The emerging positive educational gradient in fertility in Belgium: A multi-level regional analysis of a vanguard country

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1. Background

There is increasing evidence for substantial shifts in the macro- and micro-level relationships between human development and fertility in some highly developed parts of the world (Esping-Andersen and Billari 2015). At the macro level, the cross-country correlation between female labour force participation and fertility has turned positive since the mid-1980s (Ahn and Mira 2002). Similarly, the negative relation between economic and social development seems to become positive for countries with advanced levels of human development (Myrskylä, Kohler et al. 2009). Such tendencies are not only observed between countries, but also across subnational regions of a growing number of highly developed countries (Fox, Klüsener et al. 2015). At the micro level, recent research provides growing evidence that the long-standing negative relation between women's socio-economic position and childbearing is as well subject to shifts (Kravdal and Rindfuss 2008, Matysiak and Vignoli 2008). In a few countries including Belgium, positive associations between tertiary education and higher order childbearing are found (Neels and De Wachter 2010, Wood, Neels et al. 2014, Sobotka, Beaujouan et al. 2015). In attempts to explain spatial and temporal variation in these shifts, researchers have considered varying economic, socio-cultural and policy contexts across the developed world (Brewster and Rindfuss 2000, Ahn and Mira 2002, Matysiak and Vignoli 2008). In addition to literature putting forward changing gender roles as one of the main driver of these changes (McDonald 2000, Esping-Andersen and Billari 2015, Goldscheider, Bernhardt et al. 2015), the rise of reconciliation and outsourcing policies, has also been suggested to be responsible (Brewster and Rindfuss 2000, Raz-Yurovich 2014).

Existing research shows that Belgium constitutes a (or even the) vanguard country in the above mentioned shifts in the relationship between fertility and development (Neels and De Wachter 2010; Sobotka, 2015). Despite being a densely populated country with high levels of economic development, Belgium reports cohort fertility rates close to replacement level and little variation in overall fertility outcomes across educational groups (Klüsener et al. 2013). Cohorts born in the 1960s exhibit a weak positive gradient in childlessness, a positive educational gradient in second births, and a U-shaped educational gradient pattern in the progression to third births (Wood and Neels 2014). In this regard they differ from cohorts born in earlier decades which reported a negative educational gradient (Neels and De Wachter 2010). It has been argued, that these recent developments might be related to the fact that Belgium is a forerunner in implementing family and labour market policies supporting the reconciliation of family and career goals (Neels and De Wachter 2010, Klüsener, Neels et al. 2013, Raz-Yurovich 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 highly developed societies which are still confronted with a substantial gap between the number of intended and realized children particularly among the higher educated (Testa 2012). As Belgium's family and labour 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 (liberal, corporatist, conservative).

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This study aims to improve our understanding of the Belgian vanguard case by taking a close look at the compositional and regional dimensions of variation in the educational gradient in fertility outcomes. In this regional approach, we benefit from the fact that Belgium exhibits strong regional variation in economic and socio-cultural conditions and social services. Available literature shows that the study of regional contextual effects on fertility behavior is mostly hampered by the lack of appropriate data (Rindfuss, Guilkey et al. 2007). This study uses a unique dataset of all women legally residing in Belgium between 2002-2005 combined with municipality-level data on income and social services.

2. Data and methods

The 2001 Belgian census provides detailed information of all individuals legally residing in the country, including fertility histories, employment status, education, nationality and marital status. At the level of households, the 2001 census offers detailed information on household composition (Van Imhoff & Keilman 1991; Deboosere & Willaert 2004). The individual microdata from the 2001 census have been linked to data from the National Register, which provides information on changes in household composition in the period 2002-2005. The prospective research design of the linked census and register data allows to estimate the effect of covariates available in the 2001 census on family formation in the subsequent 4-year period. We combine the microdata with contextual-level information at the level of the Belgian municipalities (N=579[2]). This includes data on median income, perceived quality of neighbourhood facilities and childcare coverage. Median income is measured in Euros per year and is derived from tax returns. The perceived quality of neighbourhood facilities is estimated using factor analysis on the 2001 census for eight indicators[3]. Childcare coverage equals the amount of places as a per cent of the population aged 0-3 in a given municipality and is provided by regional childcare offices.

We estimate mixed effects discrete-time event history models of first, second and third birth hazards for women. Due to space limitations this abstract is limited to second births. After excluding women who declared to be in education in 2001 and first generation migrants, our subset consists of 445,967 women aged 15-49 (1,381,642 person-years) at risk of a second birth between 2002 and 2005. In the fixed part of the model, we control for the following micro-level characteristics: (i) age at first birth, (ii) years since first birth, (iii) education in 2001, (iv) household position in 2001, (v) employment status in 2001, (vi) origin group. *Age at first birth* is included as a quadratic function to account for the lower second birth odds among mothers who entered motherhood at relatively low or high ages. With respect to years since the first birth, dummies for the first three years are included in addition to a quadratic function. Model tests indicate that this specification yields a better approximation of the observed second birth hazard functions compared to polynomial specifications. *Education* distinguishes low education (all levels below higher secondary education) from medium education (higher secondary education) and high education (all post-secondary levels of education). Deviations from the observed baseline hazard function for different educational groups are very limited. Hence no interaction between education and second birth schedules is included. *Household position* distinguishes five categories: married (reference), living with parents, single, cohabiting, other. *Employment status* differentiates employed women (reference) from unemployed women, inactive women, or women with another or unknown employment status. Finally, *origin group* distinguishes women with a Belgian background (reference) from women with a neighbouring country background (UK, FR, NL, LU, DE), Southern European background, other European background, Turkish or

[2] Ten of the 589 municipalities are excluded due to missing data. The excluded municipalities are with one exception all belonging to the German-language community.

[3] Including items: How do you rate your neighborhood in terms of: (I) Public transport, (II) Shops, (III) Health care services, (IV) Administrative services, (V) Practitioner other than medical, (VI) Social services, schools, (VII) Nurseries and daycare centers, (VIII) Culture and recreation.

Moroccan origin, women with a background from a short list of non-European highly developed countries (US, CA, JA, AUS, NZ), and women with a background from another non-European country. These distinctions are made based on the nationality at birth of both parents. In addition to the aforementioned micro-level characteristics, median income (one-year time lag), perceived quality of facilities (in 2001) and childcare coverage (one-year time lag) are included at the municipality level.

In addition to the fixed effects, a random term is included for every combination of municipality and education. This entails (579*3) 1737 deviations from the main intercept which allow for municipality-specific educational gradients[4] 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 fertility. Whereas model 1 only includes age at first birth, years since the first birth and education, model 2 adds micro-level socio-demographic characteristics; household position, employment status, and origin group. Model 3 additionally includes median income, perceived quality of neighbourhood facilities and childcare coverage as measures of social and economic development at the municipal level. Finally, cross-level interactions between the aforementioned municipal characteristics on the one hand and education at the micro-level on the other are included in model 4.

3. Findings

3.1 Regional variation in social and economic development

The 579 Belgian municipalities studied in this paper exhibit considerable variation in income and social services. Figure 1 shows below average median income levels occur alongside the French border, but also in some other Southern areas (e.g. many municipalities in the Liège/Luik area). In addition, we find considerable variation in social services. Figure 2 shows that the perceived quality of social services is typically lower in cities. Whereas in the Northern part of Belgium the cities are relatively dispersed, the major cities in the Southern part form a belt of low perceived quality of social services. Finally, childcare coverage (Figure 3) is lowest in the La Louvière, Charleroi, and Verviers area.

3.2 Multivariate results

The first model (Model 1, Table 1) indicates that, compared to low educated mothers, the odds to progress to a second birth for medium level and highly educated mothers are respectively ((1.182-1)*100) 18.2 and ((2.262-1)*100) 126.2 per cent higher. Highly educated mothers display (((2.262/1.182)-1)*100) 91.4 per cent higher second birth odds compared to medium level educated women. Hence second births in Belgium between 2002 and 2005 are characterized by a positive educational gradient. This positive effect of education on second birth odds is not due to differences in second birth timing since second birth hazard functions are found to be very similar across educational groups. The random part of the model is illustrated by Figure 4.1 and 5.1. Figure 4.1 shows differential effects of medium (versus low) education for the 579 municipalities. Considerable deviation from the general effect of 1.182 is found. The municipality-level variation in the effect of high (versus medium) education is even greater. Whereas the general effect is 1.914, the weakest municipality-specific effect approximates (1.914*0.5) 0.957 and the strongest effect approximates (1.914*1.8) 3.445.

Subsequently, we add micro-level socio-demographic variables to the model (Model 2, Table 1). Mothers who are married in 2001 exhibit the highest odds of progressing to a second birth. Similarly, mothers who are employed in 2001 show higher second birth odds compared to unemployed mothers, inactive mothers, or mothers with another or unknown employment status. Finally, significant differences in second birth odds are found between different origin groups. Although the standard deviation of the effect of medium versus low educated women has decreased from .156 to .133 (Table 2), Figure 4.2 shows that the geographical variation in the effect of medium education on second birth

[4] Models including a random intercept for the 579 municipalities and random slopes for medium and high education for the 579 municipalities yield similar results. Since the estimation procedure is more efficient, we report models including 579*3 random intercepts.

hazards remains relatively similar. With respect to the effect of high education, a similar conclusion is reached. The standard deviation decreases from .187 to .168, but figure 5.2 resembles Figure 5.1.

Next, the municipality-level indicators for social and economic development are included. High income municipalities display lower second birth odds, whereas higher perceived quality of social services and higher childcare coverage are related to higher second birth odds. A difference in median income of 5000 Euros, which is routinely found between municipalities, is linked to a (1-(.998^50)) 9.5 per cent difference in second birth odds. Similarly, a one point difference in the factor score of perceived quality of social services is associated to a 7.4 per cent higher second birth odds, and a 25 per cent difference in childcare coverage is related to a ((1.002^25)-1) 5 per cent difference in second birth odds. However, Figures 4.3 and 5.3 indicate that the geographical variation in the effect of education on second birth hazards remains relatively similar when controlling for municipality-level income and social services.

Finally, cross-level interactions between municipality-level characteristics and education are included (Model 4, Table 1). This inclusion indicates that the aforementioned effects of municipality-level conditions mask varying effects by educational groups. Whereas for low and medium level educated mothers, a negative relation between income at the municipality level and second births odds is found, this is not the case for highly educated mothers. With respect to social services, it is clear that second births are positively associated with perceived quality of social services and childcare coverage particularly for the highly educated mothers. For this group a one point difference in the factor score of perceived quality of social services is related to a 10.9 per cent higher second birth odds, and a 25 per cent difference in childcare coverage is linked to a ((1.006^25)-1) 16 per cent difference in second birth odds. Although Figure 4.4 differs considerably from Figure 4.1, the decline in standard deviation (from .121 to .091) is similar to the decline in previous models. By contrast, the differential effects of high education for the 579 municipalities have weakened considerably when controlling for the education-specific effects of income and social services.

4. Conclusion and outlook

Although, from a cross-national perspective, Belgium can be considered to be a vanguard country with a positive educational gradient in second births (Neels and De Wachter 2010, Wood, Neels et al. 2014), this research indicates that this positive gradient in fertility varies considerably across different regions. Similarly, whereas cross-national studies present Belgium as a highly economically developed country with a long history in labour market and family policy geared towards work-family reconciliation, this paper indicates strong variation in economic conditions and social services across the country. Exploiting this subnational variation, our first results indicate that the educational gradient in second births is related to municipality-level contextual differences. This suggests that different socio-economic groups interact differently with contextual characteristics in their decision to have another birth. The need to consider population heterogeneity in the assessment of contextual effects on fertility behaviour has been repeatedly advocated (Gauthier 2007), however to our knowledge this study is among the first to implement this approach using highly detailed data.

Three fruitful avenues for future research are identified. First, we will integrate the results for first, second and third births in order to provide a more comprehensive account of the educational gradient in fertility in Belgium. Second, we will continue to test and compare various model specifications, including both fixed-effect models (conditional logit models) and random effect models (Rabe-Hesketh and Skrondal 2006, Allison 2009). Finally, various tests for spatial autocorrelation will be performed to test the robustness of our findings.

APPENDIX: Tables and Figures

Figure 1: Median income 2001-2004, Euro per year, 579 municipalities, 17 urban influence areas

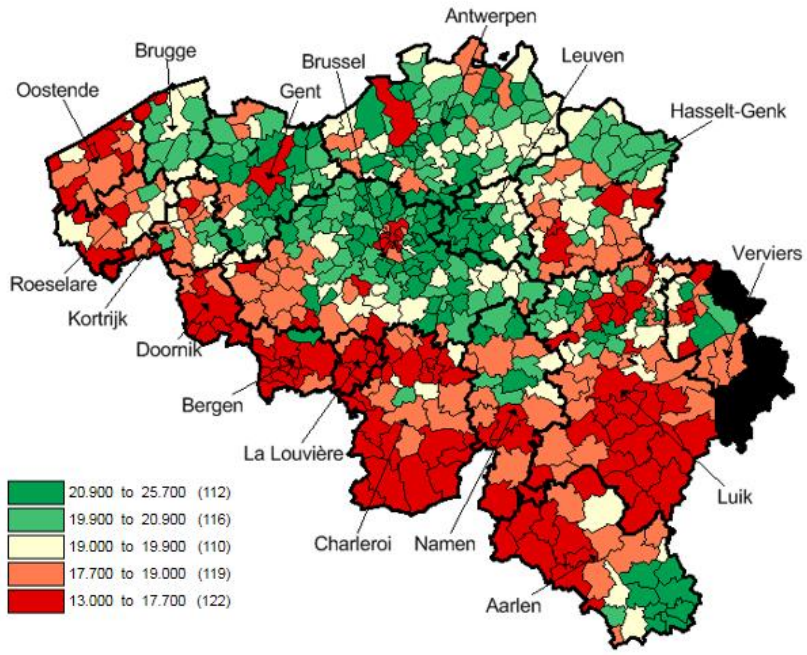


Figure 2: Perceived quality of neighbourhood facilities in 2001, factor score, 579 municipalities, 17 urban influence areas

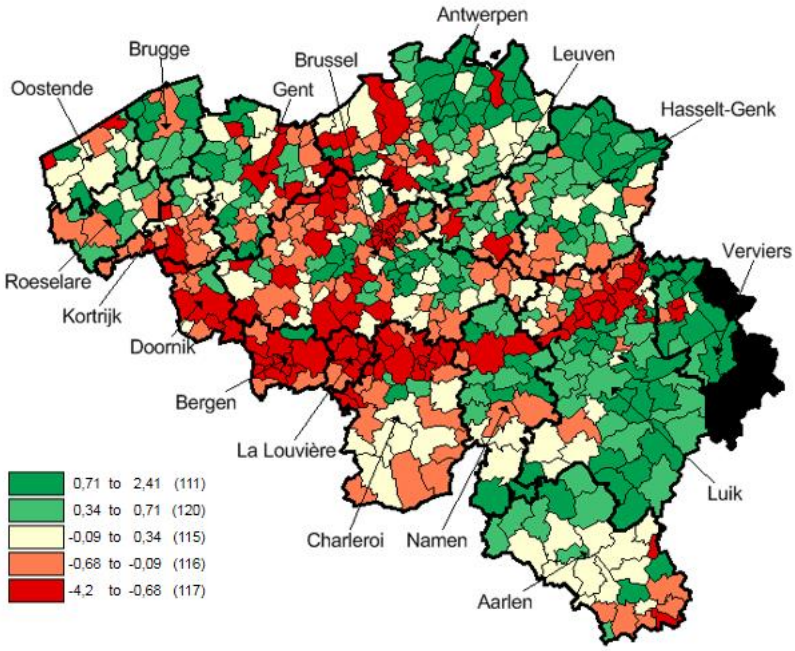


Figure 3: Childcare coverage (2003), as a per cent of the population age 0-3, 579 municipalities, 17 urban influence areas

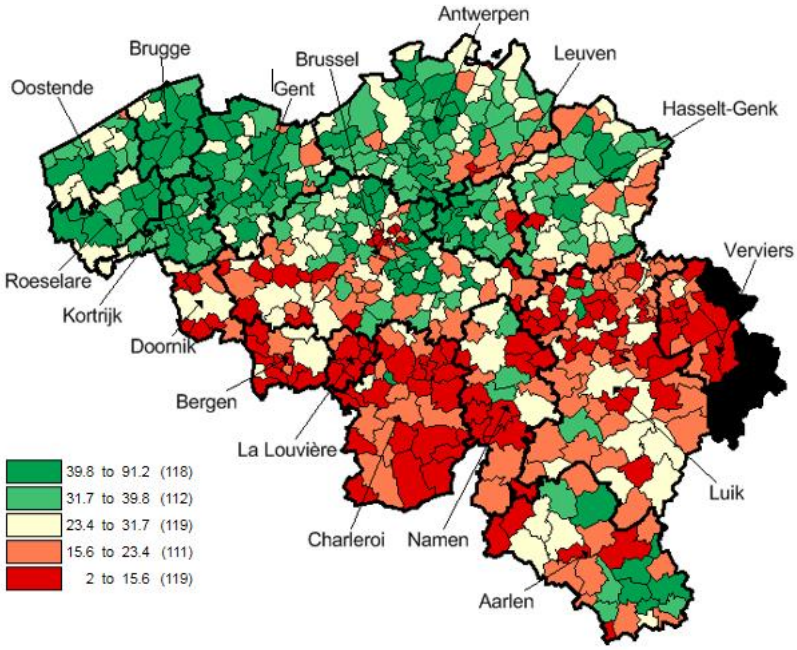


Table 2 Exponentiated coefficients (odds-ratios) from mixed effects logit models of second births.

	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	1.145	***	1.015		1.013		1.015	
. square	.996	***	.998	***	.998	***	.998	***
Years since first birth								
. first year	.157	***	.145	***	.145	***	.145	***
.second year	.908	***	.843	***	.844	***	.843	***
. third year	1.249	***	1.187	***	1.188	***	1.188	***
. linear	.629	***	.675	***	.675	***	.675	***
. square	1.003	***	1.003	***	1.003	***	1.003	***
Education *(low is reference)*								
. medium	1.182	***	1.117	***	1.103	***	1.015	
. high	2.262	***	2.054	***	2.026	***	.935	
Household position *(married is reference)*								
. living with parents	.		.589	***	.587	***	.589	***
. single	.		.596	***	.599	***	.600	***
. cohabiting	.		.354	***	.355	***	.356	***
. other	.		.626	***	.625	***	.626	***
Employment status *(employed is reference)*								
. unemployed	.		.950	***	.956	***	.948	***
. inactive	.		.935	***	.939	***	.934	***
. other	.		.992		.998		.985	
Origin group *(Belgian is reference)*								
. Neighbouring country	.		1.034		1.040		1.039	
. Southern Europe	.		.927	***	.945	**	.939	**
. Other European country	.		.851	*	.861		.860	
. Turkish or Moroccan	.		1.257	***	1.280	***	1.271	***
. US, CA, JA, AUS, NZ	.		1.468		1.475		1.475	
. Other non-European country	.		1.157	**	1.176	**	1.177	**
				Macro characteristics				
Median income								
. Median income by 100 EUR	.		.		.998	***	.	
Perceived quality facilities								
. Factor score	.		.		1.074	***	.	
Childcare coverage								
. % of population 0-3	.		.		1.002	***	.	
				Micro-macro interactions				
Median income								
. median income – low edu.	.		.		.		.997	***
. median income – medium edu.	.		.		.		.997	***
. medium income – high edu.	.		.		.		1.000	
Perceived quality facilities								
. perceived quality – low edu.	.		.		.		1.000	
. perceived quality – medium edu.	.		.		.		1.080	***
. perceived quality – high edu.	.		.		.		1.109	***
Childcare coverage								
. childcare – low edu.	.		.		.		.996	***
. childcare – medium edu.	.		.		.		1.000	
. childcare – high edu.	.		.		.		1.006	***
				Model parameters				
Number of person-years	*1,381,642*		*1,381,642*		*1,381,642*		*1,381,642*	
Number of persons	*445,967*		*445,967*		*445,967*		*445,967*	
Number of municipalities	*579*		*579*		*579*		*579*	
-2LL	*539671.28*		*528189.90*		*528074.42*		527825.56	
df	*10*		*23*		*26*		32	
Random intercepts for municipality by education								
. STDEV(low)	*.104*		*.093*		*.095*		*.058*	
. STDEV(medium)	*.141*		*.121*		*.113*		*.088*	
. STDEV(high)	*.181*		*.151*		*.134*		*.099*	
. STDEV(medium versus low)	*.156*		*.133*		*.121*		*.091*	
. STDEV(high versus medium)	*.187*		*.168*		*.161*		*.113*	

Source: Belgian 2001 census & register data, calculations by authors
Significance levels: NS (-), p < .05 (*), p < .01 (**), p < .001 (***)

Figure 4: Differential effects (odds-ratios) of medium education (versus low education) on second birth hazards for 579 municipalities

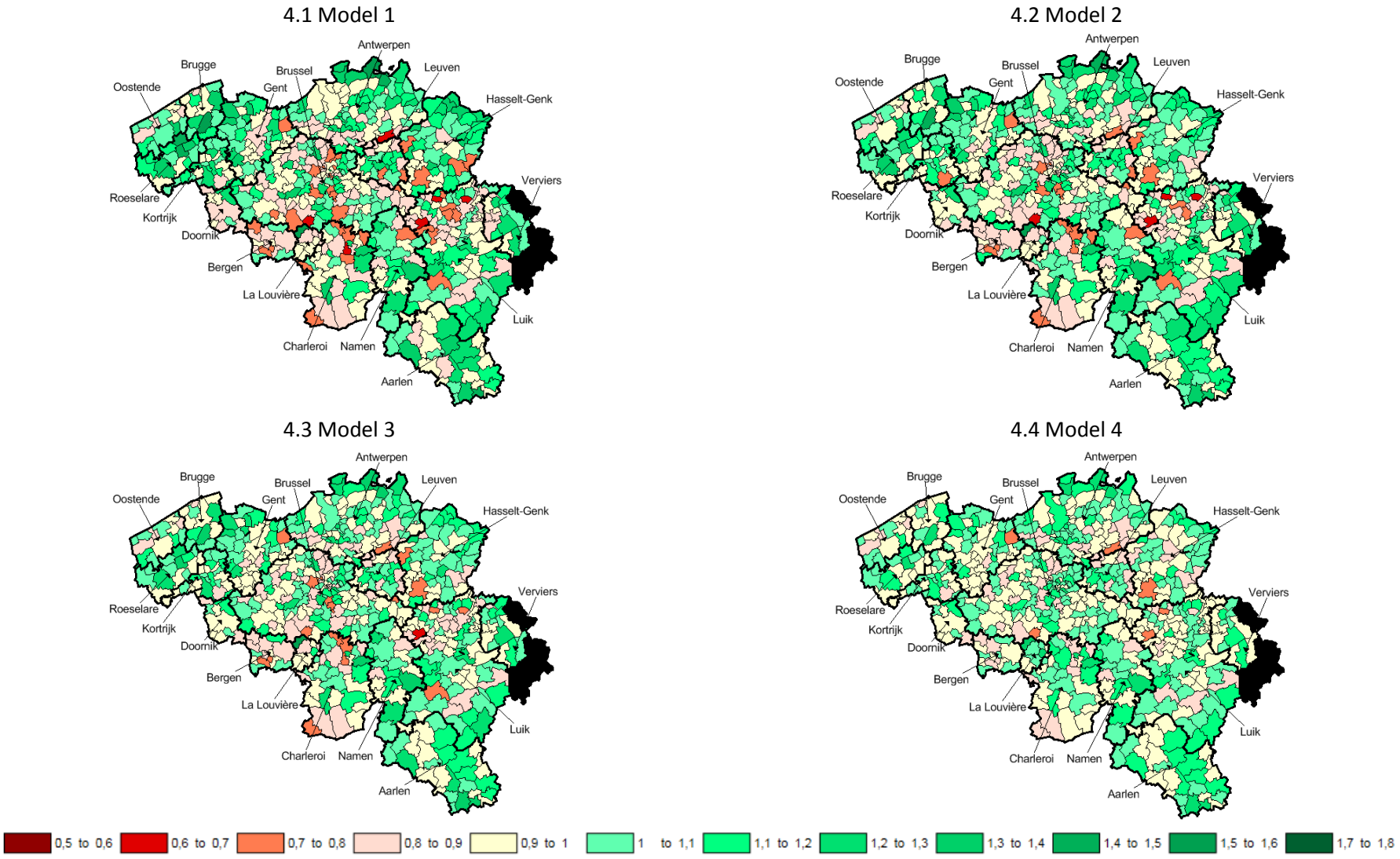
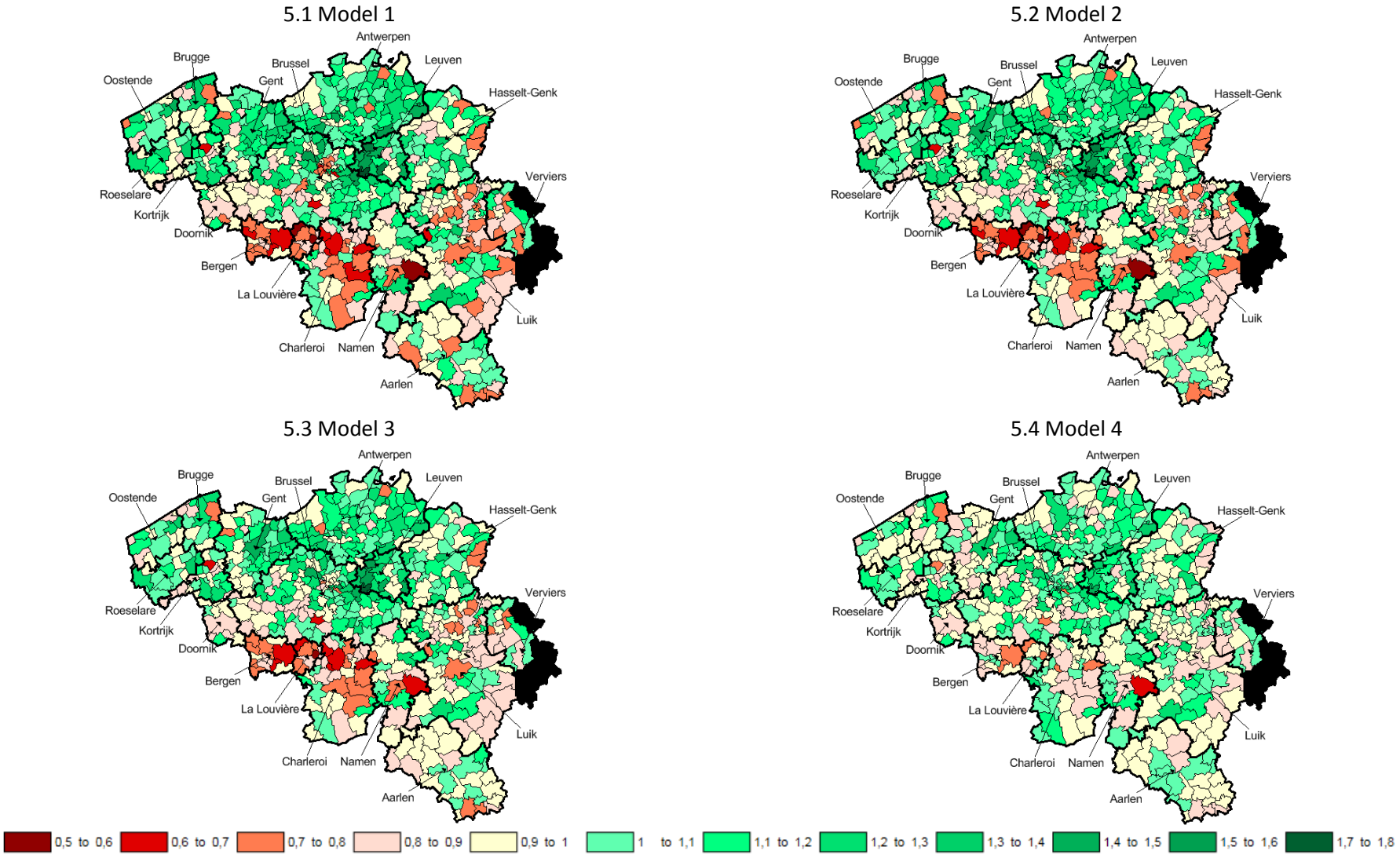


Figure 5: Differential effects (odds-ratios) of high education (versus medium education) on second birth hazards for 579 municipalities



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