Fertility choices of couples and relocations in the life course

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Abstract

Using data from retrospective surveys carried out during the early 1990s in the Netherlands, we investigate how fertility choices of couples and their residential mobility (*i.e.* short distance moves) are interrelated, both in a direct and indirect way.

The results show that the interrelationship between fertility and relocation careers is more complex than what is usually presented in the literature. The fact that children hamper relocation is not true per se: relocations are in fact likely to happen during pregnancy of the first and third (or higher-order) child, while after the birth of the child relocation is hampered, particularly when children are of school age. This finding support both the hypothesis that relocation is likely to occur in anticipation to changes in household situation, and that having children creates ties with the current location. At the same time, relocations also seem to favour fertility, at least after some month since the move.

Introduction

Residential relocations can be considered as instrumental behaviour for achieving specific goals in another parallel career (Lee, 1966), as for example the working career or the household career. The literature has already pointed out that demographic life course events can be considered as possible

determinants of the decision to move (Courgeau, 1984), especially over short distances. The first specific case of an independent residential move is usually the leaving parental home, a crucial event in the life of people since it belongs to the process of transition to adulthood (Mulder and Hooimeijer, 2002). Relocation can also be connected to other demographic events, as for example a marriage (Mulder and Wagner, 1993) or the birth of a child. It is therefore said that a parallel life-course career might *trigger* a relocation event.

At the same time, the housing situation itself creates strong links with a specific place or a specific dwelling situation, and this can limit the set of available options in other parallel careers (*i.e.* the housing career *conditions* other choices). For instance, living in the city usually offers many more job opportunities than the rural areas, and occupational careers can strongly differ depending on the place of residence.

The household career can also be affected by the housing situation, since living in a small house can hamper fertility, and a new accommodation has to be found to realize fertility plans: empirical findings suggest that the need to adjust housing to changes in the household composition is an important source of mobility (Grundy, 1986; Baizan, 2002), and residential mobility can thus be a possible response to fertility and fertility plans.

Given those ideas, and focusing attention on fertility, the question arises to what extent household and housing careers really influence and condition each other, especially in the choice of having children. In particular, we are interested in analysing how couples' strategies are concerning both having children and residential mobility (*i.e.* having a short distance move).

The issue of mutual influence between housing and household choices has not often been addressed in the literature. Mulder and Wagner (2001) investigate interconnections between household events and first time ownership. The remaining existing literature mainly focuses on influences in one direction. A number of studies address the influence of fertility on housing (for example, Mulder & Wagner, 1998) or on residential mobility (Clark et al., 1984; Wagner, 1989). These studies usually stress the importance of other parallel careers (such as the working career, the educational career, the marital history, etcetera) in conditioning and triggering the choice of having children. There are also studies addressing the influence of migration on fertility (Singley and Landale, 1998; Andersson, 2004; Kulu, 2004).

This paper focuses attention on the impact of fertility events on the housing choices and vice versa. Using data from retrospective surveys carried out during the early 1990s in the Netherlands, we investigate how fertility choices of couples and their housing relocations are interrelated, both in a direct and indirect way. We firstly focus on the one hand on the direct effect that having children has on the hazard of residential mobility (*i.e.* of having a short distance move),

and, on the other hand, on the way the decision of having an extra birth can be linked to the timing of a move. Secondly, we argue that both trajectories might be simultaneously affected by the fact that, apart from observed characteristics, individuals are heterogeneous in respect to their propensity of experiencing a birth and a relocation, and that those differences across individuals may be associated across processes.

Dealing with interdependent processes: the case of fertility and relocation

As we stated in the introduction, relocations can be considered as an instrumental behaviour for achieving specific goals in a parallel career, in particular in the household career. This means that a relocation is not considered as a goal per se, while it can be useful to reach a goal in another career.

If the goal to be reached consists in having children (and therefore relocation aims to have a better or bigger house in a better environment), it is likely that either we observe an event in the residential history due to a fertility change (current or planned), or we lack to observe a fertility change due to the fact that the current housing situation is not suitable for having children. In other words, we expect that fertility and fertility plans *cause* the decision of relocating, but whenever relocation is not possible, this impossibility to move might limit fertility.

Relocations motivated by other careers than the fertility career represent a different way *causation* can act between fertility and relocation careers. It may indeed happen that due to working reason, people decide to move from the suburbs to the city. The new environment is likely to be less suitable for having children, and therefore the relocation *cause* a postponement of childbearing. On the other hand, if relocation occurred from the city to the suburbs, this may accelerate fertility. In both cases, the relocation itself *causes* a change in the timing of fertility.

To formalize the latter ideas in terms of hypotheses on the decision process and on the empirical outcomes we expect to observe, it is useful to clearly distinguish the idea of *causation* from what we could call *empirical dependence* between events. In Cox and Wermuth's (2001) view, this means to separate the idea of "causality as explanation of a process" – what we called here *causation* - to "causation as stable association" – here *empirical dependence*.

Causation refers to the mechanism that generates the outcomes of the processes under study, or, in general, to the decision process underlying the events: the aim is therefore to *explain* the mechanism leading from a possible cause to a possible response. As stated by Cox and Wermuth (2001), this understanding typically comes from theory or from knowledge at a hierarchical level deeper than the one offered from the data. Indeed, the underlying process can hardly be observed directly: usually, we have information on some events taking place during the life course (as for

example when relocation happened or when children are born), while we ignore the decision process behind. Even when we try to analyse directly the decision process itself (as for instance via in depth interviewing), we have to be aware that respondents are subject to many different mental processes (as rationalisation) which hamper the real understanding of facts.

In our specific example, understanding the mechanism would mean to specify whether fertility leads a change in the relocation history (*i.e.* fertility is the leading choice, and relocation is a consequence of a fertility decision) and whether relocation itself turns out to be important in shaping fertility choices. In a graph, we will represent this hidden mechanism as an arrow, whose direction represents the direction of the causality of the mechanism underlying the observed behaviour.

Empirical dependence refers instead to the timing of the events and to the empirical measure of the effect that a change in the state of one process (for instance a new birth) brings about a change in the other process (as for example a relocation) in probabilistic terms. For example, we may find that a change in family size (due to a childbirth) is associated with an increase in the probability that the family experiences a relocation in the near future. This idea implies reference to time as a basic concept and derives empirical dependency following the sequencing of the events: in the latter example, the researcher would conclude that since "usually" a relocation follows a childbirth in a short time span, relocation empirically depends on fertility. Empirical dependence is detected whenever a pattern exists, in the sense that either that pattern appears more often than expected in a situation where the two events have nothing to do with each other (*i.e.* the first event enhances the probability that the second event happens as well), or less often (*i.e.* the first event hampers the second one). The important point consists in the fact that temporal ordering cannot be considered as sufficient proof of causal relationships [in the decisional mechanism] between interacting processes (Willekens, 1991): the "empirical dependence" does not mean causation in the decision process itself.

Representing this idea in a simple graph, where the left-right direction reflects the timing of events, the empirical dependence of relocation on fertility means that the sequencing pattern detected reveals that whenever we observe a fertility event (F), we might expect a consequence for the probability that a relocation event (R) may follow. Again, it is important to keep in mind that we can observe a positive effect (the second event appears more frequently than expected) as well as a negative one (less frequently).

There may be different mechanisms that may cause the observed empirical dependence of relocation on fertility. Long (1972) for instance demonstrated that married couples without children are more geographically mobile than married couples with children, and that mobility is even more

restricted during children's school ages. The likely mechanism underlying this pattern is that children create ties with the current location, thus hampering subsequent migration. In general indeed, if a family has to move, the net family gain will be evaluated, instead of personal gain (Mincer, 1978), or, at least, the eventual migration would be result of a negotiation process, which takes into account each family member's needs and wishes.

On the other hand, a new birth brings about a change in the need for space and in the required characteristics of a suitable dwelling. According to Clark et al. (1984) and Wagner (1989), the impact of childbirth (and pregnancy) on the probability of experiencing a short distance move is positive. In this respect, it is expected that the detected pattern reveals that relocation usually follows the birth of the child (and therefore we would hypothesise *adjustment* occurred in the housing career, due to a household event).

In all the presented cases, the mechanism underlying the observed behaviour runs from the fertility process (which in the decision comes first) to the relocation process. Therefore, in the graph representing empirical dependence, the direction of causation will run from the left to the right (*i.e.* fertility *causes* consequences on relocation process, see the direction of the arrow in Figure 1). The mechanisms differ then for the kind of consequences they bring about in the relocation history: while we expect relocation events are hampered by ties created from having children, especially during school ages (*i.e.* fertility has a negative impact on relocations), the fact of having a new child may require adjustment in the housing career, therefore temporarily enhancing a short distance move (*i.e.* fertility has a positive temporary effect on relocations). Notice moreover that if we consider conceptions as fertility events, a higher probability of moving may be observed both during pregnancy and during the first months following the birth of the child.

Figure 1. Empirical dependence of relocation on fertility: possible mechanisms, direction of causation and expected outcomes.

Mechanism	**Graphical representation**	**Expected effect**
Children create ties with current location	F → R	-
The birth of a child requires housing adjustment	F → R	+ (temporary)

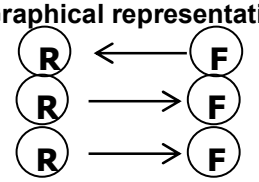
In sum, we expect that the effect of having children on the probability of a relocation varies with time (according to the age of the children): due to a new birth, the needs toward the accommodation change, resulting in a higher probability of moving during pregnancy or in the first months after the birth. In the following months, the probability of moving will decline, reaching relatively low levels: the couple has already adjusted to the new household situation without any residential move,

and ties with current location (in terms, for example, of social capital) increase due to the presence of children.

Up to now we considered the empirical dependence of relocation on fertility, but the opposite may occur as well: a relocation event can be associated with a greater/smaller chance of observing a childbirth afterwards.

Concerning the empirical dependence of fertility on relocation, we expect different mechanisms act at the same time, running now both from the fertility to the relocation process and vice versa (Figure 2).

Figure 2. Empirical dependence of fertility on relocation: possible mechanisms, direction of causation and expected outcomes.

Mechanism	**Graphical representation**	**Expected effect**
Anticipation of housing adjustment		+ (temporary)
Disruption		- (temporary)
Adaptation		? (temporary)

A clear example of the fact that empirical dependence may reverse the order of causation between processes is given by *anticipation*. Assuming for example that relocation acts as instrumental behaviour for achieving fertility goals, it might happen that people decide to relocate (we would observe R) because they want to have children (F follows), and therefore we would observe first a relocation event and then a birth. While the temporal ordering of events under study points out that fertility is empirically dependent on relocation, the causal mechanism runs in the opposite direction. The idea relocation might occur in anticipation of childbirth is supported by some empirical results: Courgeau (1989) suggested that having moved from the city to a suburban area (or rural area) due to anticipation was the case for Paris region; Clark et al. (1984) and Wagner (1989) claimed the existence of an anticipative strategy for relocations in general; Feijten and Mulder (2002) found empirical evidence for anticipative behaviour of both moving into an owner occupied home and moving to a first single-family dwelling. In all previous examples, since couples decided to have children, they moved to a more suitable setting, with the result that in a first period after a relocation takes place, we should find a higher probability of experiencing a conception (or a birth).

The mechanism underlying empirical dependence of fertility on relocation can also run from relocation to fertility events (relocation causes a change in the probability of experiencing a childbirth). In the literature concerning fertility of immigrants, the *disruption* effect of international migration has been often discussed (Goldstein, 1973; Carlson, 1985; White et al. 1995): due to

economic costs and socio-psychological stress associated with the process of residential relocation or the change in environment, fertility is expected to be postponed for some months after the move. Therefore, the overall fertility level of the immigrant group appears to drop immediately after the move, resuming gradually after some time to its usual pattern (thus, its effect will be just temporary). In our case, however, we are dealing with short distance moves. These allow the daily activity space to be at least partially maintained. No time is needed to adapt to a new language, or to a new society. Therefore the socio psychological stress is expected to be lower than for migration. Still, the process of finding a new home, moving, decorating the new home and getting used to a new neighbourhood might lead people temporarily to postpone fertility.

An additional mechanism shaping fertility of immigrants after their move consists in *adaptation*: individuals whose tastes and values concerning the family are shaped according to the current social context they live in may adapt to the fertility behaviour prevalent at the destination environment after a move (Courgeau, 1989; Kulu, 2003). The new environment will be characterised by different economic condition for childbearing and different norms and values toward family.

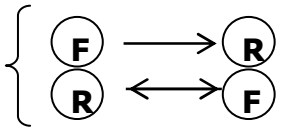
The latter hypotheses are often applied to international migration or migration from rural to urban settings in developing countries, where a move certainly means a very strong change in the social context. However, even though in this paper we are only considering short-distance relocations, *adaptation* might play an important role as well. Whenever relocations are motivated by other careers except the fertility career, the move might indeed bring about new circumstances, where fertility choices are harder or easier. If for instance due to some reason (as the working career), people decide to move from the suburbs to the city, where the new environment is likely to be less suitable for having children, relocation might *cause* new behaviour toward childbearing. On the other hand, if relocation occurred from the city to the suburbs, this may accelerate fertility. In both cases, the relocation itself seems to *cause* a change in fertility choices.

In this respect we need to underline that the place of residence itself (*i.e.* urban, suburban or rural setting) can be related to the decision of having children, both for the offered spatial opportunity structure and for the lifestyle orientation that living in a certain environment represents. Indeed, in suburban areas, there is a much higher share of single-family dwellings and owner occupied dwellings with gardens (which, according to Mulder and Wagner, 1993 and 2001, and Feijten and Mulder, 2002, better suit to the needs of people in situations which bind them for a long period – *i.e.* married or with children). Apart from this, living in a specific setting can also represent a different orientation with respect to the spending of time, money, and energy people have: for instance, according to Bootsma (1998), familistic oriented households have a higher inclination to

live in the suburbs, while households having a work oriented lifestyle are more inclined to live in the city.

The general picture we outlined up to now can be summarized as in Figure 3: we expect to find empirical dependence of fertility on relocation and of relocation on fertility. The causal mechanism is thought either to run in the same direction as empirical dependence or in the opposite direction (if *anticipation* occurs, the fertility choice is *causing* a short distance move, even if empirically we would observe first a relocation and then a childbirth).

Figure 3. Empirical dependence and causality mechanisms between relocation and fertility.



Control variables and simultaneity of choices

Since our aim consists in analysing the reciprocal impact of fertility on relocation and vice versa, we need also to control for a number of independent variables that are known to be important in influencing each process.

Previous empirical studies have shown that *duration of residence* is a major factor influencing migration. In case of long distance moves, people who had lived longer in the same region are less prone to move, since long-term residents accumulate location specific capital that would be lost in case of a move (Fisher and Malmberg, 2001). Such a duration effect can also be expected for short distance moves. However, for the short term a different effect of the duration of stay can be expected: if somebody just relocated, the likelihood of moving soon is expected to be very low, and to rise again during time. This is because moving requires an investment in terms of both money and time.

Moreover, *homeownership* and *living in a single-family dwelling* are hypothesised to restrict the likelihood of moving: ownership requires a long term investment, and, just like single-family dwellings compared with flats or apartments, owned dwellings are more spacious and have more comfort compared with rental dwellings (Feijten and Mulder, 2002). Those characteristics make this kind of dwellings particularly suitable for those who are in stable household situations and render relocation less attractive. As we previously discussed, marriage constitutes an additional factor which could hamper migration: after a first period of housing adjustment, married couples result less mobile in terms of residential setting (also because, as shown by Mulder and Wagner, 1993, the event of becoming an owner for the first time is closely connected with marriage).

In studying fertility, we will take into account various characteristics of the fertility process itself (as in Michielin, 2004). First, entering parenthood will be distinguished from transition to higher parities: *duration of the relationship* is expected to be a crucial element for having the first child, while *time since last birth* determines the risk period for having an additional child: the risk associated with the length of the exposure will constitute our baseline hazard. Then, the higher number of children already had, the lower the probability of reaching a higher parity.

For understanding subsequent fertility, the *length of the interval* between previous births or between the starting of the union and the first birth will be considered as well: a short interval is likely to predict shorter spacing to next birth (Yamaguchi and Ferguson, 1995). Due to intergenerational transmission of social norms, we also expect that people with a high number of siblings will have a higher probability of having more children than others.

In addition, we will control for birth cohort, level of education, age and sex of respondent in both processes. Indeed, Feijten and Mulder (2002) already showed that housing behaviours have changed through time (the transition to home ownership and to living in single family dwellings have been accelerated), while demographic events have been postponed by younger *birth cohorts*. Concerning the *educational level*, we expect highly educated people to delay first birth and make up for lost time afterwards (Kravdal, 2001), while the impact of education on relocation is not expected to be very strong. This is unlike what happens in long distance moves, where highly educated people show higher probability of migrating (Sandefur and Scott, 1981). Finally, an increase in *age* is expected to be associated with a lower propensity of having children and relocating.

Many of the above-mentioned set of variables are expected to influence both relocations and fertility. Besides, there might be unknown factors as well, which are not explicitly considered by the researcher, but which influence the probability of experiencing a relocation or a new conception. In other words, we expect to be able to only partly directly take into account the heterogeneity among people via observed characteristics. The portion of heterogeneity we are not able to explicitly include in the models can be accounted for via a heterogeneity term. Simultaneity of choices increases the need of controlling for unknown factors and their correlation among different processes (see for instance Lillard and Waite, 1993).

Data and methods

The empirical investigation is based on two retrospective surveys carried out at the beginning of the 1990s in The Netherlands. Both surveys include information about household and

housing histories, and also other important information concerning education and labour market trajectories. The first data source is the SSCW survey (ESR/STP, 1992), held in 1992 among a sample of about 3000 respondents, while the second is the Netherlands Family Survey (Ultee and Ganzeboom, 1993), with data on 1000 respondents. Both survey are representative of the Dutch population, and could therefore be pooled.

Our research population consists of those 2722 respondents who have ever been in a cohabiting or married partnership; we only consider these respondents while they are cohabiting or married. Focusing attention on cohabiting or married couples we will be able to isolate the period in which people are usually 'at risk' of giving birth to a child, to study in the interrelation between fertility and relocation a better way. During the period of observation the respondents had 4513 children and experienced 2315 relocations.

Individuals are considered at risk of conceiving a child and relocate starting from the beginning of their union, including both cohabitation and marriage. Furthermore, concerning childbirths, we distinguish by parity order: the risk of having a first child starts from the beginning of the union, while the risk of conceiving a child of higher order starts from the birth of the previous child. Analogously, exposure to relocation starts either at the beginning of the union (for first relocation) or after the last relocation event. To define relocation, we considered all moves over distances shorter than 40 kilometres.

Via event history techniques we simultaneously model the (log)hazard of experiencing a relocation and a conception (Lillard, 1993). Generally, we express the logarithm of the hazard rate as a function of different covariates:

$$\ln h(t) = y(t) + \sum_k z_k(u_k + t) + \sum_j a_j x_j + \sum_i b_i w_i(t) + \varepsilon$$

.

In the model, we therefore include: a baseline duration ($y(t)$), which captures the impact of the duration of the exposure on the log-hazard measured in months, additional splines ($z_k(u_k + t)$) to represent the dependence on other dimension of time, as for instance the age of the woman in a flexible way, or the age of the youngest child as well as time since last relocation or since marriage. Moreover, we also consider other time constant (x_j) and time varying covariates ($w_i(t)$) whose effect is to shift the baseline hazard proportionally.

The hazard of relocating is influenced by a number of time-related factors including time since last move, by a set of exogenous covariates (being married, residential setting, home-ownership, living in a single-family dwelling, level of education and the sex of respondent), and by a set of endogenous covariates determined by the potentially correlated process of fertility. Because our main focus is on the precise way in which the endogenous covariates exert their influences,

these covariates are considered in different ways in various models. In a first model we only include the number of children and whether some child is school aged, in the second model we also account for the age of children, and in the last model being pregnant is considered explicitly.

Similarly, the hazard of conception is influenced by time-related factors (union duration for the first parity, age of the youngest child for second parity and higher, current age) and by other variables such as length of the previous birth interval, number of siblings, level of education and working situation. In the second and third models the time since the last short-distance move is considered explicitly.

The final component ε denotes an unobserved component, which is constant over time, and specific for each respondent. This factor accounts for the portion of heterogeneity we are not able to include in the models explicitly, and is aimed to reduce the bias of estimates. When studying simultaneously the two processes, we assign ε^p and ε^q to the two components for the processes p and q, and assume their joint distribution is bi-variate normal:

$$\begin{pmatrix} \varepsilon^p \\ \varepsilon^q \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_p^2 & \sigma_{pq} \\ \sigma_{pq} & \sigma_q^2 \end{pmatrix} \right).$$

Both the variances (σ_p^2, σ_q^2) and the correlation between heterogeneity terms (ρ_{pq}, which follows from the covariance) are estimated by the model. If σ_p^2 and σ_q^2 are different from zero, the model assesses that even if we control for observed source of heterogeneity, there may still be differences among people in the way they are prone to experience each event; ρ_{pq} allows to control for the potentially simultaneous effect that individual unobserved characteristics might have on the outcome of the two processes.

Results

In describing the results, we mainly focus on the reciprocal impact of fertility events on relocation and vice versa, presenting the results of all the three different models we discussed above. The first model only considers being married and the number of children as having an effect on the relocation process, while in the others both the number and the age of the children are expected to have an impact on relocation choices, and also the time since relocation is directly considered to predict a new fertility event. In other words, while the first model of relocations only deals with the state of fertility (*i.e.* number of children the respondent already had), in the second

the process itself is fully taken into account (*i.e.* we account for being pregnant, and time since the birth of each child). Similarly, the process of relocating is accounted for in the second model for predicting fertility events. In the last model, moreover, we explicitly consider that during pregnancy and in a short period preceding marriage (between 6 months before marriage and marriage itself) it can be associated a different probability of moving (if a relocation takes place in anticipation of a household event, this probability is likely to be higher than usual).

After discussing the main results concerning interdependency of fertility and housing careers, a brief discussion follows of the impact of independent covariates on the probability of experiencing a conception and a relocation.

Results on the direct reciprocal impact of fertility on relocation and vice versa

In the first model, we consider the relocation process as a function of being married, of having children and of having school aged children, not taking into account that the effect of these covariates might change during time. The results are similar to those found in the literature: moving is restricted during marriage, and children create further ties with the current residential location, particularly while they are of school age. As shown in Table 1, all the parameters that refer to marriage, number of children, and having school aged children are negative and significant, even though we do not find significant differences between people with only one child and people with more children.

Table 1. The effect of household characteristics on relocation: Model including states only

	Model 1		
	Estimate		**St. Err.**
Being married (ref.: cohabiting)	-0.5424	***	(0.0697)
Having children (ref.:no)			
1 child	-0.2441	***	(0.067)
2 children	-0.1918	**	(0.081)
More than 2 children	-0.2313	*	(0.117)
Having school aged children (ref.: no)	-0.1202	*	(0.071)

p <0.10, ** *p* <0.05, *** *p* <0.01. Fit statistic: Ln-L -40636.3

Control variables in the model: baseline risk, age, cohort, sex, educational level of respondent, residential location in both processes; ownership, living in a single-family dwelling for relocation process; parity, number of siblings, being in education and working for fertility process.

In the second model, we account both for the number and the age of the children in the relocation equation, as well as for marriage duration. Time since relocation is directly considered in the prediction of a new fertility event. The evidence of a negative impact of children and marriage found in Model 1 now appear to be the result of an effect that varies through time. The hazard of relocation jumps up in coincidence with marriage (the intercept of marriage is positive and significant), and afterwards decreases during time: the slopes of the spline are all negative (though not always significant). At the same time, having children does not seem to constitute a reason per se for staying in the current location: the ties increase with time, with a speed which is stronger for the higher birth orders. Again, having school aged children hampers relocations further.

Table 2. The effect of household characteristics on relocation: Model including processes

	Model 2	
	Estimate	**St. Err.**
Marriage		
Marrying (intercept)	0.2867 *	(0.166)
Slope 0-6 months	-0.0510	(0.031)
Slope 6-24 months	-0.0309 ***	(0.006)
Slope 24+ months	-0.0004	(0.001)
Having children (ref.:no)		
Having the first child (intercept)	-0.0659	(0.089)
Slope (1st child)	-0.0012	(0.001)
Having the second child (intercept)	0.0252	(0.098)
Slope (2nd child)	-0.0016	(0.001)
Having the third child (intercept)	0.0355	(0.159)
Slope (3rd child)	-0.0030 *	(0.002)
Having school aged children (ref.: no)	-0.1316 *	(0.073)

Fit statistic: Ln-L -40601.2, significant improvement in respect with Model 1.

Control variables in the model: baseline risk, age, cohort, sex, educational level of respondent, residential location in both processes; ownership, living in a single-family dwelling for relocation process; parity, number of siblings, being in education and working for fertility process.

This second model seems therefore to describe the impact of fertility events on relocation better than the simplest model. However, it is interesting to see the changes when, in the third model, we take into account that anticipation may occur (Table 3 and Figure 4).

Table 3. The effect of household characteristics on relocation: Model including processes and anticipation

	Model 3

	Estimate	St. Err.
Marriage		
Being about to marry (between 6 months before marriage and marriage)	0.4170 ***	(0.159)
Marrying (intercept)	0.3685 **	(0.179)
Slope 0-6 months	-0.0546	(0.035)
Slope 6-24 months	-0.0325 ***	(0.007)
Slope 24+ months	-0.0010	(0.001)
Having children (ref.:no)		
Being pregnant of the first child	0.3971 ***	(0.095)
Having the first child (intercept)	0.0587	(0.088)
Slope (1st child)	-0.0021 *	(0.001)
Being pregnant of the second child	0.0608	(0.129)
Having the second child (intercept)	0.1332	(0.098)
Slope (2nd child)	-0.002 *	(0.001)
Being pregnant of third or higher order children	0.3859 ***	(0.133)
Having the third child (intercept)	0.1876	(0.143)
Slope (3rd child)	-0.0034 **	(0.001)
Having school aged children (ref.: no)	-0.1328 *	(0.072)

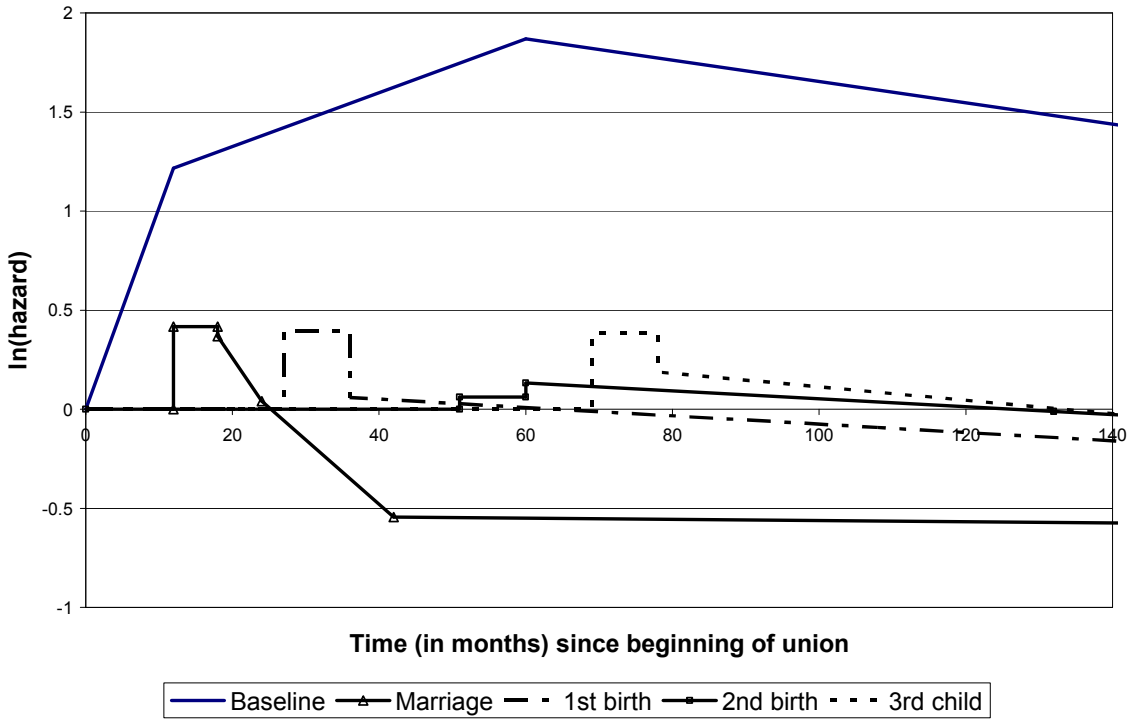
Fit statistic: Ln-L -40586.3, significant improvement in respect with Model 2.

Control variables in the model: baseline risk, age, cohort, sex, educational level of respondent, residential location in both processes; ownership, living in a single-family dwelling for relocation process; parity, number of siblings, being in education and working for fertility process.

Both the period preceding marriage and the pregnancies of the first and third (or higher-order) births are associated with a higher risk of moving. The complete trend is shown in Figure 4, which illustrates the time-dependent effect of marriage and having children on the log-hazard of relocating as well as the shape of the log-baseline duration effect. Generally, the risk of experiencing a short distance move steeply rises in the first year after relocation, increases further moderately for four years, and decreases thereafter (baseline risk). Consider now an individual who moved at the beginning of cohabitation, marries 1 year and a half later, has a child 3 years after the start of the relationship, and two additional children after 2 years and 1 and a half years from the previous child. In the figure, the additional effect of the covariate and the total combined effect resulting from adding the duration effect to the effect of household events are represented.

For instance, the hazard jumps up in the previous 6 months before marriage, is still quite high at the time of marriage and declines afterwards. Having a first child is instead associated with a higher probability of moving during pregnancy, while after the birth the probability of moving declines again. The same effect holds for the third child, whereas we do not find any positive effect of being pregnant of the second child.

Figure 4. The effect of household characteristics on relocation (complete model)



Additional results are derived from the analysis of the (empirical) effect of relocation on the hazard of conceiving a child. A residential move itself has an effect on the fertility process: despite the fact that neither the coefficient of the intercept nor the slope referring to the first 6 months after relocation are significantly different from zero (which means that we do not find any strong effect of relocation soon after the move), we find a positive effect of relocation on the probability of having a child in the few years afterwards.

Table 4. The effect of relocation on fertility: Model including processes and anticipation

	Model 3	
	Estimate	**St. Err.**
Relocation		
Moving (intercept)	-0.1578	(0.145)
Slope 0-6 months	-0.0007	(0.031)
Slope 6-24 months	0.0262 ***	(0.009)
Slope 24+ months	-0.005 ***	(0.001)

p <0.10, ** *p* <0.05, *** *p* <0.01. Fit statistic: Ln-L -40636.3

Control variables in the model: baseline risk, age, cohort, sex, educational level of respondent, residential location in both processes; ownership, living in a single-family dwelling for relocation process; parity, number of siblings, being in education and working for fertility process.

Results on control variables

Concerning the control variables, the results confirm our expectations. First, the likelihood of moving sharply increases in the first period of relocation (since the chances of moving soon after a relocation are very low), increases further at a lower speed afterwards and, after 5 years, starts declining again (see Table 5). Age, moreover, has a negative effect on the probability of experiencing a short-distance move.

Table 5. The effect of control variables on relocation and fertility: complete model

Results for relocation process			***Results for fertility process***		
	Estimate	**St. Err.**		**Estimate**	**St. Err.**
Birth cohort			***Birth cohort***		
1915-1924	0.4076 ***	(0.160)	1915-1924	-0.0246	(0.094)
1925-1934	0.4823 ***	(0.152)	1925-1934	-0.3632 ***	(0.096)
1935-1944	0.7342 ***	(0.147)	1935-1944	-0.6554 ***	(0.096)
1945-1954	0.6946 ***	(0.154)	1945-1954	-0.8292 ***	(0.099)
1955-1964	1.0544 ***	(0.200)	1955-1964	-1.2570 ***	(0.175)
Kind of dwelling			***Length of previous birth interval***		
Owned (vs rented)	-2.1170 ***	(0.099)	Slope	-0.0159 ***	(0.002)
Single-family (vs oth.)	-0.5766 ***	(0.058)			
			Number of children (ref. no children)		
			1	-5.5005 ***	(0.304)
			2	-6.5429 ***	(0.321)
			3+	-7.0438 ***	(0.334)
			Number of siblings		
			Slope	0.0581 ***	(0.008)
Residential area			***Residential area***		
Suburban area	0.2207 ***	(0.055)	Suburban area	0.1755 ***	(0.044)
Rural area	-0.0606	(0.078)	Rural area	0.2187 ***	(0.056)
Sex specific effects	-0.0636	(0.244)	***Sex specific effects***	0.9223 ***	(0.289)
Educational level (F)			***Educational level (F)***		
Medium	0.3214 ***	(0.082)	Medium (no children)	-0.1397	(0.089)
High	0.4140 ***	(0.115)	High (no children)	-0.1013	(0.126)
			Medium (with children)	0.0880 ***	(0.076)
			High (with children)	0.4234 ***	(0.111)
Age (F)			***Age (F)***		
Slope age	-0.0069 ***	(0.0005)	Slope (younger 35)	-0.0011 *	(0.001)
			Slope (older 35)	-0.0225 ***	(0.003)
Educational level (M)			***Educational level (M)***		
Medium	0.1504	(0.090)	Medium (no children)	-0.3147 ***	(0.09)
High	0.4378 ***	(0.102)	High (no children)	-0.2321 **	(0.111)
			Medium (with children)	0.1646 *	(0.077)
			High (with children)	0.3541 ***	(0.094)
			Enrolled (ref.:yes)	-0.7195 ***	(0.112)
			Working (ref.: no)	-0.3487 ***	(0.061)
Age (M)			***Age (M)***		
Slope age	-0.0070 ***	(0.0005)	Slope (younger 35)	0.0000	(0.001)

	Slope (older 35)	-0.0117 ***	(0.002)
	Enrolled (ref.:yes)	-0.0992	(0.083)
	Working (ref.: no)	0.3308 ***	(0.092)
Variance heterogeneity component	***Variance heterogeneity component***		
0.6549 *** (0.042)	0.6842 *** (0.037)		
Correlation among unobserved components -0.0966 (0.085)			

NOTE: Asymptotic standard errors in parentheses; significance: '*'=10%; '**'=5%; '***'=1%.

Interestingly, higher educational levels predict a greater likelihood of experiencing a short distance move, for both men and women. Moreover, if we do not consider home-ownership and living in a single-family dwelling (not shown here) we don't find any significant difference across cohorts (except for 1915-1924 birth cohort, which shows a slightly higher probability of relocating compared with the 1905-1914 birth cohort), and living in a rural or suburban setting is associated with a lower propensity of moving compared to living in urban settings. When we include variables for home-ownership and living in a single-family dwelling, we find a very strong negative effect of those variables on the probability of relocating. The effects of the other covariates which relate to housing characteristics change: younger cohorts show now higher propensity of relocating. This is balanced by the fact that the timing of becoming a homeowner shifted continuously to younger ages over the cohorts (see Feijten and Mulder, 2002), and the differences among residential settings now take the shape of only a slightly greater probability of relocating for people living in suburban settings than in other kinds of settings.

As far as the fertility process is concerned, the effect of control variables is again in the expected direction. The propensity of having an additional child decreases with the increase of the number of children already had. Moreover, the older the person, the smaller the probability of bearing an additional child; the longer the interval between previous births, the smaller the probability of proceeding to higher parity; the higher the number of siblings, the greater the probability of having a new birth.

The impact of level of education varies according to parity: people with a higher educational level tend to postpone parenthood, catching up for the lost time afterwards (however, in our models we only find a significant evidence for postponement of entry into parenthood of medium/highly educated people only for males and not for females, while the catching-up effect is significant for both sexes). Moreover, while working and especially being in education is hampering fertility choices for females, working males show a greater probability of having children.

The results for the control variables were quite stable in all the models we considered: they only change slightly according to the way we consider reciprocal impact of fertility on relocation and vice versa. Therefore, only the results for the third model are shown.

Finally, concerning unobserved heterogeneity components, the correlation coefficient is not significant, while the variances of each component are significantly different from zero.

Conclusions and final remarks

In this paper we focus attention on the impact of fertility events on the housing choices and vice versa. Using data from retrospective surveys carried out during the early 1990s in the Netherlands, we investigate how fertility choices of couples and their housing relocations are interrelated, both in a direct and indirect way.

Since we base our understanding of the interrelation between careers on the timing of events, while we do not have any direct information on the decision-making process itself, we explicitly distinguish between the possible causal mechanisms and hypotheses on the empirical outcomes we expect to observe – the empirical dependence.

In the theoretical section, we suggested that the empirical dependence of relocation on fertility might depend or on the fact that children create ties with current location or that the birth of a child brings about new needs concerning housing characteristics, and therefore enhances the probability of relocating for reasons of housing adjustment. At the same time, we also expected to find evidence of empirical dependence of fertility on relocation. In the latter case, the causal mechanism either runs from the relocation to the fertility process by means of disruption or adaptation, or vice versa (anticipation of housing adjustment causes a move before the birth of the child).

With respect to the mechanisms outlined above, the empirical results suggest that both the hypotheses that having a new child requires housing adjustment and that children create ties with the current location are confirmed. At the same time, housing adjustments appear to likely take place before the birth of the child, during pregnancy. Interestingly, this pregnancy effect is mainly found for first and third children. This finding may be related to the fact that when people decide to enter parenthood, it is likely they already plan or consider to have a second child as well (in fertility surveys, the desired number of children reported respondents is usually 2), while the third is not yet planned at that time. At the same time, the extra space required for having one child is probably

often enough for two children as well, but possibly not for three: the typical single-family home in the Netherlands has three bedrooms.

Moreover, we also found evidence of a positive impact of relocation on fertility, even if this positive impact does not appear immediately after relocation. Therefore, the disruption hypothesis is not supported. This shape of the effect of relocation on childbirth suggests instead that either relocation is undertaken in anticipation of fertility events, or the new residential setting experienced after relocation offers better opportunities for having children. However, since this effect is only temporary, and since we do not find any significant difference according to the destination of the relocation in terms of residential setting (urban, suburban, rural; models with these interaction terms are not shown here) the anticipation hypothesis seems to be the most likely.

All these findings suggest that there is a strong link between fertility events and housing careers. Relocation appears both in anticipation of fertility events and as a result of housing adjustment. Considering the process of having children, inclusion of the number of children in the analysis allowed us better to disentangle the interrelation between fertility choices and relocations. What is usually found to be a negative effect associated with having children appears to be the result of a temporary increase in the probability of moving first, and a negative trend in this probability afterwards. Time appears to be a key factor for understanding the effect of one life-course event on another.

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