables explain regional variation in the educational gradient in second birth hazards. Finally, in order to cancel out the effect of selective migration patterns, model four only takes into account women who have been living in the same municipality for at least four years.

As we run models on data with high spatial detail, it is also immanent to explore whether and to what degree spatial autocorrelation might affect our findings. One important assumption of a regression model frequently violated in models of spatially detailed data is that the observations are independent from each other. Social science research is usually confronted with positive spatial autocorrelation where neighboring spatial units share many similarities. If

[9] Tests for basic models indicated that models including a random intercept for the 588 municipalities and random slopes for medium and high education for the 588 municipalities yield similar results. Since the estimation procedure is far more efficient, we report models including 588*3 random intercepts.

these similarities are not adequately controlled for in the model, spatial autocorrelation can introduce bias in the estimates. In case of positive spatial autocorrelation the explained variance tends to be overestimated, which entails too narrow confidence intervals and too high significance levels. In addition, spatial autocorrelation can also introduce bias in the derived coefficient and random intercept estimates (Anselin, 2009; Bivand et al., 2013). To look into the degree to which spatial autocorrelation is affecting our model results, we apply the Moran's I test of spatial autocorrelation (Moran, 1950) on the mean municipality-level residuals and the municipality-level random intercepts. This test is similar to Pearson's correlation coefficient, but instead of measuring the correlation between two variables *x* and *y* it detects the correlation between the value of a variable *x* in municipality *i* with the (weighted) average value of the same variable in neighboring municipalities *j*. Neighborhood is defined via a spatial weight matrix. In our case we consider a contiguity-based first order queen definition of adjacency, in which municipalities are neighbors if they have at least one border point in common, and spatial weight matrices based on n-nearest neighbors (3-7 nearest neighbors).[10] In addition, we mapped the municipality-level mean residuals and random intercepts of the models to identify areas in which high and low municipality-level residuals or municipality-level random intercepts are clustered.

In addition to the robustness checks for potential bias due to spatial autocorrelation, we also test whether our results are robust to the usage of models other than logistic regression. Logistic regression models have been proven prone to limitations, such as the incomparability of the parameter effects across different models or samples. Many of these limitations of logistic regression models find their root in the fact that the variance of the residuals is fixed a priori (Mood, 2009). Given that the analytical strategy of this study relies on the interpretation of how the random effects at the municipal level change when controlling for additional composition

[10] We use the spherical distance between the centroids of the municipalities to derive the n-nearest neighbours.

and contextual effects, we also use linear probability models to test the robustness of our results over different model specifications.

Results

Regional Variation in the Educational Gradient in Second Births

The results of model 1 (Table 1) indicate a positive educational gradient in second births, which corroborates previous research (Neels & De Wachter, 2010; Wood et al., 2014). Overall, women with medium levels of education exhibit ((1.146 - 1)*100) 14.6 per cent higher odds of having a second birth, whereas the corresponding number for highly educated women is 108.1 per cent higher odds. In addition, the random part of the model shows that there is a considerable amount of variation in the educational gradient in second births across Belgian municipalities. Especially with respect to the difference in second birth hazards between low and highly educated individuals the results exhibit notable variation (STDEV: .3164). The municipality-specific associations of medium (versus low) education and second births range from 16.3 per cent lower second birth odds to 61.2 per cent higher second birth odds (Figure 1), whereas the corresponding associations of high education range from 14.2 per cent to 192.1 per cent higher second birth odds (Figure 2).

Composition Effects

In line with previous studies, model 2 (Table 1) indicates that natives with a non-European migration background and especially those with a Moroccan or Turkish origin exhibit higher odds of continued childbearing compared to natives without a migration background (Kulu & Gonzalez-Ferrer, 2014). Non-European migrant groups from a set of non-European high-

income countries (USA, Canada, Japan, Australia and New Zealand) exhibit birth odds similar to native groups without a migration background. With respect to European origin groups, those with a Southern European background – a minority group originating from post-war labor migration – display 9.4 per cent higher second birth odds, whereas those from remaining European migrant backgrounds exhibit similar birth odds than native groups without a migration background. Although birth hazards clearly differ across different origin groups, the random part of the model indicates that the regional variability in the educational gradient remains very similar when controlling for origin group composition (STDEV of association medium education: .1344; STDEV of association high education: .3121). The municipality-specific associations of education with second birth odds (Figure 1-2) are nearly identical to the corresponding effects in model 1.

Income and Childcare Coverage at the Municipal Level

Subsequently, this study assesses to which degree variation in local opportunity structures – median income and childcare coverage at the municipal level – coincides with varying effects of level of education on second birth hazards. The random effects of model 2 are plotted against these municipal characteristics (Figure 3). It is striking that both for median income as well as for childcare coverage positive associations with second births seem to emerge for highly educated women only. Loess-fitted smooth curves indicate that this conclusion is not driven by distinct differences between the four large regions (Dutch-speaking Flanders, French-speaking Wallonia, Brussels capital, German-speaking community) but also holds true if these areas are looked at separately. Model 3 (Table 1) indicates that whereas the effect of median income is negative for low and medium level educated women, the contrary holds for highly educated groups. A 5,000 € increase in the median income, which is routinely observed between municipalities in Belgium, is associated to ((1-.994^50)*100) 26 per cent lower second birth

odds among low educated women, while among highly educated women a 10.5 per cent increase is found. With respect to the availability of formal childcare, low educated women do not seem to be affected in their transition to a second birth, whereas medium level and particularly highly educated women exhibit positive effects of childcare coverage. A 25 per cent difference in childcare coverage, which is frequently observed across Belgian municipalities, entails a ((1.003^25-1)*100) 7.8 per cent and a 19 per cent increase in second birth odds among medium level and highly educated women respectively. With respect to the explanatory value of these municipal characteristics, the random part of model 3 indicates that the standard deviation of the random effects of medium and high education have decreased by 23 per cent and 34 per cent respectively. Municipality-specific effects of medium level and especially high education are drawn to the average of 1.188 and 2.160 respectively and the range of associations is narrowed down considerably (Figure 1-2). Hence local income and childcare availability are identified as important predictors of the educational gradient in continued childbearing in Belgium.

Sensitivity Model for Selective Migration

Model 4 (Table 1) indicates to which degree regional variation in the educational gradient in second birth odds alters when excluding women who have recently moved. Parameter estimates for the fixed part of the model are similar to the results for model 3 and substantive conclusions remain the same. In addition, the random part of the model indicates that the degree of regional variation in the educational gradient in second births does not differ noteworthy from the previous model (Figure 1-2).

Robustness Checks: spatial autocorrelation and linear probability models

Although the use of unique register data for the complete resident Belgian population allows for more detailed assessments of regional correlates of the educational gradient in fertility compared to cross-national comparisons (Klesment et al., 2014; Puur et al., 2016), spatial autocorrelation may distort our results. Our models assume that the 588 municipalities under consideration are independent, whereas neighboring municipalities may share common features both in terms of regional characteristics as well as fertility regimes. The Moran's I tests on the mean municipality-level residuals and the municipality-level random intercepts return evidence for quite high spatial autocorrelation (Table 2). We thus implemented sensitivity checks to explore whether our main findings derived from the models could potentially be artefacts due to bias introduced by spatial autocorrelation. For this we specified the same models at the level of the 43 Belgian districts as we expected lower levels of positive spatial autocorrelation at this higher level of spatial aggregation.

Our district-level sensitivity models yield very similar results, indicating that also at this higher subnational level childcare coverage and municipal income are important explanatory variables for regional variations in the educational gradient in fertility. For the observed second birth hazards at the level of the 43 districts we still obtained high Moran's I (0.45-0.77 dependent on the model and weight matrix). But for the spatial autocorrelation tests on the residuals and random intercepts, we obtained much reduced Moran's I indices, which were, however, generally still significant. Maps allowed us to identify that these outcomes seem to a large degree be driven by an area with high second birth hazards in the south-east of Belgium that our models do not explain. In order to assess to which degree our findings hold when this region is excluded from the analysis, we estimated additional models excluding five districts in the South-East (Verviers, Aarlen, Bastenaken, Neufchâteau and Virton), or 375,376 person-months (3.2 per cent of the sample). This model yields nearly identical results with respect to the regional correlates and their explanatory value towards the educational gradient in birth

hazards. The correlation between income and formal childcare coverage on the one hand and second birth hazards on the other, varies depending on the educational group considered, and the inclusion of these regional contextual conditions decreases the standard deviation of the municipality-specific correlations of medium and high education by 23 per cent and 42 per cent respectively. Finally, after excluding the aforementioned districts in the South-East, Moran's I tests for model 3 provide only weak indications for remaining spatial autocorrelation, while for model 4 none of the spatial autocorrelation tests on the residuals and random intercepts is significant (see supplementary material, Table 3). This provides us reassurance that our main findings are not just artefacts due to bias introduced by spatial autocorrelation.

Finally, additional robustness checks for potential bias due to the usage of logistic regression models rooted in the fact that the variance of the residuals is fixed a priori (Mood, 2009), indicate very similar results when linear probability models are adopted. Hence, our results are not artificial in the sense that the decline in the spatial variation in the educational gradients after controlling for the association between educational gradients and contextual factors also holds when using linear probability models.

Discussion and Conclusion

The fact that Belgium has been a vanguard case in recent shifts in the association between female educational attainment and fertility outcomes provided a motivation for this study. In contrast to many other high-income countries, Belgian fertility levels by education indicate limited educational gradients or even increasingly higher fertility for highly educated women compared to other educational groups (Sobotka et al., 2017), which results mainly from a strong positive educational gradient in second births (Wood et al., 2014). Due to extensive childcare provisions combined with fertility levels above the European average and relatively weak socio-economic gradients in fertility, the Belgian context is likely to support the cross-national

hypothesis that reconciliation policies stimulate fertility and counteract negative effects of women's socio-economic position on continued childbearing (Myrskylä et al., 2009; Van Bavel & Rozanska-Putek, 2010; Wood et al., 2016). It is noteworthy that most literature on women's education and fertility levels is preoccupied with the position of highly educated women, typically in terms of opportunity costs of childrearing (Klesment et al., 2014; Puur et al., 2016; Wood et al., 2014). Whereas this emphasis on highly educated women resulted from the appearance of an ever increasing group of highly educated women in the second half of the twentieth century (Becker, 1981; Lesthaeghe & Surkyn, 1988), contemporary contributions also focus on social polarization and the position of the lowest educated women as a factor determining educational fertility differentials (Adsera, 2015). Also in this respect, Belgium provides a well-suited laboratory as the country – similarly to many other Western countries - exhibits a concentration of unemployment and poverty risks in an increasingly select group of low educated women. Social policy struggles to remediate these inequalities (Cantillon & Buysse, 2016; Iversen & Soskice, 2015) and even exacerbates inequality by supporting work-family reconciliation particularly for higher status households (Kil et al., 2018; Marx & Vandelannoote, 2014; Van Lancker, 2017; Van Lancker & Ghysels, 2012).

This study brings together multiple strands of literature. First, research on the educational gradient in fertility increasingly consists of multi-country contributions suggesting that economic and social policy development plays a role (Klesment et al., 2014; Puur et al., 2016; Van Bavel & Rozanska-Putek, 2010; Wood et al., 2014). This paper takes a regional perspective within a country, which benefits from the fact that our results are less likely to be driven by (unobserved) variation in national policies, national welfare state development and variation in educational classifications across countries. Second, influential reviews on the effects of work-family policies have called for varying effects by population subgroups (e.g. education) to be tested (Bártová & Emery, 2018; Gauthier, 2007; Neyer & Andersson, 2008) using detailed

longitudinal information on the local availability of such policies (Rindfuss et al., 2007). Third, literature on subnational fertility differences – such as urban-rural gaps – provides a fruitful set of mechanisms through which local opportunity structures, composition effects and selective migration influence fertility levels (Kulu, 2010; Kulu & Washbrook, 2014). These different components may also be instrumental in the study of educational gradients in fertility.

Exploiting uniquely detailed data for Belgium, this article shows that local opportunity structures are strongly related to the regional educational gradient in fertility. Whereas the role of ethnic composition and selective migration seems limited, controls for formal childcare coverage and wealth at the municipal level explain a considerable part of the variation. Regional childcare coverage positively associates to second birth hazards among highly educated groups in particular, whereas no association is found for low educated women (Neyer & Andersson, 2008; Wood et al., 2016). This result seems consistent with the growing body of literature indicating that highly educated groups to a higher extent benefit from work-family reconciliation programs (Cantillon & Buysse, 2016; Marx & Vandelannoote, 2014; Van Lancker & Ghysels, 2012). With respect to wealth at the municipal level, our results suggest that residing in a wealthy municipality is a stimulating factor for fertility among highly educated groups, whereas it is negatively associated to the transition to a second birth among low and medium level educated women. Highly educated women might perceive the high living standards and conformation to culturally entrenched norms of wealthy regions as a precondition to childbearing, and are also more likely to have the resources to maintain this standard of living. In contrast, low educated groups in wealthy municipalities possibly experience a stronger tension between the high costs of living and conforming to costly social norms on the one hand, and continued childbearing on the other (Dalla Zuanna, 2007). Belgium, but also other Western countries, exhibit considerable concentration of unemployment and poverty risks in low status households which among other factors is related to differences in housing tenures

and social investment policies geared towards the (higher-)middle class (Cantillon & Buysse, 2016; Iversen & Soskice, 2015; Kurz & Blossfeld, 2004).

We identify several limitations to this study and corresponding avenues for future research. First, this study highlights the explanatory power of local correlates of the educational gradient in fertility, but our analyses do not allow for a causal interpretation, nor does it shed light on the mechanisms through which the contextual factors – formal childcare and municipal wealth – affect educational gradients in fertility. Although the theoretical section of this article puts forward local opportunity structures and cultural milieus as potential pathways of association, a sharp distinction between both strands of explanation requires more detailed indicators (e.g. the cost of formal childcare or the local acceptance of childcare use). In addition, the available literature suggests that the understanding of the causality between demographic behavior and regional characteristics requires different research setups, such as (quasi-) natural experiments (Klüsener et al., 2013; Neyer & Andersson, 2008). Second, our focus on second order births is justified as the positive educational gradient in Belgian fertility is mostly driven by second births (Wood et al., 2014) and fertility variation among high-income countries is mainly shaped by variation in the transition to second births (Frejka, 2008; Frejka & Sobotka, 2008). However, it would definitely be interesting to expand this study to total fertility. As a result of differential fertility schedules and timing effects between educational groups, the assessment of first and third or higher order births requires a different and – in many respects – more complicated analytical strategy to estimate regional variation in differential birth hazard functions.

Using the Belgian vanguard case, this study provides additional support for the view that recent shifts in the relationship between educational attainment and fertility outcomes might indeed be linked to contextual conditions that are supportive of reconciling work and family. In this respect Belgium might serve as an example for countries in which work-family reconciliation policies are currently less developed. However this study also highlights the risk that such work-

family reconciliation policies might result in higher social polarization (see also (Kil et al., 2018; Marx & Vandelannoote, 2014; Van Lancker & Ghysels, 2012). One option to reduce social polarization effects of the existing family support might be to include elements of the more inclusive Scandinavian work-family policies. Sweden for instance exhibits a more equal distribution of the benefits of public childcare and universal parental leave benefits (Kil et al., 2018; Van Lancker & Ghysels, 2012). Such elements might be considered by policy-makers throughout the developed world in the design of inclusive work-family policies.

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Table 1: Exponentiated coefficients (odds-ratios) from mixed effects discrete-time hazard models of second births, 588 Belgian municipalities, 2002-2005

	Model 1		Model 2		Model 3		Model 4	
	e(b)	*sig.*	*e(b)*	*sig.*	*e(b)*	*sig.*	*e(b)*	*sig.*
				Micro characteristics				
Age at first birth								
. linear	1.014	***	1.015	***	1.015	***	1.016	***
. square	.999	***	.999	***	.999	***	.999	***
Years since first birth								
. the first year	.415	***	.416	***	.418	***	.386	***
. the second year	.817	***	.818	***	.821	***	.796	***
. linear	.736	***	.738	***	.738	***	.720	***
Education *(low is reference)*								
. medium	1.146	***	1.158	***	1.188	***	1.203	***
. high	2.081	***	2.118	***	2.160	***	2.169	***
Origin group *(Belgian is reference)*								
. Neighbouring country	.		.998		1.001		.998	
. Southern Europe	.		1.094	***	1.090	***	1.146	***
. Other European country	.		.847		.852		.861	
. Turkey or Morocco	.		1.837	***	1.818	***	1.858	***
. USA, Canada, Japan, Australia, New Zealand	.		.727		.727		.962	
. Other non-European country	.		1.283	***	1.281	***	1.416	***
				Micro-macro interactions				
Median income								
. median income – low edu.	.		.		.994	***	.994	***
. median income – medium edu.	.		.		.997	***	.997	***
. medium income – high edu.	.		.		1.002	***	1.002	*
Childcare coverage								
. childcare – low edu.	.		.		1.000		.998	
. childcare – medium edu.	.		.		1.003	**	1.002	
. childcare – high edu.	.		.		1.007	***	1.006	***
				Model parameters				
Number of person-months	*11,602,755*		*11,602,755*		*11,602,755*		*9,223,318*	
Number of municipalities	*588*		*588*		*588*		*588*	
-2LL	*548854.64*		*548314.18*		*548078.74*		336628.82	
Random intercepts for municipality by education								
Standard deviation (med. edu.)	*.1363*		*.1344*		*.1035*		*.0999*	
Standard devation (high edu.)	*.3164*		*.3121*		*.2052*		*.2008*	

Source: Belgian 2001 census & register data, calculations by authors

Significance levels: p < .05 (*), p < .01 (**), p < .001 (***)

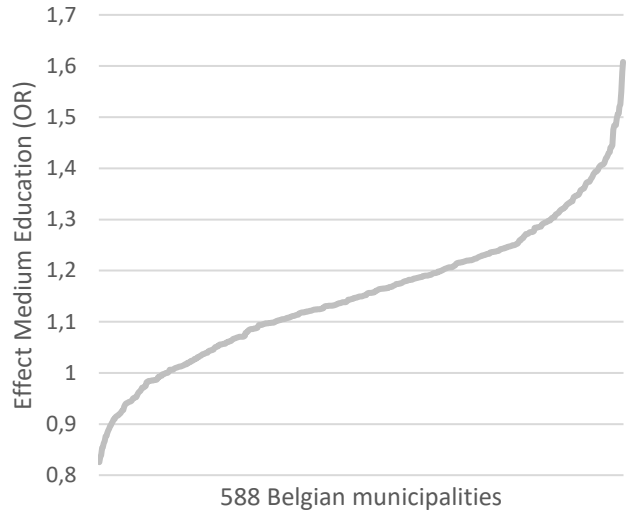
Table 2: Test for spatial autocorrelation for different spatial weight matrices, 588 Belgian municipalities, 2002-2005

Description	N	FOQ	NN3	NN4	NN5	NN6	NN7
Observed 2nd birth hazards and residuals							
Models 1-3 - Observed 2nd birth hazard	588	.606***	.605**	.616***	.595***	.594***	.584***
Model 4 - Observed 2nd birth hazard	588	.555***	.545***	.554***	.530***	.528***	.520***
Model 1 - Residuals 2nd birth hazard	588	.446***	.435***	.455***	.425***	.423***	.403***
Model 2 - Residuals 2nd birth hazard	588	.460***	.452***	.471***	.440***	.438***	.418***
Model 3 - Residuals 2nd birth hazard	588	.459***	.445***	.469***	.441***	.441***	.424***
Model 4 - Residuals 2nd birth hazard	588	.398***	.393***	.401***	.370***	.370***	.359***
Random intercepts							
Model 1 - Low education	588	.239***	.242***	.228***	.221***	.247***	.239***
Model 1 - Medium education	588	.244***	.247***	.244***	.232***	.232***	.221***
Model 1 - High education	588	.362***	.355***	.351***	.348***	.337***	.329***
Model 2 - Low education	588	.175***	.168***	.155***	.152***	.176***	.168***
Model 2 - Medium education	588	.238***	.229***	.234***	.223***	.224***	.214***
Model 2 - High education	588	.379***	.380***	.375***	.370***	.358***	.351***
Model 3 - Low education	588	.102***	.107***	.102***	.089***	.099***	.092***
Model 3 - Medium education	588	.200***	.198***	.203***	.185***	.184***	.176***
Model 3 - High education	588	.229***	.210***	.216***	.210***	.202***	.198***
Model 4 - Low education	588	.088***	.067*	.053*	.063**	.076***	.062**
Model 4 - Medium education	588	.176***	.150***	.152***	.143***	.148***	.148***
Model 4 - High education	588	.185***	.177***	.183***	.178***	.159***	.158***

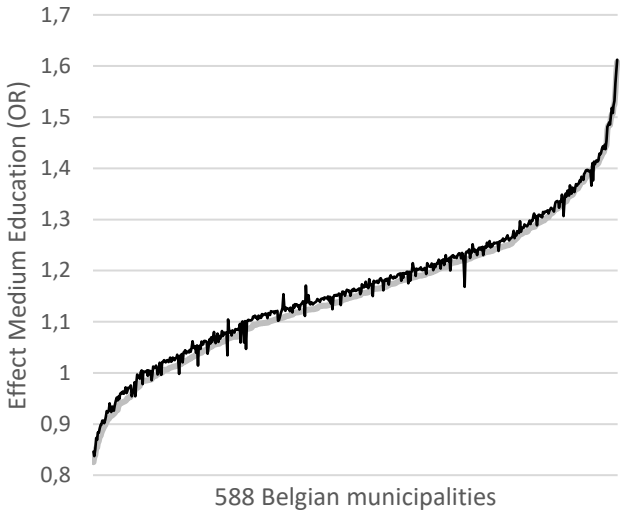
FOQ: First order queen adjacency, NNn: n-nearest neighbors
Source: Belgian 2001 census & register data, calculations by authors
Significance levels: p < .05 (*), p < .01 (**), p < .001 (***)

Fig. 1: Municipality-specific effects (odds-ratio) of medium level education (low education is reference) on 2nd birth hazards, 588 Belgian municipalities, 2002-2005

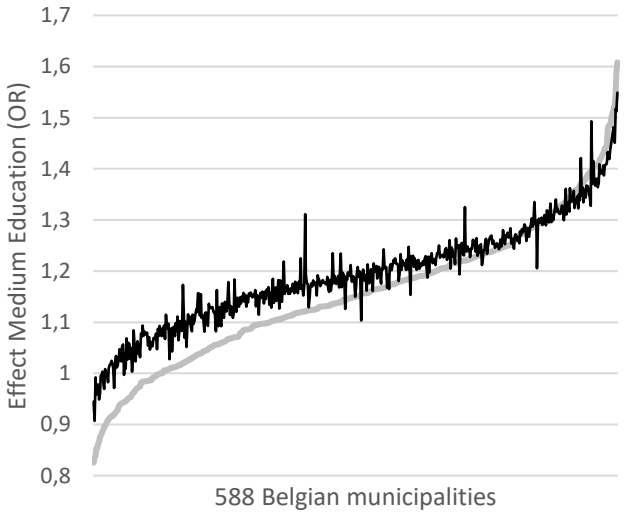
Model 1
Controlling for: Age at first birth, Years since first birth



Model 2
Controlling for: Age at first birth, Years since first birth, Origin group



Model 3
Controlling for: Age at first birth, Years since first birth, Origin group, Median income, Childcare coverage



Model 4
Controlling for: Age at first birth, Years since first birth, Origin group, Median income, Childcare coverage, selective migration

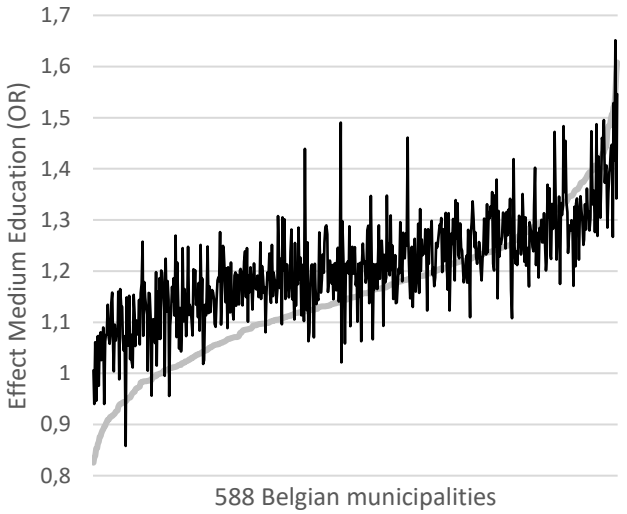
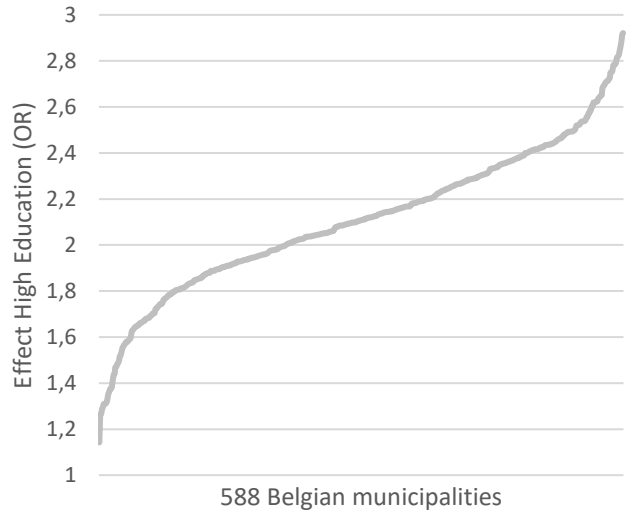
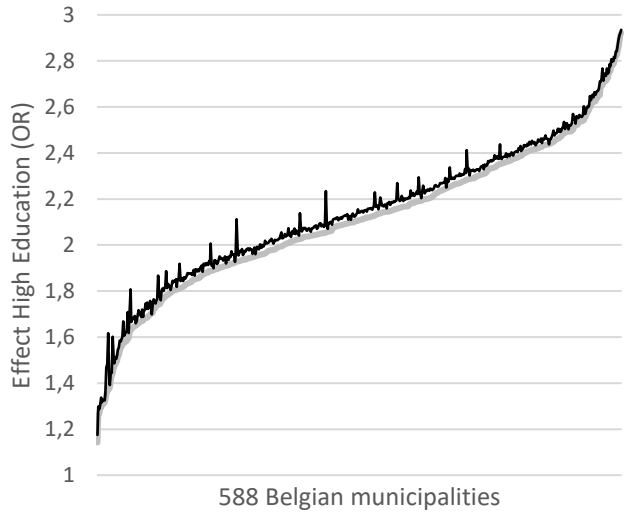


Fig. 2: Municipality-specific effects (odds-ratio) of high education (low education is reference) on 2nd birth hazards, 588 Belgian municipalities, 2002-2005

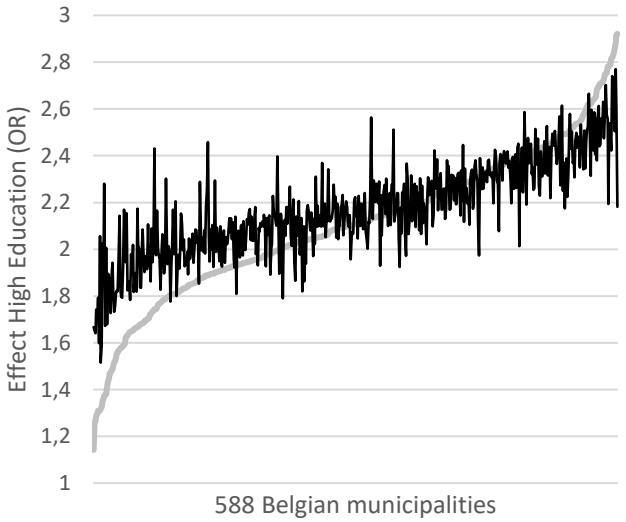
Model 1
Controlling for: Age at first birth, Years since first birth



Model 2
Controlling for: Age at first birth, Years since first birth, Origin group



Model 3
Controlling for: Age at first birth, Years since first birth, Origin group, Median income, Childcare coverage



Model 4
Controlling for: Age at first birth, Years since first birth, Origin group, Median income, Childcare coverage, selective migration

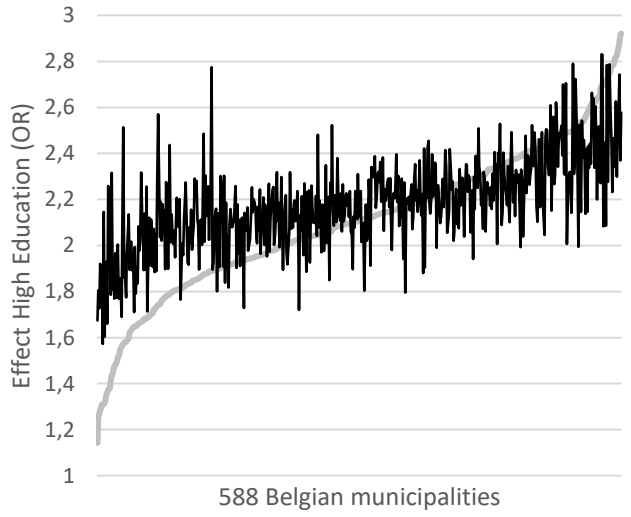
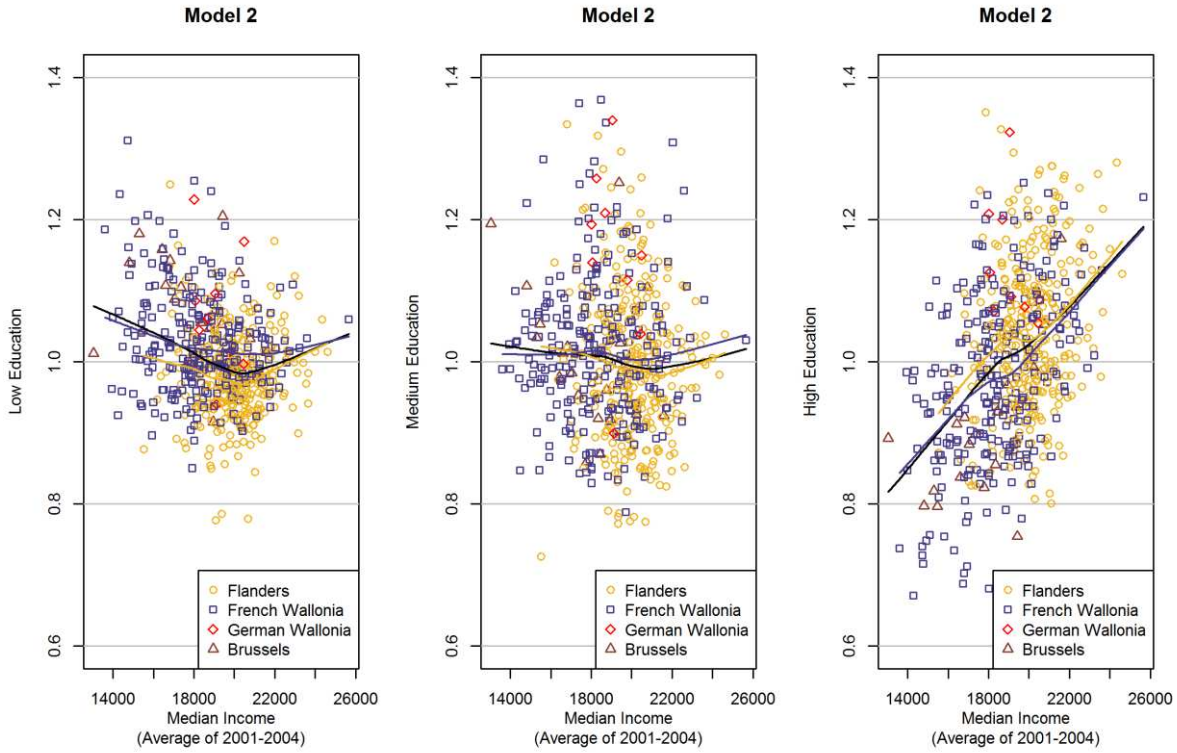
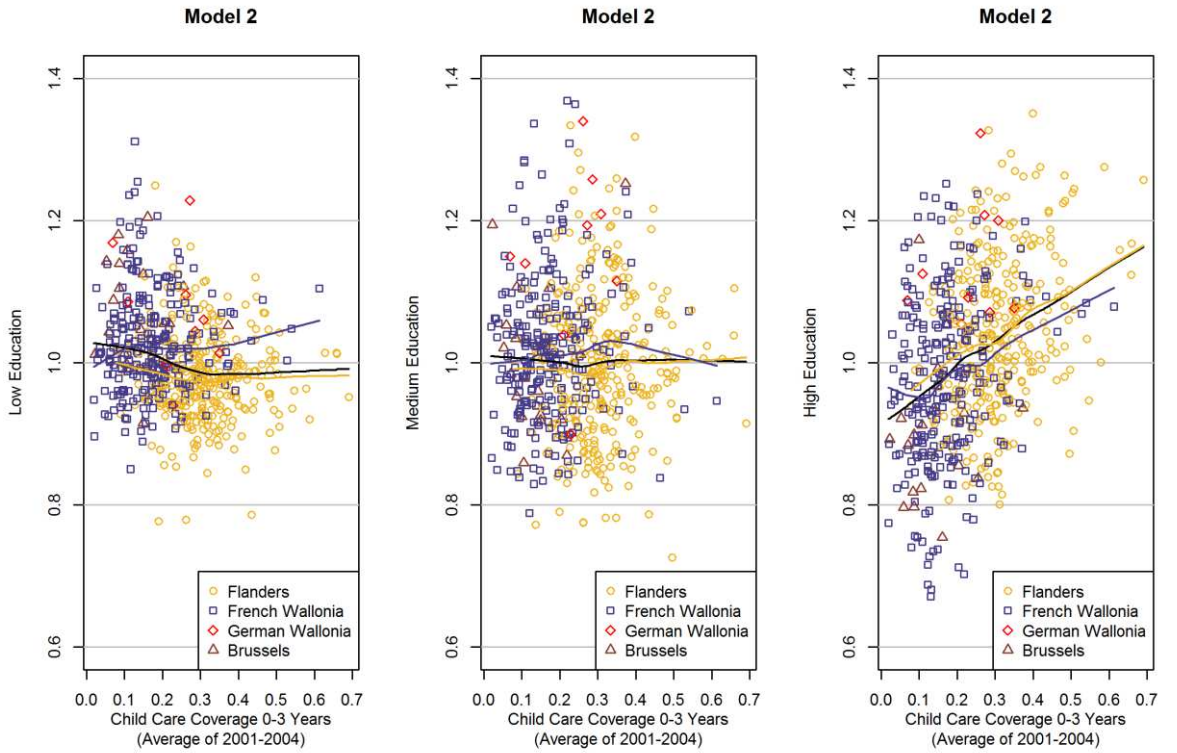


Fig. 3: Random effects by education and municipality (Model 2) on second birth hazards, by median income and childcare coverage at the municipal level, 588 Belgian municipalities, 2002-2005

A. Random effects by median income, smooth curve fitted by loess



B. Random effects by childcare coverage, smooth curve fitted by loess



SUPPLEMENTARY MATERIAL - Is a positive link between human development and fertility attainable? Insights from the Belgian vanguard case – SUPPLEMENTARY MATERIAL

Table 3: Test for spatial autocorrelation for different spatial weight matrices – consistency checks, 588 Belgian municipalities, 2002-2005

Description	N	FOQ	NN3	NN4	NN5	NN6	NN7
Observed 2nd birth hazards and residuals							
Models 1-3 - Observed 2nd birth hazard	38	.260**	.270*	.184*	.126	.125	.087
Model 4 - Observed 2nd birth hazard	38	.236**	.228*	.127	.105	.103	.085
Model 1 - Residuals 2nd birth hazard	38	.373***	.340**	.338***	.273***	.262***	.239***
Model 2 - Residuals 2nd birth hazard	38	.396***	.368***	.360***	.290***	.279***	.251***
Model 3 - Residuals 2nd birth hazard	38	.172*	.153	.123	.075	.073	.062
Model 4 - Residuals 2nd birth hazard	38	.079	.099	.036	-.004	.006	-.012
Random intercepts							
Model 1 - Low education	38	.322***	.297**	.265**	.193*	.217**	.222***
Model 1 - Medium education	38	.136	.158	.043	-.022	.010	-.008
Model 1 - High education	38	.399***	.409***	.373***	.326***	.302***	.261***
Model 2 - Low education	38	.444***	.401***	.391***	.333***	.346***	.318***
Model 2 - Medium education	38	.263**	.315**	.211*	.165*	.189**	.144*
Model 2 - High education	38	.387***	.397***	.365***	.321***	.298***	.264***
Model 3 - Low education	38	.294**	.163	.223*	.172*	.198**	.194**
Model 3 - Medium education	38	.239**	.280**	.183*	.140	.159*	.110
Model 3 - High education	38	.197*	.202*	.139	.128	.112	.097
Model 4 - Low education	38	.114	.105	.138	.085	.106	.081
Model 4 - Medium education	38	.169	.200	.123	.103	.124	.083
Model 4 - High education	38	.088	.113	.016	.008	.007	-.018

FOQ: First order queen adjacency, NNn: n-nearest neighbors
Source: Belgian 2001 census & register data, calculations by authors
Significance levels: p < .05 (*), p < .01 (**), p < .001 (***)