Temporal variation in unemployment rates and their association with tempo and quantum of fertility: some evidence for Belgium, France and the Netherlands[1].

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ABSTRACT

The economic recession that recently manifested itself on a global scale raises interest on the effect of economic context on fertility. This paper investigates the effect of unemployment on age-specific first birth hazards. The focus is on period-induced reduction of birth hazards at younger ages and on possible recuperation mechanisms where births postponed due to adverse period conditions are recuperated later in life. As economic context is likely to differentially affect socio-economic groups, the analysis is stratified by level of education. This allows to control effectively for the expansion of educational attainment among recent births cohorts and its effect on timing of fertility. Results for Belgium indicate that unemployment has adversely affected birth hazards at younger ages in all socio-economic groups between 1960 and 2000. However, higher educated women have been more successful in overcoming adverse period conditions afterwards. Results for Belgium are compared to those of similar analyses for France and the Netherlands.

[1] This paper was prepared for the session on 'low fertility and its association with macro-economic trends' of the annual meeting of the Population Association of America in 2010. Several persons have contributed to the paper by providing contextual data on unemployment rates. I would like to thank Tim Van Rie *(Centrum Sociaal Beleid)* who has been most helpful in documenting time-series of unemployment rates in Belgium since the late 1940s; Arnaud Régnier Loilier *(Institut National Etudes Démographiques, INED)* for providing additional data on unemployment in France and Helga De Valk *(Interface Demography)* for pointing out some useful sources of unemployment data for the Netherlands.

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1. INTRODUCTION

Economic recession, postponement and recuperation

The economic recession that recently manifested itself on a global scale raises interest on the effect of such variations in economic context on demographic behavior. As a result of the recession, economic growth has slowed down, unemployment levels have risen sharply and in doing so have affected the income position of many households. The question addressed in this paper is whether variations in economic context are likely to affect fertility behavior and fertility levels. In a period of adverse economic conditions, it seems plausible that an increasing number of households put the decision to have a(nother) child on hold. This could be the case when a household is actually confronted the loss of income (i.e. unemployment at the individual level), but could also occur when one or more household members face the threat of being laid off and thus consider the loss of income as a possible or even plausible course of events in the near future. In the latter case there is no experience of unemployment at the individual or household level, but the variation of unemployment rates at the aggregate level rather serves as an indicator of the economic uncertainty that individuals face and that affects their demographic decision-making. The idea of period-induced fertility postponement raises in turn raises questions whether and to what extent these births forgone during periods of adverse economic conditions are caught up later in life, and, whether i) recuperation of fertility is primarily determined by the prevailing economic conditions in that stage of the life cycle or whether ii) births are recuperated regardless of the economic conditions faced at that time. In the first scenario period effects such as economic conditions shape both tempo (postponement) and quantum (recuperation) of fertility, whereas in the second scenario period circumstances determine the age when women have their child(ren), but have limited effect on the quantum of fertility.

Measuring effects on tempo versus quantum

The discussion on the effect of economic context on fertility – coined in terms of fertility postponement and the possible recuperation of births subsequently - is closely associated with the discussion on tempo and quantum of fertility. The last decades have witnessed an increasing number of studies addressing precisely this issue. Increasing availability of maternity history data has fostered the calculation of more sophisticated measures such as synthetic parity progression ratios (Feeney and Yu 1987; Ní Brolcháin 1992), but particularly the recent introduction of tempo-adjusted fertility measures has

drawn attention to bias in period measures by explicitly addressing the effect of changes in the timing or tempo of childbearing on period measurement of fertility levels or quantum (Bongaarts and Feeney 1998). Although both types of measures are routinely introduced as more robust alternatives to conventional measures such as the period total fertility rate, the rationale behind these measures is quite different. Whereas synthetic parity progression ratios merely present an improvement over the conventional PTFR by standardizing age- or duration-specific fertility rates over subsequent years for period variations in the parity distribution of the (female) population, the tempo-adjusted measures actually introduce an adjustment that corrects for the deflating or inflating effect of observed changes in the timing of fertility. Although synthetic parity progression ratios and particularly tempo-adjusted measures thus both control/adjust for the disturbing effect of changes in the timing of childbearing when making inferences about the quantum of fertility based on age- and/or duration-specific fertility rates observed in some period, both types of measures are ill-suited to investigate the effects of economic context on fertility postponement and recuperation. Whereas proponents of the synthetic parity progression framework argue that cohort effects can safely be ignored (Ní Brolcháin 1992), the rationale behind tempo-adjusted fertility measures explicitly precludes the possibility of cohort effects affecting fertility (Bongaarts and Feeney 1998). This paper takes a different approach. In order to map the short-term and long-term effects of economic recession on fertility, we use birth hazard models to investigate whether and to what extent age-specific first birth hazards are a function of economic circumstances i) in the preceding year (cfr. postponement), and ii) economic circumstances in a more distant past (cfr. recuperation). Because the interest is on recession-induced postponement of fertility at younger ages and on possible recuperation of these postponed births later in life, economic context is thus introduced into the analysis using different time-lags and the effects are moreover allowed to vary by age.

Increasing educational attainment as a confounding factor

Apart from methodological issues on the measurement of postponement and recuperation, the secular rise in educational levels over the last few decades also has repercussions for the analysis of economic effects on fertility behavior. This affects the analysis in a number of ways. First, the prolongation of educational careers of women is an important factor in accounting for the rise in mean ages at childbearing. For Belgium, analysis based on the 2001 census demonstrates that 75 per cent of the increase in

MAC1 since the early 1970s is due to increasing educational attainment of women born after 1950 (Neels 2009). In the analysis there is thus clearly a concern to discern variations in tempo induced by economic conditions from secular changes in the tempo of fertility due to increasing educational attainment. Second, although education should clearly be taken into account in birth hazard models that investigate the effect of economic context, the shape of age-specific first birth hazard functions is fundamentally different depending on the educational level considered. Birth hazards of women with tertiary education are typically low under age 25, whereas birth hazards are already substantial at that age among women having lower levels of education. Conversely, the birth hazard function of higher educated women generally reaches a peak in the late 20s or even round age 30 when birth hazard of lower educated women are already declining. Clearly, an additive specification for the effect of education on first birth hazards – although routinely implemented in many analyses – is largely insufficient to control for increasing educational attainment as birth hazard functions are allowed to vary in level, but are at the same time constrained to have the same general shape. For first births, an additive effect of education on age-specific birth hazards thus amounts to a misspecification of the education-effect altogether. Although this problem can be accommodated by introducing interaction terms between educational attainment and the baseline hazard function, there are additional substantial concerns that warrant attention. Third, because educational attainment is intimately related to opportunities and positions on the labour market, women (and men) with different levels of education are likely to be differentially affected by variations in economic context. Moreover, such socio-economic differentials may emerge in terms of i) variation in period-induced postponement of births, ii) variation in the ability to recuperate forgone fertility subsequently or iii) variation in both postponement and recuperation. Fourth and finally, in a recent review of the literature on the effects of policy on fertility behavior, Gauthier draws attention to the fact that conventional (additive) statistical controls for factors such as education are unlikely to suffice in analyses of fertility trends as socio-economic groups have been shown to respond differently to (changes) in family policies (Gauthier 2007). Literature on family policy suggests that for instance childcare arrangements – despite becoming increasingly available in a number of countries during the period considered here - may have had a differential impact on fertility behavior different socio-economic groups because of 'Matthew'-effects in access to such amenities. As a result of methodological and substantial concerns related to the effect of educational attainment on first

births hazards, the analyses on the effect of economic recession on postponement and recuperation have been stratified by level of education. Apart from eliminating the need for complex interaction terms, stratification at the same time has the benefit of allowing socio-economic differentials in postponement and recuperation of fertility to emerge in response to variations in economic and/or policy context.

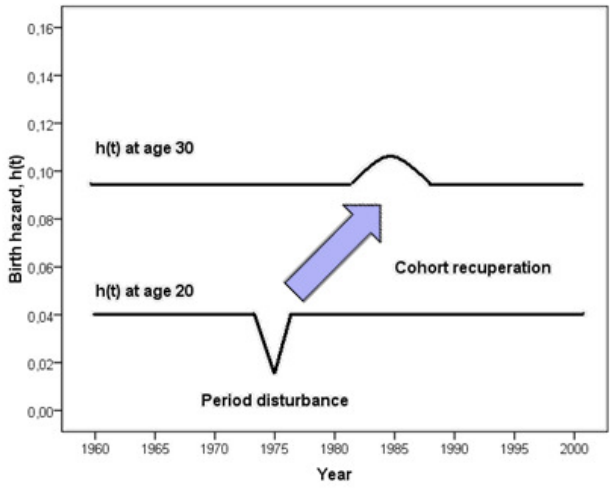
2. RESEARCH QUESTIONS

The analysis into the effect of economic context is limited to first births and focuses on the variations in the annual unemployment rate as a proxy of the effect of economic context. To allow sufficient variation in unemployment rates, the analysis covers the observation period between 1960 and 2004. With these limitations in mind, the research questions can be detailed as follows:

1. *Does economic context adversely affect fertility levels? More specifically, are first birth hazards of all age groups affected or is the effect more pronounced among younger age groups?* To answer these questions first birth hazards between 1960 and 2004 are analyzed as a function of unemployment levels in the preceding year (i.e. unemployment rate is lagged by one year) and the effect of unemployment is allowed to vary by age (i.e. interaction-effects between the lagged unemployment rate and 5-year age-groups are included in the hazard models to investigate the age-structure of the unemployment effect).
2. *Is there empirical support for cohort effects in the sense that the negative effect of economic context on birth hazards at younger ages is offset by increasing fertility at older ages, net of prevailing economic conditions at older ages?* This question is answered by i) introducing unemployment rate in considerably larger lags into the hazard models and ii) reconstruction of cohort parity progression ratios. In the hazard models, first birth hazards are analyzed in function of unemployment levels 10 years earlier, net of contemporary unemployment levels. If recuperation does take place, we expect it to take place at older ages. This implies that the hazard model should again allow interaction effects, this time between the age of women and past unemployment levels on first birth hazards. Whereas postponement of first birth is expected to be clearly located in time in response to adverse period conditions, we assume recuperation to take place gradually over a more extended period of time. For the hazard models this implies that we expect unemployment levels in the preceding

year to exert a clearly articulated negative effect on first birth hazards, whereas positive effects of past unemployment rates associated with recuperation are expected to be smaller and last for an extended period of time (see figure 3). Although a time lag of 10 years allows to illustrate cohort-recuperation effects, the chosen lag is in essence largely arbitrary and does not allow to assess the *cumulative* amount of recuperation that takes place over subsequent years. For this reason, period variations in unemployment rates are compared to lagged cohort parity progression rations where the latter provide a more encompassing assessment of the amount of recuperation that has been taking place.

Figure 1. Period induced postponement and subsequent recuperation of fertility: potential effects on first birth hazard functions



3. *Is there evidence that socio-economic groups respond differently to variations in economic context? If so, are socio-economic differentials more articulated with respect to postponement or with respect to recuperation?* This question is answered by stratifying the analyses in the preceding two points by level of education. This of course amounts to the implicit adoption of interaction by socio-economic group in the analysis of both postponement and recuperation effects.

3. DATA & METHODS

The analysis uses data from the 2001 census (SES2001) for Belgium and data from the first round of the Generations & Gender Surveys (GGS) for France and the Netherlands. Both the census and the GGS provide maternity histories that allow retrospective estimation of first birth hazards between 1960 and 2004. The results of the validation of fertility data in the SES and GGS against vital registration data are included in appendix.

Data Sources

In line with the Belgian census tradition, the SES2001 contains the maternity histories of all women aged 14 and older who resided in *Belgium* at the time of the census. More specifically the SES2001 provides the year of each live-birth up to the 12th child. The retrospective nature of these data allows us to reconstruct birth hazards retrospectively between 1960 and 2000, a period characterized by substantial variations in economic context and unemployment rates. As the SES2001 does not provide data on fertility of male respondents, the analysis for Belgium is necessarily restricted to women.

The analysis for *France* uses data from the first wave of the French GGS or *'Étude des Relations Familiales et Intergenerationelles (ERFI)'* conducted by INED and INSEE in 2005 (N=10079). Using data from the household roster and the module on children, fertility histories were reconstructed for both male and female respondents. The results for France use data on the year of birth of biological children of respondents.

The analysis for the *Netherlands* uses data from the first wave of *'Netherlands Kinship Panel Study (NKPS)'* conducted between 2002 and 2004 (N=8161). Although the KNPS is not entirely consistent with the GGS, a harmonized datafile derived from NKPS containing a more limited number of variables has been included in the Generations & Gender Programme. Consistent with the GGS, the data from the NKPS allow to reconstruct fertility histories of both male and female respondents.

A discrete-time model of first births

The effect of variations in unemployment on postponement and recuperation of first births between 1960 and 2004 is assessed through discrete-time fixed-effects models of age-specific first birth hazards. Consistent with the research questions outlined above, two models are estimated for each country. In the *postponement-model* first birth hazards between ages 15 and 49 are expressed as a cubic function of age and the unemployment rate in the preceding year

where the effect of unemployment is allowed to vary by 5-year age-group. The *recuperation model* subsequently restricts the analysis to the ages 30 to 49 and expresses age-specific first birth hazards as a cubic function of age, unemployment rates in the preceding year and unemployment rates 10 years earlier. Again the effect of unemployment rates at lags of 1 and 10 years are allowed to vary by 5-year age-groups in the age bracket considered. The recuperation model corresponds to the second research question stated above. Finally, for each country, the postponement and recuperation models are stratified by educational attainment, allowing socio-economic differentials to emerge in response to economic conditions, consistent with the third research question.

The hazard models are estimated separately for Belgium, France and the Netherlands. For Belgium the hazard models are restricted to female respondents aged 15 to 49 between 1960 and 2000. For France, fertility histories of male and female respondents have been pooled to enhance the statistical power of the analysis. However, to accommodate the different age-specific fertility patterns of men and women the models hazard models allow interaction between gender and the baseline hazard function. For the Netherlands the setup of the analysis is similar to that of France: men and women are pooled and interaction between gender and the baseline hazard function is included to accommodate gender differences in age-specific fertility schedules. All hazard models use a logit link function. Hence, the results can readily be interpreted in terms of odds and odds-ratios of having a first births[3].

4. RESULTS

4.1 Trends in aggregate fertility

All countries included in the analysis are characterized by period fertility levels well in excess in replacement level in the 1960s (COE 2002). By 1975, however, period fertility had declined below 2 children per woman in all three countries. Despite this broad similarity, substantial differences emerge between countries in terms of the path to subreplacement fertility and current period fertility levels. In France, period fertility has remained relatively high throughout the observation period: period fertility exceeded 1,85 children per woman until the mid 1980s. The period fertility rate declined below 1,8 in the 1990s but restored to its previous level of 1,9 children per woman by 2000.

[3] All models have been estimated using the STATA (version 11).

Compared to France, the pattern for Belgium and the Netherlands is somewhat different. After an initial decline to approximately 1,7 children by the mid 1970s, period fertility levels continued their decline to 1,5 children by the mid 1980s. Although period fertility increased temporarily around 1990, fertility had by 1995 again declined to the low levels witnessed in the mid 1980s. Only after 1995, period fertility levels increased to somewhat higher levels, but the recovery has been more substantial in the Netherlands (PTFR of 1,73 in 2002) than in Belgium (PTFR of 1,62 in 2002).

Table 1 Period total fertility rate and period mean age at childbearing in Belgium, France and the Netherlands, 1960-2000.

	1960	1965	1970	1975	1980	1985	1990	1995	2000	2002
Period Total Fertility Rate (PTFR)										
Belgium	2,56	2,62	2,25	1,74	1,68	1,51	1,62	1,56	1,66	1,62
France	2,73	2,84	2,47	1,93	1,95	1,81	1,78	1,71	1,88	1,89
Netherlands	3,12	3,04	2,57	1,66	1,60	1,51	1,62	1,53	1,72	1,73
Mean age at First Birth (PMAC1)										
Belgium	24,8	24,5	24,3	24,4	24,7	25,5	26,4	27,3	-	-
France	24,8	24,4	24,4	24,5	25,0	25,9	27,0	28,1	27,9	-
Netherlands	25,7	25,2	24,8	25,2	25,7	26,6	27,6	28,4	28,6	28,7

Source: Council of Europe (2005)

The emergence of subreplacement in Belgium, France and the Netherlands was accompanied by substantial increases in the mean age of women at the birth of their first child. For Belgium, previous analyses have shown that fertility postponement has contributed significantly to the deflation of period fertility between the mid 1970s and the mid 1990s, similar to trends documented for a number of other countries. Although period fertility levels in 2002 vary from 1,60 to 1,9 among the countries considered, all three countries are currently part of the high fertility belt in Northwestern Europe (Council of Europe, 2005). The recovery to higher fertility levels in Belgium, and particularly the Netherlands and France, suggests that these countries have thus been more successful in recuperation of fertility at older ages.

4.2 Macro-level trends in unemployment

Belgium

For Belgium, several sources provide information on trends in unemployment since the late 1940s (Deleeck et al., 2008; OECD, 2010). Figure 2.a plots two series drawn from the *Rijksdienst voor Arbeidsvoorziening (RVA)* as well as the harmonized unemployment rate from the OECD. The first indicator from the RVA is higher as self-employment and some categories of civil servants have been excluded from the calculation of the unemployment rate. As a result, the estimates for this series are substantially higher throughout the 1947-2001 period than those provided by the alternative, more conventional indicator of RVA and the OECD-series. Despite some variation in levels between indicators, the evolution of unemployment in Belgium shows roughly four distinct periods: i) a period of high unemployment just under 10 per cent during the early 1950s, ii) a period of decreasing and low employment starting from the mid 1950s and lasting up to the early 1970s, iii) a period of rapidly increasing unemployment from a level of only 3,1 per cent in 1971 to 18,6 per cent in 1984 and iv) a period characterized by varying levels of high unemployment after the mid 1980s. After 1984, the unemployment rate temporarily declined to 11,9 per cent in 1990, followed by another rise to 16,7 per cent in 1994 and a new decline to 11 per cent in 2001 (CSB, 2010). Although unemployment never soared to the level recorded in 1984 again, it has not declined to the low levels recorded between the mid 1950s and mid 1970s. Surprisingly, the increase of unemployment rates after the early 1970s and the peaks in the mid 1980s and 1990s display a time path similar to that of period fertility, even when measured by a relatively crude indicator such as the period TFR.

Netherlands

Data on unemployment for the Netherlands have been drawn from three different sources: i) the US Bureau of Labor Statistics (BLS), ii) the OECD and iii) *Centraal Bureau voor de Statistiek* (CBS). The latter indicator was constructed by relating historical data on numbers of people being registered as unemployed between 1953 and 1988 to data on the population aged 20-65 in the period considered. Since unemployment is related to population numbers rather than the actual labor force, the indicator constructed from historical series provided by CBS is a more crude indicator of unemployment that the indicators provided by BLS or OECD, but has the advantage of extending the time-series of unemployment data. The hazard models in the

subsequent section draw information on unemployment from the historical series from CBS until 1970 and the harmonized unemployment rate from OECD between 1970 and 2008 (see figure 2.c).

Figure 2. Unemployment rates in Belgium, France, Germany and the Netherlands, 1947-2009, various sources

Figure 2.a Belgium

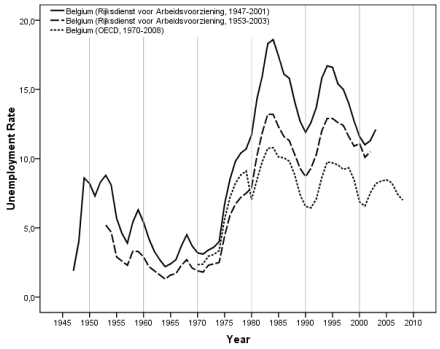


Figure 2.b France

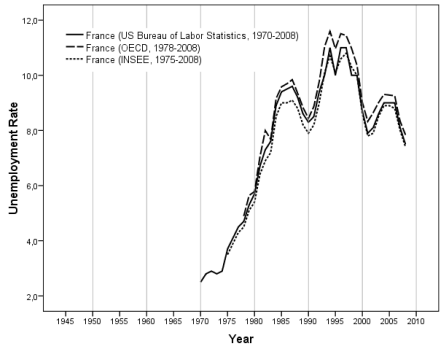
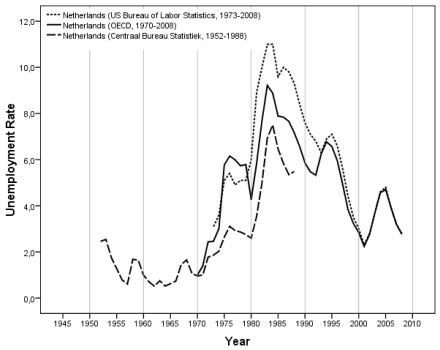


Figure 2.c Netherlands



Sources: OECD (2010); US Bureau for Labor Statistics (2010), INSEE (2010),

Similar to situation in Belgium, the long-term evolution of unemployment in the Netherlands is characterized by very low unemployment rates throughout most of the 1950s and 1960s, with rates being generally below 3 per cent. After 1970 unemployment increases rapidly reaching approximately 10 per cent in 1985. Unlike Belgium where unemployment has remained high since the mid 1980s, the unemployment rate in the Netherlands has gradually restored – notwithstanding temporary upsurges around 1995 and 2005 – to the levels registered in the early 1970s (i.e. around 4 per cent). The increase of unemployment between 1970 and the mid 1980s, however, was accompanied

between 1980 and 1985 by an increase in the number of people claiming means-tested benefits and this latter group has remained substantial until 2000. As a result, it is not clear to what extent the unemployment rate has been artificially deflated after 1985. On the other hand, compared to Belgium, the alleged decline of unemployment levels in the Netherlands does coincide does with a stronger recovery of period fertility levels after the mid 1990s.

France

Historical data published by INSEE suggest that between 1967 and 1974 the unemployment level in France was below 3 per cent. The unemployment data published by OECD (figure 2.b) indicate, however, that unemployment rates increased rapidly from around 4 per cent in 1975 to 9,84 in 1987 and – despite a temporary loss of momentum in the early 1990s - to 11 per cent in the mid 1990s. Although unemployment declined between 1995 and 2000, the early years in the 21st century witnessed another peak in unemployment rates, reaching 9,3 per cent in 2005. In France too, the low level of period fertility recorded around 1995 coincides with the highest level of unemployment registered between 1967 and 2008.

4.3 Exploring the link between unemployment and birth hazards

Belgium

The period total fertility rate is ill-suited to map the effect of economic context. Also the decomposition of the period TFR into the constituent order-specific PTFRi yields biased estimates of period fertility levels. Previous analysis has indicated that PTFR1 in Belgium is severely deflated after the early 1970 as a result of the onset of postponement of first births which is largely induced by the expansion of educational attainment among cohorts born after 1950s (Bongaarts and Feeney 1998; Neels 2006; Neels and Gadeyne 2008; Neels 2009). As a result of the availability of maternity histories for the entire population in Belgium synthetic parity progression ratios to first births (SPPR1) can be estimated reliably for the observation period ranging from 1960 to 2000 (Neels 2006; Neels and Gadeyne 2008). The synthetic parity progression ratios have the additional advantage of controlling for the parity distribution of the female populations as well as being closely related to the hazard regression models used in subsequent sections (Ní Brolcháin 1992).

Figure 3a provides a 'gestalltimpression' of the correlation between the unemployment rates and SPPR1 among Belgian women between 1960 and 2000. Whereas the employment level was still situated at an unprecedented low level of 2,35 per cent in the early 1970s, it increased incessantly throughout the 1970s and early 1980s reaching a peak in 1984. Although substantial variation in unemployment levels emerges between 1985 and 2000 – with a notable through in 1990 and 1991 - the unemployment rate after 1985 never declined to the low levels observed in the early 1970s. Comparing this trend to the evolution in SPPR1 indicates that the secular rise in unemployment from the early 1970s to the mid 1980s is mirrored by a concomitant decrease of SPPR1 throughout the period considered, with SPPR1 reaching a through in 1985. As unemployment levels decline between 1985 and the early 1990s, SPPR1 too recovers, reaching a peak in 1991. Finally, the rise in unemployment rates after 1991 is again closely mirrored by a decrease of SPPR1. The correspondence between both series is even more striking in figure 3b, where SPPR1 has been reversed. The cross-correlation coefficients in table 2 evaluate the correlation between SPPR1 and unemployment rates at different time lags[4]. Significant negative correlations emerge between SPPR1 and unemployment rates in the preceding year (r=-0,612) and the unemployment rate two years earlier (r=-.500). Cross-correlations between unemployment rates and synthetic parity progression ratios to higher-order births, suggest that the effect of variations in unemployment rates is less articulated for progressions the second and higher-order births. Previous analyses suggest, however, that variations in inflation rates and purchasing power may be more relevant in accounting for variation to higher-order births as a proxy of purchasing power and relative income, rather that temporal variation in access to the labour market (Neels 2009).

The correlation between the unemployment rate and a synthetic fertility measure such as SPPR1 provides limited information on the long-term effects of adverse economic conditions on fertility of the cohorts concerned. Even if women only marginally adjust their fertility behavior in response to prevailing economic conditions, the synthetic parity progression ratio is likely to magnify or exaggerate such an effect as small adjustments made by women at various ages are added up as a result of the synthetic nature of the measure. An

[4] A lag of 0 years indicators that SPPR1 and unemployment rates refer to the same year. A lag of 15 years indicates that the SPPR1 in year t is correlated with the unemployment rate in year (t-15).

encompassing assessment of the effect of unemployment rates on first birth hazards thus requires a more detailed analysis of the age-structure of the effect of unemployment rates on both postponement and recuperation of first births. Figures 4a investigates the effect of unemployment on fertility postponement in more detail by plotting the cross-correlations between first birth hazards at age 20 and unemployment levels 0 to 15 years earlier. The plots clearly show that significant negative correlations emerge between first birth hazards at age 20 and unemployment in the immediately preceding years (i.e. high unemployment reduces fertility at younger ages), suggesting that younger women effectively postpone their transition to parenthood as a result of adverse period conditions (or advance fertility in times of economic prosperity). The hazard models of fertility postponement provides additional information on the age-structure of the unemployment effect and allow to analyze whether socio-economic groups react differently to variations in macro-economic conditions (see table 3)[5]. The estimates of the hazard models suggest that the effect of unemployment on first birth hazards is strongly differentiated by age group, having a significant negative effect on birth hazards of women aged 15 to 34, whereas the effect is not significant or positive on birth hazards of women aged 35 and older. Hence, variation in economic conditions – in this case varying access to labour markets - negatively affects the first birth hazards of younger, whereas fertility of women over age 30 is not primarily influenced by such economic conditions. Comparison of the effect of unemployment rates across socio-economic groups shows that coefficients are similar in magnitude, but nevertheless suggests that fertility of lower educated is affected over a wider age range among higher educated women. For women with long type tertiary education the effect seems to be concentrated between ages 20 and 29.

Figure 4b turns to recuperation of first births by plotting the cross-correlations between first birth hazards at age 30 and unemployment rates 0 to 15 years earlier. The result indicate that first birth hazards show significant *positive* correlations with unemployment rates 7 to 12 years earlier, suggesting that

[5] Although the data from the 2001 census and the Generations and Gender Survey provide individual level data on maternity histories and birth hazards, they do not provide individual-level time-varying information on (un)employment status. Additional analyses using data from the Fertility and Family Surveys could be used to control for individual-level variation in employment status, despite the fact that the longitudinal scope of these data – referring for most countries to births taking place in the 1970s and 1980s – is more limited. This possibility is not pursued in this paper.

women who faced adverse period conditions earlier in life and had remained childless as a result, make up forgone fertility at older ages. The hazard model of fertility recuperation provides more detailed information on the age-effect of unemployment rates on fertility recuperation. The results show, however, that the recuperation-side of the story is strongly differentiated in terms of socio-economic position of the women concerned. For lower educated women – this encompasses women without formal education, primary and lower secondary education - the model suggests that fertility after age 30 is predominantly determined by prevailing economic at older ages and grants little empirical support for cohort effects in the sense that the adverse economic conditions these women faced between ages 20 and 29 are compensated by higher first birth hazards after age 30. Results are different for women with short and long type tertiary education. For these socio-economic groups economic conditions in the previous year no longer have significant effect on first births hazards after age 30, whereas significant positive associations emerge with the unemployment rates these women faced 10 years earlier. For higher educated women the results thus suggest that these socio-economic groups effectively recuperate births that were postponed at younger ages due to adverse economic conditions, regardless of the economic climate these groups face at older ages. By focusing at lags of 1 and 10 years, the recuperation model provides only a partial view of socio-economic differentials in fertility recuperation, whereas figure 4c suggests that fertility recuperation is a process that takes place gradually over time. To complement the results of the recuperation model, figure 5 compares synthetic parity progression ratios and cohort completed fertility levels at age 39 for different socio-economic groups with trends in unemployment rates. Cohort completed fertility levels pertain to the proportion of women having a first child by age 39 – which for all socio-economic groups is nearly identical to the proportion that has remained childless at age 49 – and have been lagged by the cohort mean age at childbearing. The results in figure 5 confirm the socio-economic differentials that emerged from the hazard model on fertility recuperation. For lower educated women, cohort completed fertility for first births correlates strongly with both the SPPR1 and variations in economic context when these women were in their prime childbearing years. For women with higher secondary and particularly tertiary education, the SPPR1 are closely associated with variations in unemployment levels – similar to the results encountered for the lower educated – but economic conditions clearly had limited effect in these socio-economic groups on cohort completed fertility of first births at age 39.

Figure 3. Synthetic parity progression ratio to first birth (SPPR1) & unemployment rate (lagged by 1 year), Belgium, women holding Belgian nationality in 2001, 1960-2000.

Figure 3a. Unemployment Rate & SPPR1

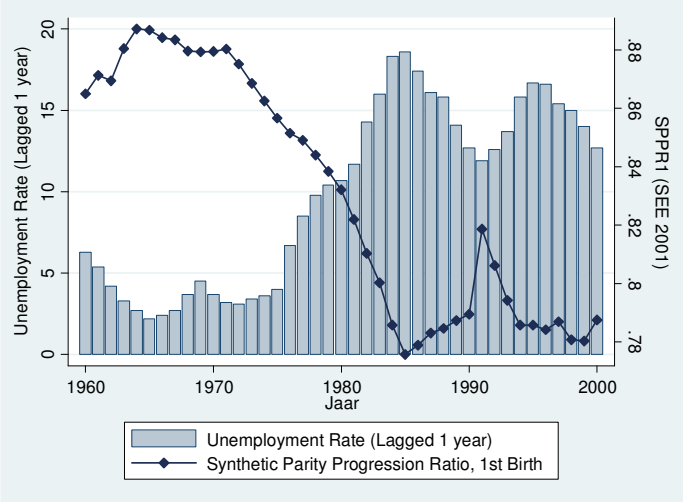
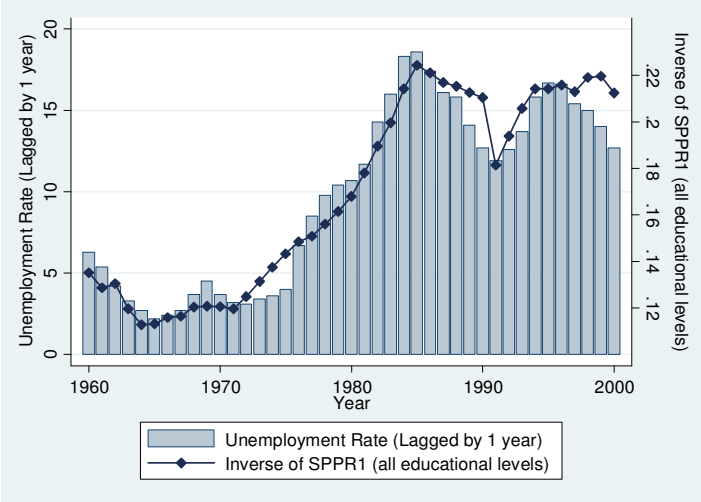


Figure 3b. Unemployment Rate & Complement of SPPR1



Source: Statistics Belgium, 2001 Census, Calculations by author.

Table 2. Cross-correlations between synthetic parity progression (SPPR, Birth-orders 1-4) & unemployment rate unemployment at ages 20-35.

	Cross-correlation of Unemployment Rate with:							
	SPPR1		SPPR2		SPPR3		SPPR4	
Lag (in years)	*CC*	*SE*	*CC*	*SE*	*CC*	*SE*	*CC*	*SE*
0	-.430	.158	-.386	.158	-.367	.158	-.296	.158
1	-.612	.160	-.199	.160	-.160	.160	-.085	.160
2	-.500	.162	.006	.162	.109	.162	.107	.162
3	-.319	.164	.246	.164	.329	.164	.333	.164
4	-.068	.167	.369	.167	.386	.167	.357	.167
5	-.113	.169	.315	.169	.335	.169	.330	.169
6	-.078	.171	.172	.171	.146	.171	.252	.171
7	.031	.174	.097	.174	.107	.174	.057	.174
8	.154	.177	.180	.177	.220	.177	.070	.177
9	.021	.180	.300	.180	.228	.180	.123	.180
10	.098	.183	.160	.183	.220	.183	.185	.183
11	-.007	.186	.099	.186	.223	.186	.245	.186
12	.002	.189	.122	.189	.173	.189	.195	.189
13	.095	.192	.102	.192	.234	.192	.215	.192
14	.164	.196	.079	.196	.166	.196	.205	.196
15	.127	.200	-.043	.200	.073	.200	.068	.200

(1) *Cross-correlation function is calculated at lags from 0 to 15 years. Non-seasonal differencing relative to the value in the preceding year is applied to both series to eliminate bias in the cross-correlation coefficients resulting from upward of downward trends.*

(2) *Sources: OECD & Statistics Belgium, 2001 Census, calculations by author.*

Figure 4a. Cross-correlation between unemployment rate and first birth hazard at age 20, Belgium, time-series 1970-2000.

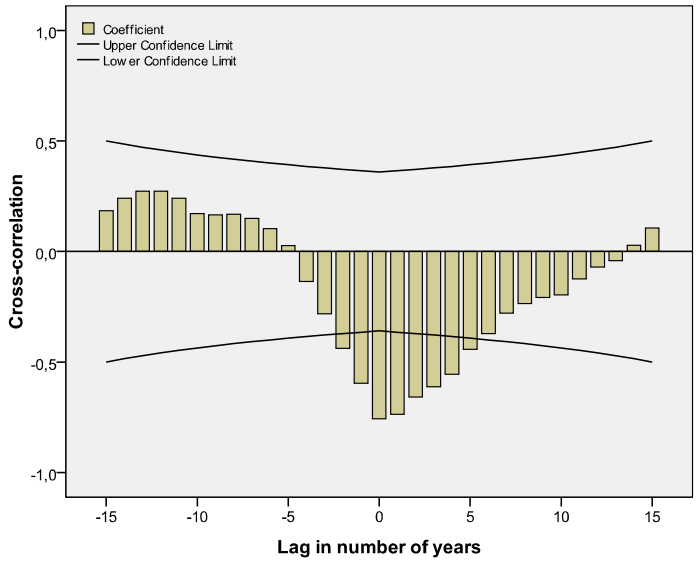
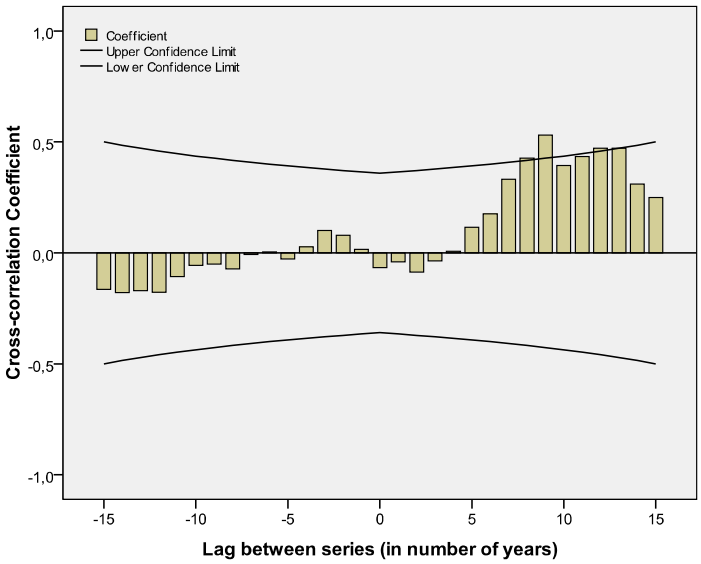


Figure 4b. Cross-correlation between unemployment rate and first birth hazard at age 30, Belgium, time-series 1970-2000.



Source: Statistics Belgium, 2001 Census, calculations by author.

Table 3. Fixed-effect of unemployment rate in preceding year on birth hazard of first child, Analysis stratified by five-year age-groups and educational level, Belgian women aged 15-49 years, 1960-2000.

	No education & Primary Education		*Lower Secondary Education* (1)		*Higher Secondary Education* (1)		*Short Type Tertiary Education* (1)		*Long Type Tertiary Education* (1)	
	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -	- 7 -	- 8 -	- 9 -	- 10 -
Age										
Linear	2.044 ^{C}	2.258 ^{C}	2.578 ^{C}	2.910 ^{C}	3.353 ^{C}	3.892 ^{C}	5.223 ^{C}	5.323 ^{C}	10.066 ^{C}	10.222 ^{C}
Quadratic	0.951 ^{C}	0.943 ^{C}	0.937 ^{C}	0.927 ^{C}	0.929 ^{C}	0.915 ^{C}	0.914 ^{C}	0.908 ^{C}	0.890 ^{C}	0.884 ^{C}
Cubic	1.001 ^{C}	1.001 ^{C}	1.001 ^{C}	1.001 ^{C}	1.001 ^{C}	1.002 ^{C}	1.001 ^{C}	1.002 ^{C}	1.002 ^{C}	1.002 ^{C}
Age-groups (5 years) * Current Unemployment Rate (lagged by 1 year)										
age 15-19		0.954 ^{C}		0.983 ^{B}		0.959 ^{C}		0.928 ^{B}		1.029 ^{N}
age 20-24		0.957 ^{C}		0.970 ^{C}		0.963 ^{C}		0.937 ^{C}		0.910 ^{C}
age 25-29		0.939 ^{C}		0.968 ^{C}		0.973 ^{C}		0.973 ^{C}		0.954 ^{C}
age 30-34		0.972 ^{C}		0.996 ^{N}		0.997 ^{N}		0.995 ^{N}		0.979 ^{A}
age 35-39		1.013 ^{N}		1.021 ^{N}		1.007 ^{N}		1.045 ^{C}		1.021 ^{N}
age 40-44		0.931 ^{N}		0.922 ^{A}		0.955 ^{N}		1.001 ^{N}		1.008 ^{N}
age 45-49		0.688 ^{A}		-		-		-		
-2LL	18374.7	18211.5	30814.7	30689.3	35496.7	35351.1	23838.6	23649.8	7051.6	6986.8

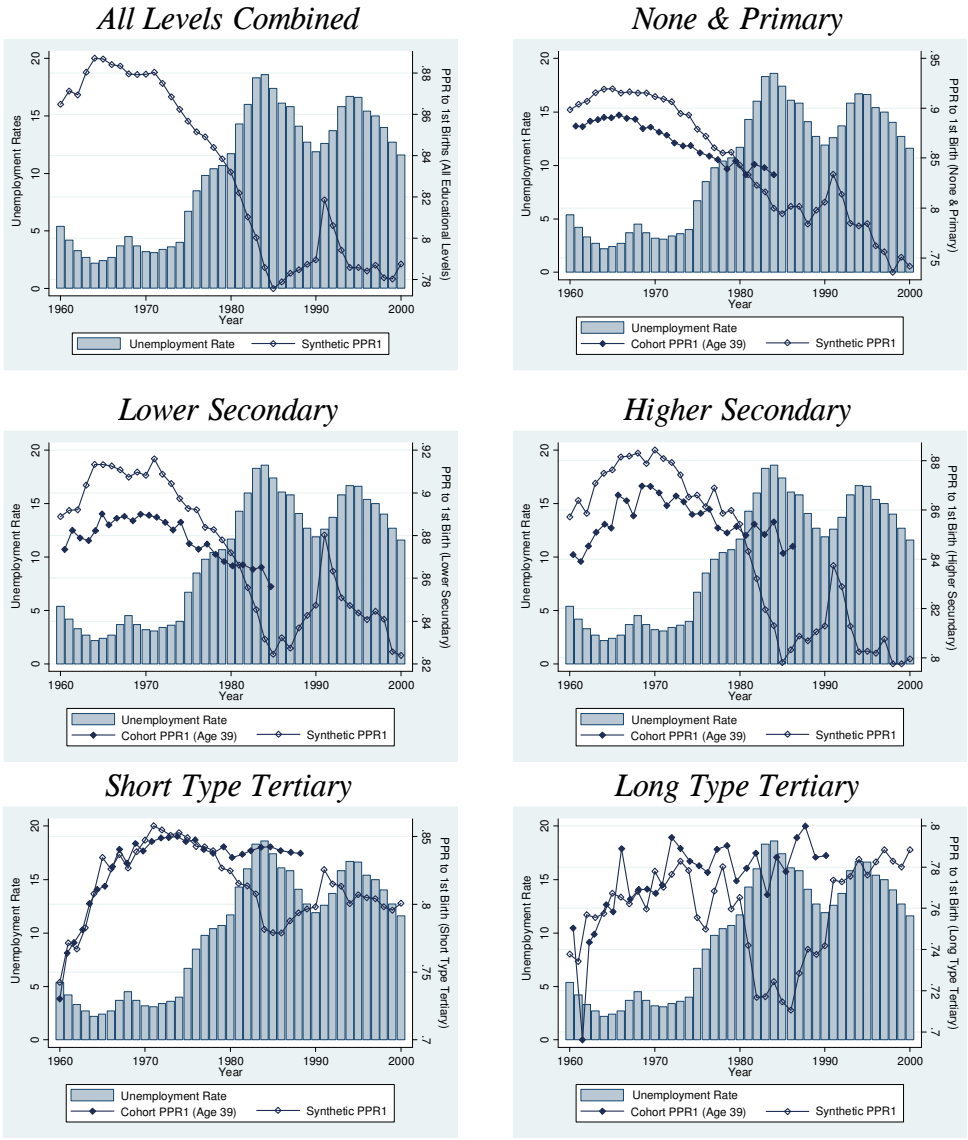
Legend: ^{N} $p > 0.05$; ^{A} $p < 0.05$; ^{B} $p < 0.01$ and ^{C} $p < 0.001$.
Note (1): Analysis restricted to ages 15-44 years in models 3-8.
Source: Statistics Belgium, 2001 Census, Calculations by author

Table 4. Fixed-effect of unemployment rate (lagged by 1 year and 10 years) on age-specific first birth hazards, Analysis stratified by five-year age-groups and educational level, Belgian women aged30-44 years, 1960-2000.

	No education & Primary Education		*Lower Secondary Education* (1)		*Higher Secondary Education* (1)		*Short Type Tertiary Educaton* (1)		*Long Type Tertiary Education* (1)	
	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -	- 7 -	- 8 -	- 9 -	- 10 -
Age										
Linear	4.646 N	5.855 N	1.683 N	1.093 N	0.025 N	0.027 N	1.035 N	1.093 N	0.422 N	0.631 N
Quadratic	0.929 N	0.920 N	0.965 N	0.986 N	1.913 N	1.188 N	1.006 N	1.004 N	1.053 N	1.031 N
Cubic	1.001 N	1.001 N	1.001 N	1.000 N	0.997 N	0.997 N	1.000 N	1.000 N	0.999 N	0.999 N
Age-groups (5 years) * Current Unemployment Rate *(unemployment rate lagged by 1 year)*										
age 30-34	0.964 B	0.971 A		0.966 B	1.007 N	1.009 N	1.020 A	0/995 N	1.032 N	1.001 N
age 35-39	.0968 N	0.975 N		1.018 N	0.988 N	0.977 N	1.040 B	1.011 N	1.039 N	0.970 N
age 40-44	0.934 N	0.830 A		0.920 N	0.991 N	0.945 N	1.053 N	1.009 N	1.052 N	1.109 N
Age-groups (5 years) * Past Unemployment Rate *(unemployment rate lagged by 10 years)*										
age 30-34		0.979 N		1.036 B		0.997 N		1.041 C		1.053 B
age 35-39		0.994 N		0.992 N		1.013 N		1.047 A		1.101 A
age 40-44		1.171 A		1.072 N		1.061 N		1.065 N		0.951 N
-2LL	2964.4	2957.5	3693.2	3684.0	4235.0	4234.0	4568.9	4548.4	1994.9	1976.1

Legend: ^{N} $p > 0.05$; ^{A} $p < 0.05$; ^{B} $p < 0.01$ and ^{C} $p < 0.001$.
Note (1): Analysis restricted to ages 15-44 in models 3-8.
Source: Statistics Belgium, 2001 Census, Bewerking door auteur

Figure 5. Synthetic (SPPR1) & Cohort Parity Progression to 1st Birth (CPPR1) by Level of Education, Belgium, 1960-2000.



Source: Statistics Belgium, 2001 Census, Calculations by author.

In sum, the results for Belgium grant empirical support for the hypothesis that the effect of economic conditions on fertility behavior takes the form of a 'postponement-recuperation'-mechanism as the one outlined in figure 1. Analysis of socio-economic differentials shows that first births hazards of

younger women are adversely affected by variation in unemployment rates at the macro-level, regardless their level of education – although results suggest that lower socio-economic groups are affected over a broader age range – but that the subsequent recuperation of births shows strong differentiation in terms of the socio-economic position of the women concerned. Among lower socio-economic groups rising unemployment levels induce postponement of first births and recuperation also depends on economic conditions later in the life-course. In Belgium, the persistence of high unemployment rates since the mid 1980s has thus curtailed cohort completed fertility of lower educated women. Among the higher educated, recuperation of first births occurs regardless of economic conditions faced later in life. The stability of cohort fertility patterns is thus the outcome of cohort-recuperation effects rather than being coincidental (Hoem 2008; Neels and Gadeyne 2008; Neels 2009).

France

The analysis for France does not allow the estimation of age-specific first birth hazards by educational attainment over a 30-year period because it is based on survey rather than population data. Hence, the analysis is necessarily restricted to the estimation of the postponement and recuperation hazard models. In contrast to the SES2001 for Belgium, however, GGS France allows the reconstruction of fertility histories for both men and women. Both sexes have been pooled to enhance statistical power of the hazard models and - in contrast to Belgium where the analysis is restricted to women as a result of data availability - the hazard models for France include interaction between the baseline hazard function and gender to accommodate different age-specific fertility schedules by sex. For the analysis age is centered at age 28.

Table 5 reports the results for the *fertility postponement model* for French men and women aged 15-49 years between 1968 and 2004. Compared to the results for Belgium, variation in unemployment rates has a significant effect over a more limited age range among lower educated in France: between ages 20 and 29, a 1 per cent increase in the unemployment rate reduces the odds of having a first child by approximately 5,5 per cent. For respondents with intermediate levels of education, first birth hazards are adversely affected between ages 15 and 29, a 1 percentage point increase significantly reducing the odds of having a first birth by 14 per cent between ages 15 and 19, 8 per cent between ages 20 and 24 and 5 per cent between ages 25 and 29. For higher educated women first birth hazards are similarly adversely affected with a 1 percentage point increase in unemployment rates significantly

reducing the odds of a first birth by 22 per cent (ages 15-19), 12 percent (ages 20-24) and 6 per cent (ages 25-29).

Table 5. Fixed effect of unemployment rate (lagged by 1 year) on first birth hazards. Analysis stratified by five-year age-groups and educational level, France, male and female respondents aged 15-49, 1968-2004.

	Educational Level:			
	ISCED 0-2	ISCED 3&4	ISCED5&6	ISCED ALL
Age centered				
Linear	0,906 [C]	0,960 [A]	1,062 [B]	0,953 [C]
quadratic	0,976 [C]	0,974 [C]	0,970 [C]	0,976 [C]
Cubic	1,001 [C]	1,001 [C]	1,001 [C]	1,001 [C]
Female	1,367 [C]	1,161 [A]	1,353 [C]	1,225 [C]
Age centered*Female				
Linear	0,936 [C]	0,912 [C]	0,922 [C]	0,936 [C]
Quadratic	1,003 [A]	1,005 [B]	1,002 [N]	1,004 [C]
Cubic	1,000 [A]	1,000 [N]	1,000 [N]	1,000 [B]
Age-groups (5 years)*Current Unemployment Rate (lagged by 1 year)				
age 15-19	0,978 [N]	0,860 [C]	0,774 [B]	0,871 [C]
age 20-24	0,942 [C]	0,921 [C]	0,874 [C]	0,897 [C]
age 25-29	0,946 [C]	0,951 [C]	0,935 [C]	0,940 [C]
age 30-34	1,002 [N]	0,996 [N]	0,988 [N]	1,000 [N]
age 35-39	1,092 [C]	1,028 [N]	1,031 [N]	1,050 [C]
age 40-44	1,052 [N]	1,051 [N]	1,074 [N]	1,071 [B]
age 45-49	0,840 [N]		0,993 [N]	0,926 [N]
Constant	0,163 [C]	0,205 [N]	0,177 [C]	0,191 [C]
-2LL	10365,5	15827,9	9446,4	36443,7

Legend: [N] $p > 0.05$; [A] $p < 0.05$; [B] $p < 0.01$ and [C] $p < 0.001$ - Age centered at 28 years
Source: GGS France, 2005, Calculations by author.

Table 6 provides the results for the *fertility recuperation model* for French respondents aged 30-49 years between 1977 and 2004. Among lower educated women, fertility recuperation is influenced by unemployment levels in both the past and the present. However, current unemployment rates increase fertility between ages 35-39, whereas past unemployment levels significantly reduce birth hazards in the same age bracket. Although the reason for this peculiar pattern is not clear, it is does not involve a large number of women

as most women in lower socio-economic groups have made the transition to parenthood by this age. For the intermediate group – isced levels 3 and 4 – the effects of past and contemporaneous unemployment rates are in the hypothesized direction with the unemployment rate in the preceding year reducing the odds of a first birth between ages 35-39 by 13 per cent. Birth hazards between ages 30-49 are positively correlated on the other hand with the unemployment rate 10 years earlier, significantly increasing the odds of a first birth by 12 per cent between ages 35 and 39. Among higher educated women, the unemployment rate prevailing after age 30 no longer exerts a significant effect on birth hazards, whereas first birth hazards are again positively related to unemployment levels 10 years earlier, significantly increasing the odds of a first birth by 7,1 per cent between ages 30 and 34.

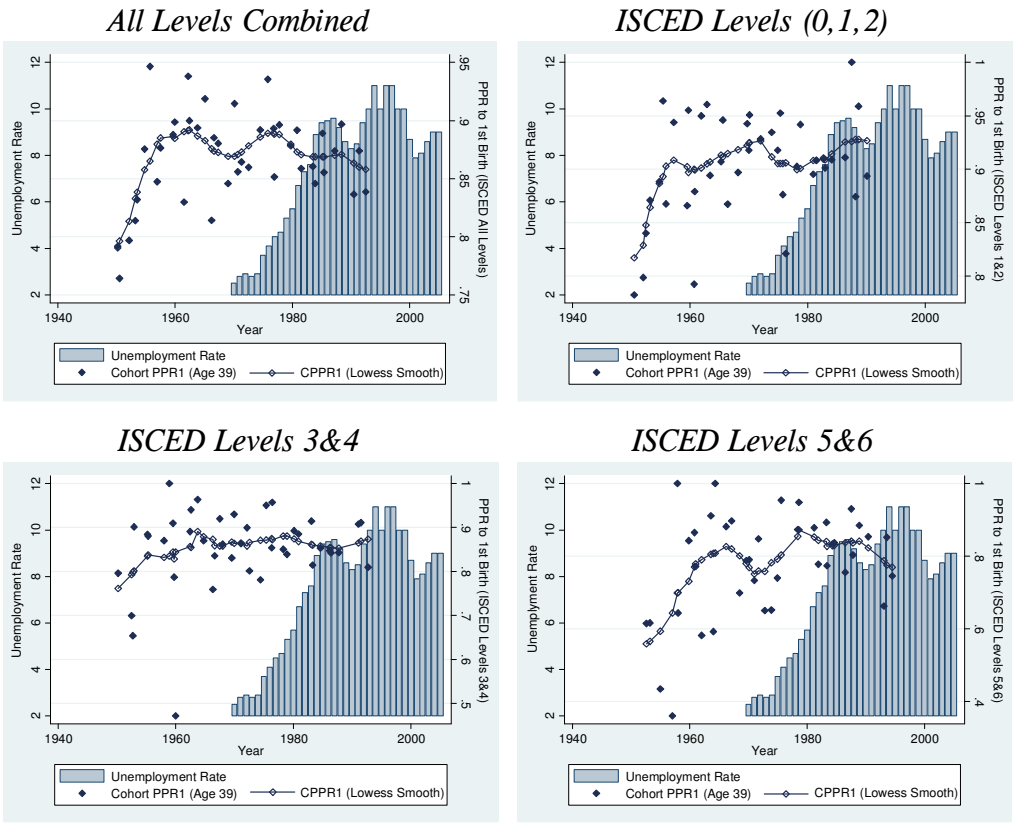
Whereas the hazard model of fertility recuperation merely illustrates the effect of unemployment rates at the specified lag, figure 6 provides a more comprehensive account of socio-economic differentials in female fertility postponement in France. Compared to lower educated women in Belgium, cohort parity progression to first births does not seem to have declined substantially among French women in the lower educated group. Traces of a negative effect of economic recession on cohort parity progression are found for lower educated women (i.e. ISCED-levels 0, 1 and 2) in the late 1970s and early 1980s, but the decline is limited to a few percentage points. For women with intermediate levels of education, the results suggest that the adverse effects associated high unemployment that emerged from table 5 have had little effect on cohort completed fertility of first births for the cohorts concerned. Finally, for higher educated women, the results suggest that – similar to the results for Belgium - progression to parenthood has become more frequent among women born in the 1940s and 1950s than it had been among women born in the early 1930s. Although the results suggest that progression to parenthood has also remained frequent for the more recent cohorts as a result of recuperation, a limited reduction in cohort parity progression seems to have taken place during the mid 1970s and more clearly with the economic recession of the mid 1990s.

Table 6. Fixed effect of unemployment rate in preceding year on birth hazard of first child. Analysis stratified by five-year age-groups and educational level, France, men and women aged 30-49, 1977-2004.

	Educational Level: ISCED 0-2		ISCED 3&4		ISCED5&6		ISCED ALL	
Age centered								
Linear	0,921	N	1,106	N	0,892	A	0,947	N
Quadratic	1,006	N	1,012	N	1,001	N	1,006	N
Cubic	1,000	N	0,996	B	1,000	N	0,999	N
Female	1,109	N	0,759	N	0,972	N	0,959	N
Age centered*Female								
Linear	0,895	N	0,932	N	0,938	N	0,939	N
quadratic	0,990	N	1,001	N	0,983	N	0,991	N
Cubic	0,999	N	1,001	N	1,000	N	1,000	N
Age-groups (5 years)*Current Unemployment Rate (lagged by 1 year)								
age 30-34	1,106	N	0,990	N	0,987	N	1,000	N
age 35-39	1,191	A	0,870	B	0,980	N	0,991	N
age 40-44	1,104	N	0,872	N	1,178	N	1,017	N
age 45-49	0,684	N	0,832	N	1,054	N	0,851	N
Age-groups (5 years)*Past Unemployment Rate (lagged by 10 years)								
age 30-34	0,960	N	1,063	B	1,071	B	1,056	B
age 35-39	0,890	A	1,117	A	1,083	N	1,041	N
age 40-44	0,885	N	1,071	N	0,870	N	0,967	N
age 45-49	1,341	N	1,289	N	0,951	N	1,160	N
Constant	0,027	C	0,078	C	0,061	C	0,055	C
-2LL	1832,1		3119,3		2985,4		8015,5	

Legend: ^{N} $p > 0.05$; ^{A} $p < 0.05$; ^{B} $p < 0.01$ and ^{C} $p < 0.001$ – Age centered at 35 years.
Source: GGS France, 2005, Calculations by author.

Figure 6. Cohort Parity Progression to 1st Birth (CPPR1) by Level of Education & Unemployment Rate, France, 1960-2000[6].



Although less robust than the results obtained for Belgium, the results of the hazard models for France suggest that economic recession and variation in unemployment levels has entailed similar period-induced postponement effects and cohort-recuperation effects subsequently. Unlike Belgium, the comparison of cohort completed fertility levels by education with secular trends in unemployment suggests that the rise in unemployment levels between 1974 and 1984 does not seem to have entailed similar socio-economic differentials in cohort completed fertility in France. Whereas cohort fertility patterns of

[6] Unlike the analysis for Belgium where the census data allow robust estimates of cohort parity progression ratios by education for single year cohorts, the estimation based on the French GGS yields results that are less stable (e.g. scatterplot in figure 6). A lowess smooth was added in figure 6 to enhance visualization of the trend in cohort parity progression.

different socio-economic groups show diverging trends in Belgium, the more egalitarian pattern of fertility postponement and recuperation in France may well be associated with the higher period fertility levels encountered[7].

Table 7. Fixed effect of unemployment rate (lagged by one year) on first birth hazard. Analysis stratified by five-year age-groups and educational level, Netherlands, male and female respondents aged 15-49, 1962-2002.

	Educational Level:			
	ISCED 0-2	ISCED 3&4	ISCED5&6*	ISCED ALL
Age centered				
Linear	0,998 [N]	1,129 [C]	1,197 [C]	1,082 [C]
Quadratic	0,974 [C]	0,974 [C]	0,970 [C]	0,975 [C]
Cubic	1,001 [C]	1,001 [C]	1,001 [A]	1,001 [C]
Female	1,575 [C]	1,324 [C]	0,829 [N]	1,382 [C]
Age centered*Female				
Linear	0,930 [C]	0,960 [B]	1,021 [N]	0,938 [C]
Quadratic	1,003 [N]	1,002 [N]	1,008 [N]	1,004 [B]
Cubic	1,000 [N]	1,000 [A]	0,999 [N]	1,000 [C]
Age-groups (5 years)*Current Unemployment Rate (lagged by 1 year)				
age 15-19	0,890 [B]	0,845 [B]	-	0,815 [C]
age 20-24	0,898 [C]	0,850 [C]	0,767 [C]	0,842 [C]
age 25-29	0,905 [C]	0,871 [C]	0,799 [C]	0,864 [C]
age 30-34	0,959 [A]	0,905 [C]	0,893 [C]	0,921 [C]
age 35-39	1,012 [N]	0,903 [C]	0,902 [A]	0,940 [C]
age 40-44	0,969 [N]	0,997 [N]	0,894 [N]	0,980 [N]
age 45-49	0,956 [N]	1,021 [N]	0,776 [N]	0,960 [N]
Constant	0,180 [C]	0,178 [C]	0,156 [C]	0,179 [N]
-2LL	11889,1	18535,0	3077,9	34338,5

Legend: [N] $p > 0.05$; [A] $p < 0.05$; [B] $p < 0.01$ and [C] $p < 0.001$. * Model restricted to ages 20-49 due to lack of variation in the age category 15-19.
Source: GGS Netherlands, 2002-2004, Calculations by author.

[7] The apparent lack of socio-economic differentials in transition to parenthood encountered in France compared to Belgium, is also found for progression to second-order births (results not shown). Whereas socio-economic differentiation is evident in Belgium with higher educated women showing more frequent progressions to second birth (Neels, 2006; Gadeyne et al. 2010), socio-economic differentials in the progression to 2nd births are again less pronounced in France.

Netherlands

Relying on survey data, the setup of the analysis for the Netherlands is similar to that for France. Table 7 provides the results for the *fertility postponement model* for Dutch men and women aged 15-49 between 1962 and 2002. Unlike the results for France and Belgium, variation in unemployment levels (lagged 1 year) in the Netherlands is associated with significant negative effects on the odds of having a first child over a broad age range, regardless of socio-economic position. For lower educated women, 1 percentage point increase in unemployment rates significantly reduces the odds of having a first child by 10 per cent between ages 15 and 29 and approximately 5 per cent among women ages 35-39. For women with intermediate levels of education, the effect of unemployment significantly reduced first birth hazards over the entire age-bracket between ages 15 and 39, which covers most of the reproductive life-span. The negative effect associated with unemployment reduced the odds of having a first birth by 15 per cent between ages 15 and 29 and 10 per cent between ages 30 and 39. Higher educated women too are adversely affected by unemployment levels, a 1 percentage point increase in the unemployment rate significantly reducing first birth odds by 20 per cent between ages 20 and 29 and by 10 per cent between ages 30 and 39.

Table 8 includes the results for the fertility recuperation model for men and women aged 30-49 between 1962 and 2002. Again, the pattern emerging for the Netherlands is clearly different from that encountered in France and Belgium. Fertility after age 30 is strongly dependent on the prevailing economic situation for all socio-economic groups, despite the fact that significant cohort-recuperation effects are also found to operate simultaneously, regardless of educational attainment. Results thus suggest that cohort-recuperation effects are largely offset by variation in contemporary economic conditions faced after age 30. Among the lower educated, for instance, current unemployment levels (lagged 1 year) reduce the odds of having a first birth by 6 per cent, whereas past unemployment levels increase the odds by 6,8 per cent. Similarly for the group with intermediate levels of education, a 1 percentage point increase in current unemployment rates reduces the odds of having a first child by 7 per cent at ages 30-34 and 20 per cent among ages 35-39, whereas unemployment levels encountered 10 years earlier increase the odds of having a first birth by 3,7 per cent and 19,1 per cent respectively. Finally, among the higher educated, current unemployment rates reduces first birth odds by 10 and 20 per cent at ages 30-34 and ages 35-

39 respectively, whereas unemployment levels 10 years earlier increase first birth odds by 16,2 and 32,9 per cent.

Table 8. Fixed effect of unemployment rate (lagged by 1 and 10 years) on first birth hazards. Analysis stratified by five-year age-groups and educational level, Netherlands, male and female respondents aged 30-49, 1962-2002.

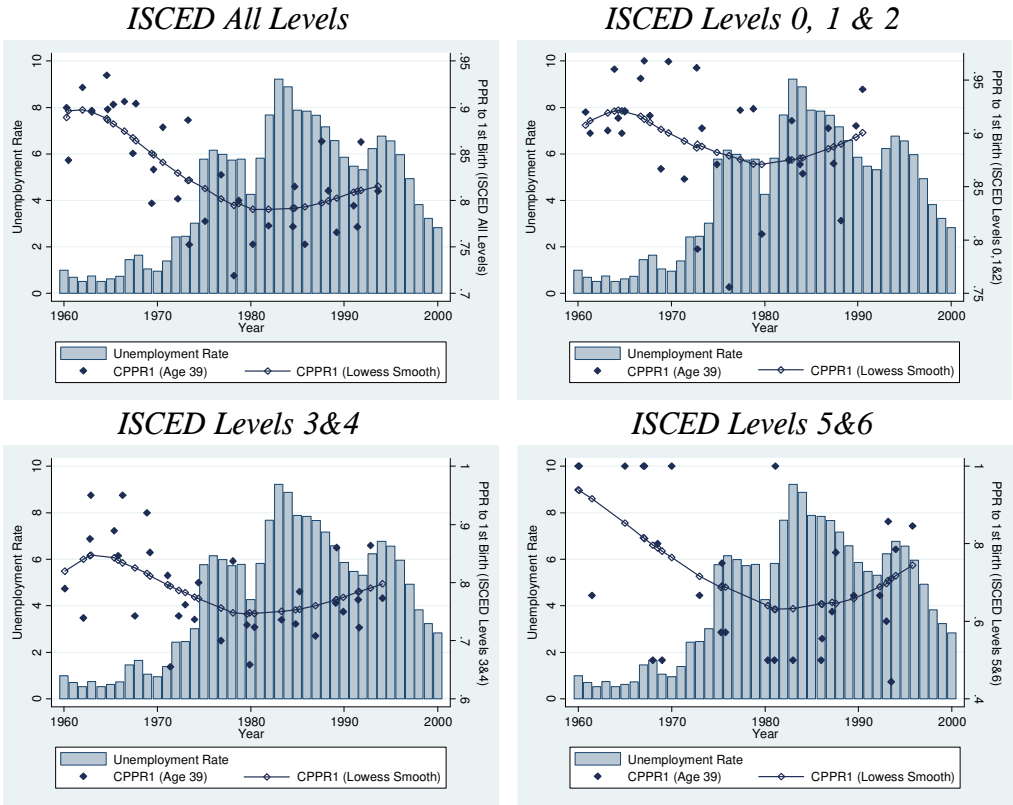
	Educational Level			
	ISCED 0-2	ISCED 3&4	ISCED5&6	ISCED ALL
Age				
linear	0,924 [N]	0,859 [C]	0,840 [B]	0,868 [C]
quadratic	1,009 [N]	0,983 [B]	0,983 [N]	0,990 [B]
Cubic	0,998 [N]	1,001 [N]	1,001 [N]	1,000 [N]
Female	1,060 [N]	0,885 [N]	0,977 [N]	0,943 [N]
Age centered*Female				
Linear	0,896 [N]	0,897 [B]	0,927 [N]	0,904 [C]
Quadratic	0,996 [N]	0,996 [N]	0,988 [N]	0,995 [N]
Cubic	1,000 [N]	1,000 [N]	1,001 [N]	1,000 [N]
Age-groups (5 years)*Current Unemployment Rate (lagged by 1 year)				
age 30-34	0,940 [A]	0,931 [C]	0,912 [A]	0,934 [C]
age 35-39	0,983 [N]	0,799 [C]	0,804 [B]	0,858 [C]
age 40-44	0,881 [N]	0,958 [N]	0,745 [N]	0,907 [N]
age 45-49	1,098 [N]	1,204 [N]	0,454 [N]	1,068 [N]
Age-groups (5 years)*Past Unemployment Rate (lagged by 10 years)				
age 30-34	1,068 [B]	1,037 [A]	1,010 [N]	1,039 [B]
age 35-39	1,020 [N]	1,191 [C]	1,162 [B]	1,143 [C]
age 40-44	1,018 [N]	1,101 [N]	1,329 [A]	1,118 [A]
age 45-49	1,075 [N]	0,864 [N]	1,679 [N]	0,984 [N]
Constant	0,056 [C]	0,101 [C]	0,122 [C]	0,087 [N]
-2LL	2770,7	6860,3	1779,4	11485,9

Significance Levels: [N] $p > 0.05$; [A] $p < 0.05$; [B] $p < 0.01$ and [C] $p < 0.001$.
Source: GGS Netherlands, 2002-2004, Calculations by author.

Figure 7 allows a more comprehensive assessment of the effect of the economic context on completed fertility of first births at age 39. The deficient recuperation of first births emerging from the hazard models in table 7 is substantiated when cohort completed fertility levels are set off against variations in the economic context. In contrast to France (where recuperation

is high regardless of socio-economic group) and Belgium (where recuperation largely depends on socio-economic position of women), economic context in the Netherlands has negatively affected completed fertility levels of women, regardless their level of education. For all socio-economic groups, the fast deterioration of the economic context between 1975 and the mid 1980s has entailed substantial reductions in cohort completed fertility for first births. According to the hazard model on fertility recuperation, the recovery of cohort fertility among recent cohorts is thus linked to the decline of unemployment that has been characteristic for the Netherlands since the mid 1980s.

Figure 7. Cohort parity progression to 1st birth by educational level (CPPR1 lagged by CMAC) & unemployment rate, Netherlands, 1960-2000.



Source: GGS Netherlands, 2002-2004, Calculations by author

5. DISCUSSION

The longitudinal models discussed for Belgium, France and the Netherlands all correspond to periods of strong variation in economic conditions, ranging from very low unemployment levels at the end of the 1960s and early 1970s to articulated peaks in the mid 1980s and particularly for France and Belgium also in the mid 1990s. The data coverage in the countries considered is thus ideally suited to analyze the effect of variations in economic context on postponement and recuperation of fertility as well as socio-economic differentials emerging for these processes.

Socio-eocnomic differentials in period-induced postponement

The hazard models on short-terms effects of economic recession demonstrate that variations in unemployment rates exert a negative effect on birth hazards in the subsequent year and thus entail postponement of first births. This effect is also characterized by a specific age structure as particularly the fertility of younger women is adversely affected. However, the strength and age-range of the effect are subject to socio-economic differentials and between-country variation. In Belgium, first birth hazards of lower educated women are significantly affected over the age between 15-34 years, whereas the postponement effect among higher educated women is more clearly articulated between ages 20 and 29. The reconstruction of synthetic parity progression ratios by level of education in Belgium illustrates that family formation of all socio-economic groups is responsive to period variation in unemployment rates. In France, on other hand, the adverse effect of economic conditions is more uniform across the socio-economic spectrum, negatively affecting first birth hazards between ages 15 and 29 for all educational levels. The period-induced postponement is, however, most pronounced in the Netherlands. High unemployment has a significant negative effect on first birth hazards of lower educated respondents between ages 15 and 34, whereas first birth hazards of persons with intermediate and tertiary education are adversely affected over most of the reproductive life-span (i.e. ages 15 to 39). Evidence for Belgium indicates that variations in unemployment rates are less strongly cross-correlated with synthetic parity progression ratios of second and higher-order births, suggesting that the negative effect of unemployment rates on early stages of family formation and first birth hazards primarily reflects temporal variations in gaining access to the labour market.

Socio-economic differentials in cohort recuperation

The pronounced postponement-inducing effect of unemployment rates on first birth hazards in the subsequent year, raises questions on whether variations in economic context merely affect the timing of births or affect cohort completed fertility of first births as well. The hazard models on fertility recuperation indicate that cohort recuperation-effects do in fact compensate for fertility reduction imposed by adverse economic conditions at younger ages, but that socio-economic and between-country differentials are clearly more pronounced with respect to fertility recuperation.

In *France*, first birth hazards of men and women with lower levels of education do not show significant recuperation effects, but are no longer adversely affected by prevailing unemployment levels after age 30. Birth hazards of men and women with intermediate educational levels are negatively affected by unemployment rates prevailing after 30, whereas recuperation effects at the same time compensate for unemployment rates faced between ages 25 and 29. No adverse effect of prevailing unemployment levels is found on first birth hazards of higher educated men and women, whereas significant recuperation effects do emerge that compensate for unemployment faced earlier in the life course. Cohort completed fertility levels of first births that provide a more comprehensive account of recuperation suggest that variations in unemployment levels seem to have had limited effect on cohort completed fertility, regardless of socio-economic position.

In *Belgium*, however, fertility recuperation is characterized by pronounced socio-economic differentials: first birth hazards of women after age 30 are significantly affected by prevailing levels of unemployment, fertility of women with higher secondary education is insensitive to variation of unemployment levels, and fertility of higher educated women is characterized by compensatory or recuperation effects for adverse conditions encountered earlier in life, net of the contemporary economic context. The results for Belgium further show that period measures such as the synthetic parity progression ratio are quite sensitive at registering adjustments in family formation in response to adverse period conditions. The hazard models unveil this mechanism: unemployment in the preceding year negatively affects first birth hazards in the following year over a fairly broad age rang, particularly in the case of lower socio-economic groups, whereas older age groups are much more insensitive to contemporary variations in unemployment levels. Subsequently, the hazard models of fertility recuperation illustrate that older

age groups respond to unemployment levels 10 years earlier, net of contemporary economic context, particularly in the case of higher socio-economic groups. Although the hazard models only analyze recuperation at a lag of 10 years, the decomposition of cohort parity progression ratios by level of education confirms the results of the hazard models: despite strong period variations in the parity progression ratio of higher educated women in response to macro-economic factors such as unemployment levels, the proportion of women actually making the transition to parenthood has remained largely unaffected. This is not the case for lower educated women. The lack of recuperation emerging from the hazard models is confirmed by the cohort parity progression ratios for these groups: period induced reductions of first birth hazards have actually translated in to lower proportions of women making the transition to parenthood. These results have some bearing for social policy and research on policy effects. Although unemployment benefits in Belgium are not limited in time and child benefits are universal, completed fertility levels of lower socio-economic groups have been affected by deteriorating economic conditions. Higher educated women on the other hand seem to have benefitted disproportionately from the policy endorsed by subsequent Belgian governments since the early 1970s aimed at the de-familialisation of care-burdens (Esping-Andersen 1999). Although 2001 census does not provide information on socio-economic differentials in the uptake of measures such as formal childcare arrangements (Neyer and Andersson 2008), recent research does show that high income groups make greater use of formal childcare arrangements than lower income groups. With respect to research into effects of social policies on family formation, the Belgian results seem to be in line with the conclusion drawn by Gauthier in her literature review of policy effects: studies that merely introduce standard (i.e. additive and linear) statistical controls for important variables such as educational attainment are likely to gloss over relevant socio-economic differentials that are likely to emerge from more complex interaction models.

Finally, in the *Netherlands*, prevailing unemployment levels continue to shape fertility of men and women after age 30, regardless socio-economic position, in tandem with positive recuperation effects that compensate for conditions experienced at younger ages. The aggregate outcome is that cohort completed fertility of first births over subsequent birth cohorts have been strongly shaped by variations in the economic context, regardless of the socio-economic position of men and women involved.

6. CONCLUSIONS

The analyses discussed in the previous sections investigated the effect of varying macro-economic conditions such as unemployment rates on first birth hazards in Belgium, France and the Netherlands between 1960 and 2005. Particularly attention was paid to period-induced postponement of first births as a result of adverse economic circumstances, on cohort recuperation-effects where postponed births are potentially recuperated later in life and on socio-economic differentials in the postponement and recuperation.

The hypothesized postponement-recuperation mechanism was found to operate in all three countries included in the analysis, but substantive socio-economic differentials and between-country differentials emerge both in terms of period-induced-postponement and cohort-recuperation of first births. Despite pronounced effects of economic context on postponement, the effect of economic conditions such as unemployment rates on cohort completed fertility is limited in France, where also limited variation emerges in terms of socio-economic position. Socio-economic differentials are more pronounced in Belgium, where all socio-economic groups postpone first births in response to high unemployment, but higher educated women have been more successful in recuperating fertility at older ages. The postponement-recuperation mechanism is also operative in the Netherlands, but prevailing economic conditions continue to shape fertility outcomes of all socio-economic groups after age 30, despite significant recuperation effects. As a result, cohort completed fertility levels in the Netherlands seem to have been most affected by variations in the economic context.

Finally, the detailed results for Belgium show that period fertility measures such as synthetic parity progression ratios are very sensitive to period-induced postponement effects and that these indicators do not represent the fertility levels of different socio-economic groups as cohort completed fertility levels of first births are largely shaped by socio-economic differentials in cohort-recuperation. These cohort-effects, however, have routinely, although incorrectly, been assumed to be unimportant.

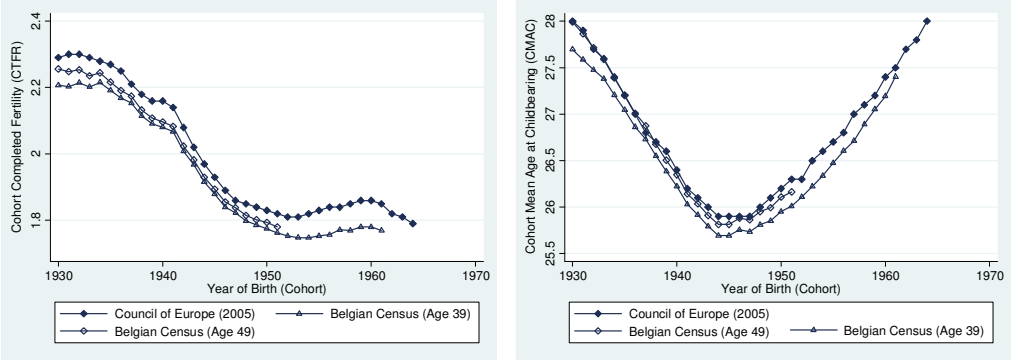
7. APPENDIX

The analyses use individual data from the 2001 census *(Belgium)* and data from the first wave of the Generations & Gender Survey *(France, Netherlands, Germany)*. This appendix validates cohort fertility indicators calculated retrospectively from the census and GGS against series drawn from vital registration in order to document and assess the external validity of the longitudinal analyses presented in the previous sections.

Belgium

The Belgian census provides the maternity histories of all women aged 14 and older in 2001. Extensive validation of the maternity history data against vital registration shows that retrospective estimation of cohort fertility schedules yields reliable estimates of cohort completed fertility for single-year cohorts born between 1911 and 1986 (Gadeyne et al. 2010).

Figure A.1 Validation of cohort completed fertility (left) and cohort mean ages at childbearing (right) estimated retrospectively from the 2001 Belgian census against vital registration (Council of Europe, 2005).



Source: Council of Europe (2005) & Statistics Belgium, 2001 Census, Calculations by author.

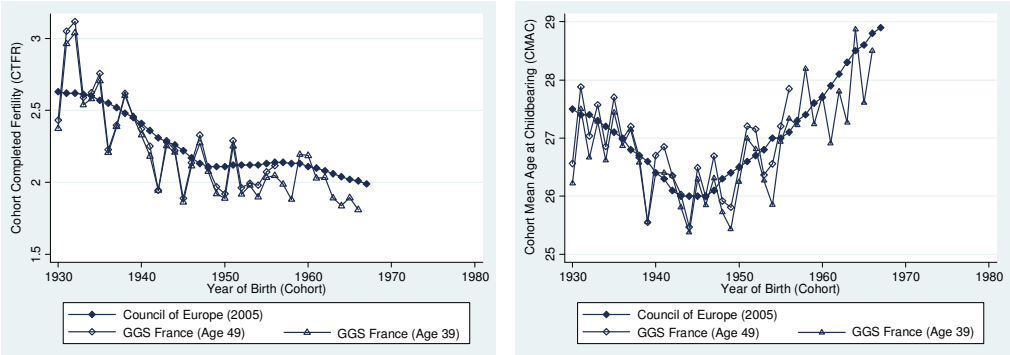
For women born between 1930 and 1961, figure A.1 compares cohort completed fertility levels estimated retrospectively from the 2001 census data against longitudinal fertility data published by the Council of Europe (2005). Because maternity history data are generally poorer for foreign women, the census-based series have been restricted to women holding the Belgian nationality in 2001. As a result of this selection, the census-based estimate of completed fertility at age 49 is low by 0,04 children per woman on average for women born between 1930 and 1951, whereas the cohort mean age at

childbearing is underestimated by 0,04 years. In summary, the bias compared to vital registration associated with the restriction to women holding the Belgian nationality is very limited. Because retrospective estimates turn out to be quite stable, even for single-year cohorts, the Belgian census clearly provides the more reliable estimates of the effects of economic recession on tempo and quantum of order-specific fertility compared to retrospective estimates based on survey data such as the GGS.

France

Figure A.2 compares cohort completed fertility levels estimated retrospectively from the first wave of GGS France against data published by the Council of Europe (2005) for single-year cohorts of women born between 1930 and 1967 [8]. Despite year-to-year variations that are typical of retrospective survey-based estimates, the GGS provides an accurate account of trends in cohort completed fertility in France. For women born between 1930 and 1956, the GGS underestimates cohort completed fertility at age 49 by 0,0287 children on average. The GGS-based estimates of the cohort mean age at childbearing equally provide an excellent approximation of shifts in the tempo of childbearing among cohorts born between 1930 and 1967. For women born between 1930 and 1956 The French GGS overestimates cohort mean ages at childbearing by 0,0312 years on average.

Figure A.2 Validation of cohort completed fertility (left) and cohort mean ages at childbearing (right) estimated retrospectively from GGS France (Wave 1, 2005) against vital registration (Council of Europe, 2005).



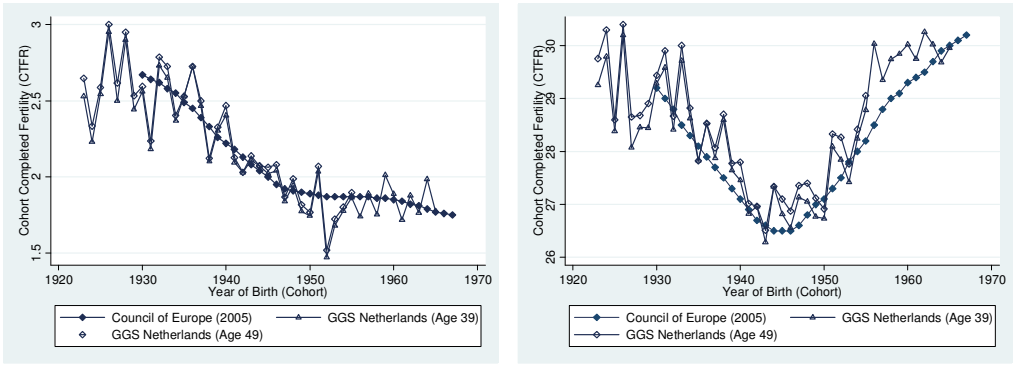
Source: Council of Europe & GGS France, Wave 1, Calculations by author.

[8] The GGS-data for France have been weighted using the weights included in release 1.8 of the harmonized data file.

Netherlands

The first wave of the Generations & Gender Survey in the Netherlands (2003) equally provides accurate estimates of completed fertility and mean ages at childbearing for cohorts of women born between 1930-1965[9]. Validation against longitudinal indicators published by Council of Europe (2005) shows that completed fertility at age 49 estimated retrospectively from the GGS is low by 0,0074 on average for the 26 single-year cohorts of Dutch women born between 1930 and 1956. The mean age at childbearing based on the GGS is also consistent with the trend emerging from vital registration data. For women born between 1930 and 1956 the retrospective estimate based on the GGS overestimates mean ages at childbearing by 0,4824 years on average compared to vital registration (Council of Europe, 2005).

Figure A.3 Validation of cohort completed fertility (left) and cohort mean ages at childbearing (right) estimated retrospectively from GGS Netherlands (Wave 1, 2003) against vital registration (Council of Europe, 2005).



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