Occupational Choice and Fertility

Jérôme Adda *
Christian Dustmann
Katrien Stevens
University College London and Institute for Fiscal Studies

July 19, 2007

Abstract

This paper develops a life-cycle model of fertility and occupational choice. The model allows for the endogenous timing of births and number of children, labour market participation, hours of work, wages and occupation. Wage profiles and the rate at which human capital depreciates when out of work are occupation-specific. To identify occupational choice, we use differential changes in regional availability of apprenticeship training positions over time as a source of exogenous variation. Shocks in availability of occupations thus affect subsequent fertility and career decisions. The model is estimated using survey and administrative data, and exploiting multiple cohorts in different geographical regions.

1 Introduction

The past century has seen a significant increase in labor market participation of women, with participation rates of mothers with young children increasing the most. During the same period, fertility rates have declined in many developed countries and women have delayed the arrival of their first child. To understand the dependencies between female participation decisions, occupational choices, wage dynamics and labor supply on the one hand and

*Funding through the ESRC grant RES-000-22-0620 is gratefully acknowledge

the fertility decision and the timing of births on the other, recognizing that joint nature of career planing and fertility, is difficult, as it involves a number of identification problems. Nevertheless, it is key to answer many important public policy questions.

There is a large literature which studies female careers over the life-cycle, but considering fertility decisions as exogenous. [1] Important examples are Mincer and Polachek (1974), Heckman and Macurdy (1980), Eckstein and Wolpin (1989), van der Klaauw (1996), Altug and Miller (1998) and Attanasio, Low, and Sanchez-Marcos (2004) [2]. These studies emphasize the role of previous labor market experience on labor market status and wages. They also emphasize the importance of child care costs as determinants of female labor supply. Other papers investigate fertility decisions of females, largely in isolation from their career decisions (Newman and McCulloch (1984)).

Few papers have modelled jointly fertility decisions and labor market choices. Hotz and Miller (1988) develop a life cycle model of fertility and female labor supply. However their model makes no connection between wages and fertility apart from the extensive margin in labor supply decisions. Francesconi (2002) also derives a joint model of fertility and career choices, emphasizing the choice of part-time work. [3]

This paper draws on this previous literature to combine a model of career and fertility choices. Due to the dynamic nature of the decisions concerning these outcomes, we cannot rely on reduced form models. Our model allows for the endogenous timing of births and the number of children, as well as labor market participation, number of hours worked and wage progression.

[1] A number of papers study the career of men such as Keane and Wolpin (1997).

[2] However, their model incorporate savings decisions

[3] Reduced-form studies investigating wages and fertility include Moffitt (1984) and Heckman and Walker (1990).

We model in addition occupational choice and how it interferes with fertility and wages. [4] In particular, following Mincer and Polachek (1974) and Mincer and Olfek (1982) we investigate how the loss of human capital following interruptions due to maternity leave shape fertility decisions across occupational groups. Rosenzweig and Schultz (1985) show that unexpected births, seen as exogenous shocks to fertility, have an impact on labor market participation and wages. Goldin and Katz (2002) have shown how (exogenous) changes in fertility, the diffusion of oral birth control pills, have changed education and career choices. We investigate the opposite relationship, considering how shocks to occupational choices affect subsequent fertility and career decision.

Our analysis is for Germany. We consider career choices of young women aged 15 or 16, and who choose apprenticeship education. This is about 60 percent of each cohort. The remaining 40 percent either join the labour market directly, or continue with high school education. Important is that the choice of school track in Germany is made earlier (at the age of 10). When enrolling in apprenticeship training (which usually lasts for about 3 years), women have to choose a particular apprenticeship occupation. There are about 360 registered apprenticeship occupations to chose from. Occupations range from craft (like carpenter) over services (like shop assistant of hairdresser) to medical (like medical assistant) to white collar occupations (like bank clerk). Occupations differ in their wage paths, as well as in the loss of human capital they imply when leaving the work force for a period. Although occupational changes are possible, and do occur, they are costly. Thus, this setting allows us to observe occupational choices of a large fraction of the female labour force at the earliest possible stage.

Another distinctive feature of our approach is that we combine data from

[4] The occupational segregation by sex has been emphasized by Polachek (1981).

a large number of cohorts who enter the labor market at different points in the business cycle and in different local labor markets, as in Adda, Dustmann, Meghir, and Robin (2006). This is an important advantage of our data over other sources such as the NLSY, which in essence follows one cohort of individuals. Thus controlling for time trends and for permanent regional effects, we use the differential changes in the availability of apprenticeship occupations as a source of identification within our structural model: Different regions include different concentrations of industry. As product prices fluctuate so does the local demand for labor and for apprenticeships, depending how the local industry is affected. While trade ensures local wages do not react to such shocks the number of apprenticeship positions will adjust. This argument provides us both with the required exogenous variation and with exclusion restrictions required to identify the effect of occupational choices on fertility. Using a difference in differences approach, we demonstrate in the descriptive part of the paper that the variation we use is indeed informative as far as occupational choices are concerned.

The paper proceeds as follows. Section 2 presents the model. Section 3 presents the data set. Section 4 presents the estimation methods and parameter estimates. Section 5 evaluates the effect of fertility on careers. Finally, Section 6 concludes.

2 The Model

2.1 An Overview of the Model

Our model takes individuals from late adolescence into the end of their working careers and focus on their occupational choices, labor supply decisions as well as fertility choices (number of children, spacing of births). Career choices and fertility decisions are interrelated as the loss of experience following a career interruption is occupational specific and depends on accumulated experience: for instance, in some occupation a career break early on penalizes women more than one later on.

In each period, an employed woman has to decide whether to conceive a child or not. At the end of the period, she may get an alternative offer which consists of a particular occupation and number of hours (part time or full time). She then decides whether to keep the current job, move to the new one or drop out of the labor force. She also faces the risk of being fired, unless she is pregnant. If the women is not contracepting, a child is conceived with a probability that depends on the age of the mother. When she is through with her pregnancy, a baby is born and the mother is entitled to maternity leave, a period during which she is paid. At the end of the leave, she is entitled to resume her previous job.

While out of work, the agent gets unemployment benefits at a replacement rate of 55%. The agent may receive a new offer and choose whether to stay unemployed or take up that offer.

A mother derives utility from her children. Children also alters preferences derived from leisure time, especially when the children are young. The model takes explicitly into account the age of the youngest child, which affects preferences for part time work and for being out of work.

The model is estimated using a simulated method of moments approach. We identify the model through a choice of relevant moments (see below) and an exclusion restriction. As in Adda, Dustmann, Meghir, and Robin (2006), we assume that occupational choices are determined through exogenous variations across region and time in the supply of apprenticeship positions.

2.2 Formal Presentation of the Model

Let $\Omega = (age_M, X, O, \lambda, N, Preg, age_K)$ be the vector of all state variables, where age_M is the age of the mother, X is the number of periods of labor market experience, O is the current occupation or the last one if not working, $\lambda = \{0, 0.5, 1\}$ is an indicator of hours of work (no work, part time or full time), N is the number of children, $Preg$ is a counter for the number of period of pregnancy (0 denotes non pregnancy status), age_K is the age of the youngest child (0 if $N = 0$).

2.2.1 Occupation and Hours of Work

In each period (quarter), the agent may choose an occupation and hours of work (no work, part time or full time). We denote the full set of occupation O and hours of work λ by $i = \{1, \ldots, I\}$. New offers of an occupation/hours of work arrives randomly in each period. The probability of receiving an offer of occupation/hours of work j while in occupation/hours of work i is noted ϕ_{ij}. Occupation affects work in many dimensions. First, occupational choice affects wages through an intercept and through specific returns to experience. Second, occupational choice affects the accumulation of experience, when the agent is not working. We allow for different atrophy rate (loss of experience) across occupation. The atrophy rate is also a function of experience. Experience for a woman in occupation/hours of work i evolves as:

$$X' = X + \rho(i, X) \tag{1}$$

$$\text{with} \quad \rho(i,X) = 1 \qquad \text{if working full time}$$
$$\rho(i,X) = 0.5 \qquad \text{if working part time}$$
$$\rho(i,X) < 0 \qquad \text{if not working.}$$

This allows to capture the fact that individuals with sale job may loose less than those in more skilled office jobs while out of the labor force. Finally, occupations affect preferences for those with (young) children as some professions are more child friendly.

2.2.2 Wages

Wages depend on experience, occupation and (unobserved) individual ability:

$$w = w(X, O, \varepsilon) \tag{2}$$

ε is the unobserved type (by the econometrician) of the agent.

2.2.3 Utility Function

The agent derives utility from earnings and leisure and from non pecuniary motives which includes the type of current or past occupation and the number of children. Agents derive also a utility of working part time, and we allow this to vary with the presence of children and especially of young children. We denote the utility function:

$$u(\lambda w, O, N, \lambda, age_K)$$

where λ is equal to 0.5 (1) for a part time (full time) job.

2.2.4 Dynamic Choice

The dynamic choice depends whether the agent is currently working or out of the labor force. If the agent is employed at the start of the period, she has to decide whether to try to conceive a child or not. The overall value is denoted:

$$V_i = \max[V_i^C + \eta_i^C, V_i^{NC} + \eta_i^{NC}]$$

where η_i^C and η_i^{NC} are two tastes shocks, drawn from an extreme value distribution. The value of not conceiving a child is given by:

$$\begin{aligned} V_i^{NC}(\Omega) &= u\left(\max(w(X, O_i, \varepsilon), b), O_i, N, age_K\right) \\ &+ I_{Preg=0}\left[\delta\beta EV_{i,U}(\Omega_i^{'}) + (1-\delta)\beta\sum_j \phi_{i,j}E\max[\tilde{V}_i(\Omega_i^{\prime}), \tilde{V}_j(\Omega_j^{\prime}), \tilde{V}_{i,U}(\Omega_i^{'})]\right] \\ &+ I_{Preg\in\{1,2\}}\beta\sum_j \phi_{i,j}E\max[\tilde{V}_i(\Omega_{i,P}^{\prime}), \tilde{V}_j(\Omega_{j,P}^{\prime}), \tilde{V}_{i,U}(\Omega_{i,P}^{'})] \\ &+ I_{Preg=3}\beta EM_i(\Omega_{i,M}^{'}) \end{aligned}$$

where a value function with a tilda represents the value function plus a taste shock which is assumed to follow an extreme value distribution (e.g. $\tilde{V}_i(\Omega_{i,P}^{\prime}) = V_i(\Omega_{i,P}^{\prime}) + \eta_i$).

Note that the agent may decide not to conceive a child either because a child is not desirable in that period, or, because the agent is already pregnant. At the last period of pregnancy, the agent goes into maternity leave. When pregnant, the agent cannot be fired, but can still decide to quit the labor force. When the agent is not pregnant, she can be fired with a probability δ, or choose from unemployment, staying on one more period with the current job, or move to an alternative job if one is offered (with a probability $\phi_{i,j}$).

The evolution of the state space is denoted as:

$$\Omega'_j = \begin{pmatrix} age_M + 1 \\ X + \rho(i, X) \\ Occup = j \\ N \\ Preg = 0 \\ I_{N>0}(age_K + 1) \end{pmatrix} \qquad \Omega'_{j,P} = \begin{pmatrix} age_M + 1 \\ X + \rho(i, X) \\ Occup = j \\ N \\ Preg = Preg + 1 \\ I_{N>0}(age_K + 1) \end{pmatrix} \qquad \Omega'_{j,M} = \begin{pmatrix} age_M + 1 \\ X + \rho(i, X) \\ Occup = j \\ N + 1 \\ Preg = 0 \\ 0 \end{pmatrix}$$

Experience evolves as follows. If the individual is working, experience is incremented by one if in full time occupation or one half in part time. If unemployed, experience depreciates (atrophy) and the rate of decrease depends on the current occupation as well as on the level of experience.

The value of conceiving a child is denoted:

$$\begin{aligned} V_i^C(\Omega) \;=\;& u\left(\max(w(X, O_i, \varepsilon), b), O_i, N, age_K\right) \\ &+(1-\delta)(1-\pi(age_M))\beta \sum_j \phi_{i,j} E \max[\tilde{V}_i(\Omega'_{i,NP}), \tilde{V}_j(\Omega'_{j,NP}), \tilde{V}_{i,U}(\Omega'_{i,NP})] \\ &+(1-\delta)\pi(age_M)\beta \sum_j \phi_{i,j} E \max[\tilde{V}_i^{NC}(\Omega'_{i,P}), \tilde{V}_j^{NC}(\Omega'_{j,P}), \tilde{V}_{i,U}^{NC}(\Omega'_{i,P})] \\ &+\delta(1-\pi(age_M))\beta E V_{i,U}(\Omega'_{i,NP}) \\ &+\delta\pi(age_M)\beta E V_{i,U}^{NC}(\Omega'_{iP}) \end{aligned}$$

Conception occurs with a probability $\pi(age_M)$, which declines with the age of the mother, in a non-monotonic way. We calibrate this function using medical data. Conception beyond the age of 45 is very unlikely. The state space evolves as:

$$\Omega'_{j,P} = \begin{pmatrix} age_M + 1 \\ X + \rho(i, X) \\ Occup = j \\ N \\ Preg = 1 \\ I_{N>0}(age_K + 1) \end{pmatrix} \qquad \Omega'_{j,NP} = \begin{pmatrix} age_M + 1 \\ X + \rho(i, X) \\ Occup = j \\ N \\ Preg = 0 \\ I_{N>0}(age_K + 1) \end{pmatrix}$$

If the agent is unemployed, she first decides whether to conceive a child or not:

$$V_{i,U} = \max[V_{i,U}^{C} + \eta_{i,U}^{C}, V_{i,U}^{NC} + \eta_{i,U}^{NC},]$$

where the value of not conceiving a child is:

$$\begin{aligned} V_{i,U}^{NC}(\Omega) &= u\,(b, N, age_K) \\ &+ I_{Preg=0}\left[(1-\phi_0)\beta EV_{iU}(\Omega'_{i,NP}) + \phi_0\beta\sum_j \phi_{i,j} E\max[\tilde{V}_{i,U}(\Omega'_{i,NP}), \tilde{V}_j(\Omega'_{j,NP})]\right] \\ &+ I_{Preg\in\{1,2\}}\left[(1-\phi_0)\beta EV_{iU}(\Omega'_{i,NP}) + \phi_0\beta\sum_j \phi_{i,j} E\max[\tilde{V}_{i,U}(\Omega'_{i,NP}), \tilde{V}_j(\Omega'_{j,NP})]\right] \\ &+ I_{Preg=3}\beta EM_{i,U}(\Omega'_{i,M}) \end{aligned}$$

At the end of the period, the agent is offered a new job with a probability ϕ_0 and decides whether to take up that job or stay out of work. If the agent is through her last pregnancy period, she is entitled to maternity leave. However, as she started off unemployed when pregnant, she is not entitled to full maternity benefits (hence the U subscript on the associated value function $EM_{i,U}$.

$$\Omega'_{j,NP} = \begin{pmatrix} age_M + 1 \\ X + \rho(i, j, U) \\ Occup = j \\ N \\ I_{Preg \in \{1,2\}}(Preg = Preg + 1) \\ I_{N>0}(age_K + 1) \end{pmatrix} \qquad \Omega'_{j,M} = \begin{pmatrix} age_M + 1 \\ X + \rho(i, j, U) \\ Occup = j \\ N + 1 \\ Preg = 0 \\ 0 \end{pmatrix}$$

The value of being out of work and trying to conceive a child is modelled as:

$$\begin{aligned} V^C_{i,U}(\Omega) &= u\left(b, N, age_K\right) \\ &+(1-\phi_0)\pi(age_M)\beta E V^{NC}_{i,U}(\Omega'_{i,P}) \\ &+(1-\phi_0)(1-\pi(age_M))\beta E V_{iU}(\Omega'_{i,NP}) \\ &+\phi_0(1-\pi(age_M))\beta \sum_j \phi_{i,j} E \max[\tilde{V}_{i,U}(\Omega'_{NP}), \tilde{V}_i(\Omega'_{i,NP})] \\ &+\phi_0 \pi(age_M)\beta \sum_j \phi_{i,j} E \max[\tilde{V}^{NC}_{i,U}(\Omega'_{i,P}), \tilde{V}^{NC}_j(\Omega'_{j,P})] \end{aligned}$$

$$\Omega'_{j,P} = \begin{pmatrix} age_M + 1 \\ X + \rho(i, X) \\ Occup = j \\ N \\ Preg = 1 \\ I_{N>0}(age_K + 1) \end{pmatrix} \qquad \Omega'_{j,NP} = \begin{pmatrix} age_M + 1 \\ X + \rho(i, X) \\ Occup = j \\ N \\ Preg = 0 \\ I_{N>0}(age_K + 1) \end{pmatrix}$$

The maternity leave lasts T_M periods. While on leave, the mother is not working and receives maternity benefits b_M. The value of maternity is defined as:

$$M_i(\Omega) = u(b_M, N)\frac{1-\beta^{T_M}}{1-\beta} + \beta^{T_M} \sum_j \phi_{i,j} E \max[\tilde{V}_i(\Omega'_{i,M}), \tilde{V}_j(\Omega'_{j,M}), \tilde{V}_{i,U}(\Omega'_{i,M})]$$

where the new state space is:

$$\Omega'_{j,M} = \begin{pmatrix} age_M + T_M \\ X + T_M\rho(i,j,U) \\ Occup = j \\ N \\ Preg = 0 \\ T_M \end{pmatrix}$$

$$\begin{aligned} M_{i,U}(\Omega) &= u(b_M, N)\frac{1-\beta^{T_M-1}}{1-\beta} \\ &+\beta^{T_M}\left[(1-\phi_0)\beta EV_{iU}(\Omega'_i) + \phi_0\beta\sum_j \phi_{i,j} E\max[\tilde{V}_{i,U}(\Omega'_i), \tilde{V}_j(\Omega'_j)]\right] \end{aligned}$$

2.2.5 Initial Choice of Occupation

At age 15, before entering apprenticeship, the agent has to decide on an occupation, based on the expected flow of utility for each choice, region and time effects as well as a taste shock drawn from an extreme value distribution:

$$V_{init}(\Omega) = \max_j[V_j(\Omega) + \eta_j]$$

with

$$V_j(\Omega) = c(\Omega, j, Region, Time) + \beta EV^{NC}_{j,U}(\Omega'_j)$$

and

$$\Omega'_{j,} = \begin{pmatrix} age_M + 1 \\ X = 0 \\ Occup = j \\ N = 0 \\ Preg = 0 \\ age_K = 0 \end{pmatrix}$$

2.2.6 Unobserved Heterogeneity

The model allow for fixed unobserved heterogeneity in ability and in desired fertility. This heterogeneity is introduced as in Heckman and Singer (1984), using discrete mass points, which are estimated together with the relative proportion in the sample. We allow for two ability types, through different intercepts in the wage equation and two types in desired fertility, through differences in the utility of the number children. We also allow for a fraction of women to be unable to conceive (although they do not anticipate that fact).

3 The Data

The description of individual behaviour of females in terms of career and fertility relies on 2 different datasets: (1) the IAB Employment subsample: employment register data, for the period 1975-2001 and (2) the German Socio-Economic Panel (GSOEP): a German household panel survey, covering the period 1984-2003. Each dataset provides information about specific aspects of the career-fertility process. The IAB data provide information on the wage profile and transitions in and out of work, while the GSOEP data mainly supply information about the fertility process and the (yearly) work behaviour of females after birth.

3.1 IAB Employment Sample

The first dataset is provided by the German Institute for Employment Research (IAB[5]). It is a 1% random sample drawn from German social security

[5]Institut fuer Arbeitsmarkt- und Berufsforschung, Nuremberg (Institute for Employment Research).

records, to which all employers have to report about any employees covered by the social security system. These notifications are required at the end of each year and whenever an employment relationship is started or completed. The reports include information on aspects as exact start and end date of a work contract, year of birth, gender, nationality, occupation, qualification and gross daily earnings of the employee[6]. Furthermore, each spell includes some information on the industry and the firm in which an individual is employed. The data provides a continuous employment history for each of the included employees over the period 1975-2001. The definition of the register database implies that civil servants and self-employed persons are not observed in the data. Note also that work spells with earnings below the earnings threshold do not require payment of social security contributions and are therefore also not present in the data. Finally, individuals working in East-Germany (before 1992) or abroad are not included. This 1% sample contains around 20 million observed spells, for +/- 2.5 million individuals.[7]

The sample drawn from this dataset includes females in West-Germany who have undertaken vocational training within the dual apprenticeship programme in the period 1976-2001, but did not continue into higher education[8,9]. Typically, they have completed 9-10 years of schooling and 2-3 years of apprenticeship. The detailed information by spell (with variable duration) is transformed into observations per quarter. The sample contains 28125 women, born between 1955-1975, observed from entry into the labour market (LM) onwards to 2001, i.e. for some time between age 15 and 45 - on a

[6]Gross daily earnings reflect an average daily wage for the period worked in a firm (up to one year).

[7]For more info on the dataset, see Bender et al.(2000).

[8]Apprenticeship training is observed in the data.

[9]In addition, our sample requires engaging in apprenticeship training before age 22.

quarterly basis. Descriptive information is shown in the top panel of table 1. This sample is mainly used for information about the wage profile and transitions between the work/not work states. A unique aspect of the IAB data is that work histories can be observed from the start and that there is very detailed information about labour market experiences. Remark, however, that this type of data does not provide information on household characteristics such as income and employment of the partner.

3.2 GSOEP data

The GSOEP is a longitudinal survey of private households and persons in Germany, which started in 1984. It is a representative sample of households living in Germany with detailed information about socio-economic variables on a yearly basis. The dataset provides information on population, demography, education, training, qualification, labour market and occupational dynamics, earnings, income, social security, housing, health and household production. The first wave (1984) included almost 6000 households and more than 12000 respondents.[10]

A sample is chosen to obtain information on total fertility and labour market behaviour of women. As in the IAB sample, we focus our attention on women who obtain an apprenticeship degree, but do not take higher education; individuals who work as civil servants or self-employed individuals are dropped. Parallel to the sample from the IAB data, only women of the birth cohorts 1955-1975 are included. We retain information about year of birth, employment status, part time or full time work, actual and agreed hours of work (per week), occupation, gross and net individual earnings, education

[10] A detailed description of the data set can be found in Haisken-DeNew and Frick (2003)

level, number of children and year of birth of children. The sample contains a total of 13634 successful interviews, from 1304 women. The youngest women in our sample are observed at age 17, while the oldest women are aged 48. We observe more than 500 women at each age between 21-35. For 50% of the women we have data from 10 or more successful interviews. There are more than 1000 births in the sample and almost 8200 work spells (after apprenticeship)[11]. Most of the latter have net and gross individual earnings reported. Further descriptive information is provided in panel B of table 1.[12]

3.3 Wages, hours of work and fertility in the data

This section presents descriptive evidence on occupations, work behaviour and fertility from both datasets. We distinguish between 4 occupations: sales, care[13], office and industry jobs[14].

Figure 1 shows the wage-experience profile for each of the occupations[15]. Daily earnings in office jobs are the highest for any level of experience, followed by jobs in industry. Wages in care jobs are higher at lower levels of experience compared to sales jobs, but both occupations yield similar wages from 10 years of work experience onwards.

[11]Note that some women report doing 'irregular PT work' in the GSOEP data. Given the rather low frequency of this status and given that we do not observe this status in the IAB data, we choose to classify this type of work as not working.

[12]Earnings in both the IAB and GSOEP samples have been (1) deflated using the Consumer Price Index for private households, obtained from the German Statistical Office, and (2) have been converted into Euros.

[13]This type of jobs involves caring for people and includes e.g. nurses, teachers, social workers, but also waiters and hairdressers

[14]This includes e.g. laboratory workers, sewers and tailors, technicians and cleaners

[15]Average daily wages are shown from 2 years of experience onwards, as the first 2-3 years are spent in apprenticeship - with very low wages

Experience accumulation by occupation is illustrated in figure 2. Work experience starts deviating from potential experience (or years since entry) after 8 years in the labour market. For given potential experience, individuals in office jobs accumulate most work experience, while experience is lowest in industry jobs. After 20 years, the difference in actual experience amounts to about 2 years.

Figure 3 shows hours of work (full-time, part-time or no work) at the ages 30, 35 and 40 in each of the (current) occupations. Participation rates among females are rather low at these ages, as can also be seen in table 7. PT work becomes more important with age, while FT work remains at a low level. Working, in particular FT employment, is most common in office jobs at all ages, while PT work is most widespread in care jobs (age 35,40). Jobs in sales and industry show a similar incidence of the 3 types of work.

The annual transitions rates between FT,PT and no work (for all ages) can be seen in Table 8. In all occupations, persistence is very high (>90%), i.e. few women change the intensity of work from one year to the other. The transition from FT to no work and from PT to no work is most common in industry jobs, while it is least frequent in office jobs (5.6 and 6.6% versus 3.2% and 4.4%). Returning to work on a FT basis is most frequent in care jobs (4.7%).

A key element in this study is the occupation-specific rate at which human capital depreciates while an individual is not working. Table 10 shows descriptive evidence from a regression of wage losses when returning to work after an interruption, for each of the occupations[16]. Interruptions are associated with higher wage losses (or lower gains) if occurring at higher levels

[16]Note that these results do not reflect causal relations; significance of the coefficients is not reported, but applies to all coefficients unless indicated here.

of experience - in all occupations. The penalty also rises with duration of the interruption. In addition, the duration of an interruption seems to be punished more heavily at higher levels of work experience, as the interactions are negative and significant[17]. At low levels of experience (2-4 years), an interruption incurs the highest penalty in care and office jobs (-2.3 resp. -2.4% per year of interruption), while industry jobs involve the highest penalties at experience levels above 8 years (-6%).

A large proportion of interruptions are related to the presence of children. Table 11 shows the distribution of the number of children by age. At age 25, 70% of women do not have children, while this proportion falls to 16.4% by age 40. A rather large proportion has two or more children (50-60%).

Figure 4 shows the total number of children, by occupation - the last occupation worked in by age 38. Women in office jobs are the least likely to have any children, while females working in sales are most likely to have children. Women working in care stand out: they are very likely to have 2 or more children as opposed to only one child (73% versus 11%). Also a large proportion of women in sales jobs have 2 or more children (60%).

The timing of first births differs by occupation. Figure 5 shows the proportion of childless women by age and last occupation worked in at each age. The fractions seem rather stable from age 36 onwards. The figure illustrates the pace with which women start the childbearing process. Office jobs have the highest proportion of childless women at each age, whereas sales have most mothers - at least until age 30. Women in care again stand out: the fraction of first-time mothers climbs considerably between the ages 26 and 30 (from 30 to 70%), after which they even seem to overtake women in sales.

[17]The coefficients in care and office jobs for experience 5-8 years are not significantly different from 0

Remark that this matches with the above idea that most of them get 2 or more children in total - more than in any other occupation. Women in industry, in contrast, seem rather fertility-minded at early ages, but the rate at which women start childbearing slows down from age 26 onwards - they have the largest variance in age at first birth. [18]

The link between wages, occupations and the presence of children is presented in Table 12. Results from a wage regression show that there is a 'child-penalty' in all occupations - wages are lower for mothers. Remark again that the coefficients are purely descriptive and do not reflect causal effects. Wages are especially lower in sales jobs for women with multiple children. Jobs in the care sector, in contrast, are associated with the highest wages in the presence of children.

4 Estimation

4.1 Methodology and Identification

The model is estimated using simulated method of moments. This allows to combine different data sources which gives information on career choices, wages and fertility decision over the life time.

The model contains 113 parameters and we use 386 moments from the data. For a given set of parameters, the model is solved by backward induction (value function iterations). The model is then simulated for agents between age fifteen and fifty five. At age fifteen, each agent decides on an occupation, conditional on the discounted future utility and from region and

[18] Note, however, that there might be some mobility between occupations over time. Therefore, the patterns in the figure might not completely be due to differences in timing of first birth.

time specific costs of education. The simulated data provides a panel data set which is used to construct moments which are compared with the moments from the data.

The model is identified through a judicious choice of moments. The moments we use are listed in Table 4. We first use as moments simple means of outcome variables such as occupation, average wage by occupation, hours of work or the number of children at different ages (usually at age 16, 20,25, 30, 35 and 40). These moments help to make sure the model reproduces the basic trends (and levels) in the real data. Next, we also use transition rates from one period to another. We focus on the transition from one occupation to another and from different choices of hours of work. These moments help to identify the probability of receiving an offer, $\phi_{i,j}$ as well as the variance of the taste shock for each occupational choice. Focusing on simple means is not enough to properly identify the model, just as marginal distributions of variables are not enough to recover their joint distribution. Therefore, we use moments which are informative of the link between several outcomes such as wages, fertility, occupation and work experience. We use OLS regression coefficients to capture the relationship between a number of outcome variables. This method - also called indirect inference- was introduced by Gourieroux, Monfort, and Renault (1993). For instance, we use the coefficients of a regression of log wage on experience and experience squared by occupation as moments to be matched by the model. We run the same regression using simulated data and compare the coefficients from this auxiliary equation as moments. The regression of log wage on experience helps to identify the true return to experience by occupation in equation (2). Similarly, to identify the true atrophy rates in equation (1), we use a regression of the change in (log) wages for individuals who interrupt their career on the duration of the interruption, dummies for experience levels and the interaction of duration and experience. [19] To link wages, the number of children and the choice of occupation, we use coefficients from an OLS regression of log wage on age, age squared, dummies for the number of children, occupational dummies and the interaction between the number of children and occupational choice. This helps to identify the coefficients in the model which pertains to fertility (utility of children) to the dynamic trade off between children and experience (atrophy rates, return to experience) and to the interaction between occupation and fertility in the utility function.

Finally, we use an instrumental variable approach as in Adda, Dustmann, Meghir, and Robin (2006) to identify the selection into different occupations. Changes in the local demand for apprentices by firms over time provides such exogenous variation. We use time and region interactions at the time of choice of occupation (around age 16) as an instrument. Table 3 displays the Wald test for the joint significance of the instrument for the first stage. The first column indicate that time and region interactions are indeed a significant predictor of occupation at the start of apprenticeship. Columns 2 and 3 indicate that these variables are also significant predictors of occupational choice later on, after five and even 10 years.

The model is solved numerically using value function iterations. The estimation is performed using the NAG e04ucf minimization routine.

4.2 Goodness of Fit

Tables 5 to 12 provide the fit of the model along different dimensions.

[19] Note that these set of OLS regressions do not identify the true atrophy rates either in the data or in the model. Selection into different occupations, differences in hours of work and the timing of children would bias the OLS estimates in both data sample.

Table 5 displays the occupational choices overall and at the initial period (labelled age 15). The initial occupational choice is very closely fitted. Considering the occupational choice in all periods, the proportions in industry and office jobs are well approximated. The fraction of females in care jobs, however, is too small while sales jobs are slightly overvalued. Table 6 displays the annual transition rate between occupations. Persistence within the occupational choice is well fitted in all but the jobs in care for people. That is clearly linked to the too low proportion of individuals in care jobs overall.

Table 7 shows the hours of work by age. The simulated proportion of females not working after age 20 corresponds well to the observed proportions. Also the peak at age 35 is matched. Part time work becomes more popular with age both in the observed and simulated data, but the magnitude of the increase is not fully matched in the simulation. Therefore also the simulated proportions in full time work are too high at later ages. The annual transition rates in hours of work in each of the occupations is displayed in table 8. The simulated data exhibit high persistence in each of the hours of work groups, as in the observed data. The degree of persistence among part time workers and not working females, however, is somewhat underestimated.

The wage-experience profile in each of the occupations is presented in table 9. The simulated profile corresponds very closely to the observed profile and the ranking in the returns to experience is matched. Also the profile of number of children by age is rather well fitted in the simulated data (table 11). Females start childbearing slightly too early in the simulated data (age 25), but true and simulated distributions match up again soon after.

The link between wages, number of children and occupation is presented in table 12. The reference occupation is sales. The simulated data match a concave profile over age and exhibit a 'child penalty' which is increasing in the number of children, as in the observed data. Also the rather low wages in care and industry are mutual, but the higher wages in care jobs in the presence of children are not fitted.

4.3 Parameters

Tables 13 to 15 displays the estimated parameters together with standard errors. In total, the model contains 113 parameters. This is rather parsimonious considering that we model five broad outcomes: wages, hours of work, occupational choice (four categories), number of children and spacing of each birth.

The first three rows of Table 13 displays the parameters of the (log) wage as a function of experience. Compared to the OLS coefficients displayed in Table 9, the model implies a steeper wage profile for Sales and a slightly lower wage profile for Care. The wage profiles for the two other occupational categories are very close to the OLS estimation. The next three rows display the atrophy rate, i.e. the loss of human capital due to work interruption. The first entry, -0.171 represents the loss of experience due to a one year interruption for a woman in Sales with less than five years of experience. Hence, it takes about five to six years to lose the experience accumulated over a period of one year of work. The atrophy rate for this occupation is the lowest with Care and Office jobs having the highest. The atrophy rate is greater for women with more experience.

The third panel of Table 13 displays the parameters pertaining to utility of work and occupational choice. We allow the utility function to vary by occupation (Industry is the default occupation), which enables to fit occupational choices over and above initial conditions and disparities in wage profiles. We also interact occupational choice with the presence of children.

Sales appear to be less enjoyable than other occupation when children are present. Unemployment (next 2 rows) appears to be more favored when the number of children increases.

Table 14 displays the estimated offers for occupation and part time-full time positions, conditional on previous status. Not surprisingly, the numbers on the diagonal are larger, indicating that women are likely to keep their occupation and hours of work for a number of periods.

Table 15 displays the parameters pertaining to unobserved heterogeneity. We allow for four types of women, differing in terms of ability and preference for children. Women of Type 1 and 2 are more able, with an intercept in the log wage equation higher by about 0.06. Women of Type 1 and 3 value children more. The first row displays the estimated proportions for each types. Type 1 (high ability, high taste for children) is most common, followed by Type 3 (low ability, high taste for children).

5 Fertility and Careers

In this section we explore the determinants of fertility and its effect on careers, wages and occupational choice. We use the estimated model as a baseline and simulate the effect of various changes in parameters.

5.1 The Effect of Fertility on Careers

We evaluate the consequences of fertility on the career of women by simulations. We compare the baseline model to an economy where women cannot have children. In our model, fertility has many consequences on careers. While women are out of work during maternity leave or parental leave, their work experience decreases, leading to lower wages. This loss of human capital is occupational specific, leading to different choices of occupation, which, in turn, have an impact on wages.

Figures 6 to 8 display the effect on wages, labor supply and occupational choices. Figure 6 shows the wage profile by age. From age 25 onwards, wages would be around 15% higher if women were not to have children. The difference in the profiles seems to fall somewhat from the late 30s onwards. A large part of this can be explained by labor supply which does not show the dramatic fall in case women were not to get children (figure 7). Participation rates remain very high throughout the period considered. Figure 8 demonstrates that without fertility, women would be less likely to work in office and sales jobs, while industry jobs would be much more popular.

5.2 The Role of Atrophy

To understand the effect of atrophy, we simulate an economy where human capital does not depreciate during interrupted careers and compare it to the baseline constituted by the estimated model. Figure 9 presents the effect on the number of children. Loss of human capital leads to a decrease in the number of children, especially at older ages. However, it has a limited effect on occupational choice over the life-cycle (see Figure 10).

5.3 The Role of Wages

We explore the role of the return to experience by simulating an economy with higher returns. There are evidence that the return to experience has changed over time (Buchinsky (1994) and Gosling, Machin, and Meghir (2000) for instance).

We investigate the effect of a 10% increase in the slope of the wage profile for women with no experience on fertility. This increase occurs in all occupations. Figure 11 shows that fertility declines by about 0.1 child over the life cycle. This change also has an impact on occupational choice with a decline is Sales and an increase in office jobs.

5.4 Extended Maternity Leave

We simulate the effect of extending maternity leave. In the simulation, the maternity leave is extended by one quarter. All other parameters stay the same. Figures 12 and 14 display the effect on wages, labor supply and fertility.

Longer maternity leave leads to lower wages, especially between the age of 30 and 40. This decrease is explained from the loss (and lack of accumulation) of experience while women are out of work. Extending maternity leave also makes childrearing more appealing and it slightly increases total fertility.

6 Conclusion

This paper aims to understand the way women make career choices jointly with fertility choices. In particular we analyse the timing of the first child as well as subsequent fertility decisions, and how these interact with, determine, and are determined by occupational choice. The paper makes three contributions; first, it develops a model of fertility and career choice over the life-cycle. Second, it uses unique data that contains information allowing a much more general approach to this question than previous papers. Third, the analysis is for a country where the educational system locks individuals into a particular occupation before the fertility period (Germany). This avoids problems with unravelling the timing of the two choices, and provides instruments for occupational choice in form of regional occupation structure. It enables us to disentangle occupational choices and fertility decisions.

Our empirical analysis is based on a combination of two data sets which provide detailed information on wage progression, labor market participation, occupational choice and fertility over the life-cycle. We find that raising children accounts for about a 10 to 15% loss in wages. This decrease is due to two different factors, the lack of accumulation and loss of human capital due to interrupted careers and to the sorting of mothers into child-friendly occupations. Our results also emphasize the role of the wage profile in shaping fertility and the timing of births. Our estimated model shows that interruptions in careers lead to a loss of human capital which is larger for women with higher work experience and differs across occupation. This differential loss explains partly the fertility patterns across occupation. Similarly, the return to experience also shapes fertility.

References

Adda, J., C. Dustmann, C. Meghir, and J.-M. Robin (2006): "Career Progression and Formal versus on the Job Training," IZA Discussion Paper No. 2260.

Altug, S., and R. A. Miller (1998): "The Effect of Work Experience on Female Wage and Labor Supply," *Review of Economic Studies*, 65(1), 45–85.

Arroyo, C. R., and J. Z. J (1997): "Dynamic Microeconomic Models Of Fertility Choice: A Survey," *Journal of Population Economics*, 10, 23–65.

Attanasio, O., H. Low, and V. Sanchez-Marcos (2004): "Explaining Changes in Female Labour Supply in a Life-cycle Model," University of Cambridge Working Paper 04/51.

Becker, G. (1960): "An Economic Analysis Of Fertility," in *Demography And Economic Change In Developed Countries*, pp. 209–231. Universities-NBER Research Conference Series 11, Princeton.

Bender, S., A. Haas, and C. Klose (2000): "IAB Employment Subsample 1975-1995: Opportunities for Analysis provided by the Anonymised Subsample," Discussion Paper 117, IZA, Bonn.

Brown, R. S., M. Moon, and B. S. Zoloth (1980): "Occupational Attainment And Segregation By Sex," *Industrial and Labor Relations Review*, 33(4), 506–517.

Buchinsky, M. (1994): "Changes in the US Wage Structure: 1963-1987," *Econometrica*, 62(2), 405–458.

Carrington, W. J., and K. R. Troske (1995): "Gender Segregation In Small Firms," *The Journal of Human Resources*, 30(3), 503–533.

Cigno, A., and J. Ermisch (1989): "A Microeconomic Analysis Of The Timing Of Births," *European Economic Review*, 33, 737–760.

Eckstein, Z., and K. I. Wolpin (1989): "Dynamic Labour Force Participation of Married Women and Endogenous Wage Growth," *Review of Economic Studies*, 56(3), 375–390.

Francesconi, M. (2002): "A Joint Dynamic Model of Fertility and Work of Married Women," *Journal of Labor Economics*, 20, 336–380.

Goldin, C., and L. Katz (2002): "The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions," *Journal of Political Economy*, 110(4), 730–770.

Gosling, A., S. Machin, and C. Meghir (2000): "The Changing Distribution of Male Wages in the UK," *Review of Economic Studies*, 64(4), 635–666.

Gourieroux, C., A. Monfort, and E. Renault (1993): "Indirect Inference," *Journal of Applied Econometrics*, 8, S85–S118.

Groshen, E. L. (1991): "The Structure Of The Female/Male Wage Differential: Is It Who You Are, What You Do, Or Where You Work?," *The Journal of Human Resources*, 26(3), 457–472.

Haisken-DeNew, J., and J. Frick (2003): "Desktop Companion to the German Socio-Economic Panel Study (SOEP)," DIW, Berlin.

Heckman, J., and B. Singer (1984): "A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data," *Econometrica*, 52(2), 271–320.

Heckman, J. J., and T. E. Macurdy (1980): "A Life Cycle Model of Female Labour Supply," *Review of Economic Studies*, 47(1), 47–74.

Heckman, J. J., and J. R. Walker (1990): "The Relationship Between Wages and Income and the Timing and Spacing of Births: Evidence from Swedish Longitudinal Data," *Econometrica*, 58(6), 1411–1441.

Hotz, J., and R. Miller (1988): "An Empirical Analysis of Life Cycle Fertility and Female Labor Supply," *Econometrica*, 56(1), 91–118.

Keane, M. P., and K. I. Wolpin (1997): "The Career Decisions of Young Men," *Journal of Political Economy*, 105(3), 473–522.

Mincer, J., and H. Olfek (1982): "Interrupted Work Careers: Depreciation and Restoration of Human Capital," *Journal of Human Resources*, 17, 3–24.

Mincer, J., and S. Polachek (1974): "Family Investment in Human Capital: Earnings of Women," *Journal of Political Economy*, 82(2), 76–108.

Moffitt, R. (1984): "Profiles of Fertility, Labour Supply and Wages of Married Women: A Complete Life-Cycle Model," *Review of Economic Studies*, 51(2), 263–278.

Newman, J., and C. McCulloch (1984): "A Hazard Rate Approach To The Timing Of Births," *Econometrica*, 52, 939–962.

Polachek, S. (1981): "Occupational Self-Selection: A Human Capital Approach To Sex Differences In Occupational Structure," *Review of Economics and Statistics*, 63(1), 60–69.

Rosenzweig, M., and P. Schultz (1985): "The Demand For And Supply Of Births: Fertility And Its Life Cycle Consequences," *American Economic Review*, 75(5), 992–1015.

van der Klaauw, W. (1996): "Female Labor Supply and Marital Status Decisions: A Life-Cycle Model," *Review of Economic Studies*, 63(2), 199–235.

Table 1: Descriptive statistics: IAB and GSOEP sample

	N	mean	sd	min	max
A. IAB SAMPLE:					
age at LM entry	28125	17.3	1.47	15	21
year of LM entry	28125	1984	4.82	1976	1996
birth cohort	28125	1967	4.50	1955	1975
age at end apprenticeship	28125	19.5	1.65	16	25
age at last observation	28125	33.2	5.03	18	46
year at last observation	28125	2000	3.32	1977	2001
work spells[a]	1375599				
PT work spells[a] (% of work spells)	154279	11.2%			
gross daily earnings (in Euro)[a,b]	1086260	54.1	21.5	0.31	137
censored earnings[a] (% of earnings obs)	2617	0.24%			
occupation of apprenticeship:	28125				
(1) sales jobs	6697	23.8%			
(2) care for people	7313	26.0%			
(3) office jobs	9701	34.5%			
(4) industry jobs	4374	15.6%			
(5) missing	40	0.14%			
B. GSOEP SAMPLE:					
age observed	13634	29.5	6.79	17	48
year observed	13634	1994	5.51	1984	2003
age at first observation	1304	22.8	4.83	17	45
age at last observation	1304	32.4	8.03	17	48
birth cohort	1304	1965	5.25	1955	1975
# years observed	1304	10.5	6.72	1	20
work spells [c]	8188	64.5%			
PT work spells (% of work spells)	2318	28.3%			
monthly earnings (in Euro)[a]	7555	1445	634	31.7	7118
age mother when first child	710	25.7	4.22	18	40
age mother when second child	438	28.5	3.93	20	39
total fertility (age 39): # children	320				
0	50	15.6%			
1	79	24.7%			
2	138	43.1%			
≥3	53	16.6%			

[a] work spells after apprenticeship

[b] daily earnings in IAB data are censored from above (if above the 'upper earnings limit'); censored daily earnings are included in earnings observations, with reported earnings=limit

Table 2: Occupational Choice at Entry and 10 Years After

Occupation at Entry	Prop in Occupation 10 Years on Sales	Care	Office	Industry
Sales	52.14	4.01	27.14	16.71
Care	4.75	68.00	15.85	11.40
Office	4.13	1.35	91.79	2.74
Industry	7.41	7.66	15.52	69.41

Table 3: First Stage: Strength of Instruments

Period	Initial	5 years after	10 years after
Chi2	125.13	111.19	1873.73
Prob>Chi2	0.0085	0.064	0.0000
df	90	285	89
N	28085	23426	16433

Note: Based on data from the IAB Employment sample, period 1982-2001; df= number of restrictions tested jointly.

Table 4: Moments used in Estimation

Moments	Data Set
Proportion of full time work, by age	IAB
Proportion of part time work, by age	IAB
Proportion of full time work, by age and initial occupation	IAB
Proportion of part time work, by age and initial occupation	IAB
Annual transition rate between occupation	IAB
Annual transition rate between full time, part time and no work, by occupation	IAB
Average work experience, by age	IAB
Average wage by age and by initial occupation	IAB
OLS regression of log wage on experience, by occupation	IAB
OLS regression of log wage for interrupted spells on duration,	IAB
OLS regression of log wage on age, number of children and occupation	GSOEP
Proportion with no children, by age	GSOEP
Proportion with one child, by age	GSOEP
Proportion with two children or more, by age	GSOEP
Centiles of age at first birth	GSOEP
Centiles of age at second birth	GSOEP
Number of children at age 40	GSOEP
Average age at first birth, by current occupation	GSOEP
Average age at second birth, by current occupation	GSOEP

Table 5: Goodness of Fit: Occupational Choices

Occupation	Observed	Simulated
	All Periods	
Sales Job	17.8	25
Care for People	20.1	7.48
Office Job	45.6	48.1
Industry Job	16.5	19.4
	At age 15	
Sales Job	23.8	24.8
Care for People	26	24
Office Job	34.5	38
Industry Job	15.6	13.2

Note: Data source: IAB. Proportion for all ages based on 248,023 observations. Proportion at age 15 based on 27979 observations. Simulated moments based on 1000 replications.

Table 6: Goodness of Fit: Annual Transition Rate between Occupation

Occupation	Observed				Simulated			
	Sales	Care	Office	Industry	Sales	Care	Office	Industry
Sales Job	92	0.63	4.5	3.1	92	1.4	4.7	1.7
Care for People	0.8	95	1.9	1.9	8	77	8.6	6.4
Office Job	0.95	0.32	98	0.7	2	1.1	96	1.2
Industry Job	1.8	1.2	3	94	3.2	1.7	3.8	91

Note: Data source: IAB. Simulated moments based on 1000 replications.

Table 7: Goodness of Fit: Hours of Work by Age

Age	Full Time		Part Time		Not Working	
	Observed	Simulated	Observed	Simulated	Observed	Simulated
20	0.82	0.922	0.0234	0.00579	0.157	0.0722
25	0.686	0.738	0.0461	0.0167	0.268	0.245
30	0.427	0.517	0.0987	0.0508	0.475	0.432
35	0.3	0.44	0.173	0.0474	0.526	0.512
40	0.3	0.491	0.249	0.0788	0.452	0.43

Note: Data source: IAB. Observed moments based on 81343 observations. Simulated moments based on 1000 replications.

Table 8: Goodness of Fit: Annual Transition Rate: Hours of Work

	From Full Time Work					
	Observed			Simulated		
	Full Time	Part Time	Not Working	Full Time	Part Time	Not Working
Sales Job	0.95	0.0069	0.042	0.91	0.017	0.074
Care for People	0.95	0.0063	0.046	0.9	0.045	0.053
Office Job	0.96	0.0035	0.032	0.87	0.0065	0.12
Industry Job	0.94	0.0046	0.056	0.91	0.028	0.063
	From Part Time Work					
	Observed			Simulated		
	Full Time	Part Time	Not Working	Full Time	Part Time	Not Working
Sales Job	0.029	0.91	0.061	0.095	0.86	0.049
Care for People	0.023	0.93	0.047	0.21	0.73	0.062
Office Job	0.02	0.94	0.044	0.26	0.59	0.15
Industry Job	0.028	0.91	0.066	0.19	0.77	0.047
	From Not Working					
	Observed			Simulated		
	Full Time	Part Time	Not Working	Full Time	Part Time	Not Working
Sales Job	0.039	0.017	0.94	0.15	0.03	0.82
Care for People	0.047	0.02	0.93	0.16	0.012	0.83
Office Job	0.042	0.021	0.94	0.15	0.008	0.84
Industry Job	0.045	0.015	0.94	0.17	0.0079	0.82

Note: Data source: IAB. Observed transition rates based on 925602 observations. Simulated moments based on 1000 replications.

Table 9: Goodness of Fit: Log Wage Regression

Variable	Sales Job		Care for People		Office Job		Industry Job	
	Obs.	Simul.	Obs.	Simul.	Obs.	Simul.	Obs.	Simul.
Experience	0.094	0.094	0.072	0.068	0.057	0.055	0.057	0.054
Experience^2	-0.003	-0.0025	-0.0024	-0.0025	-0.0016	-0.0013	-0.0016	-0.0017
Constant	3.9	3.9	4.1	4.1	4.4	4.4	4.2	4.2

Note: Data source: IAB. Regression done on 183917, 213832, 497245 and 190198 observations respectively. Simulated moments based on 1000 replications.

Table 10: Goodness of Fit: Log Wage Regression for Interrupted Spells

Variable	Sales Job		Care for People		Office Job		Industry Job	
	Obs.	Simul.	Obs.	Simul.	Obs.	Simul.	Obs.	Simul.
Duration of interuption	-0.017	-0.0044	-0.023	-0.0035	-0.024	-0.0016	-0.018	-0.0027
Experience 5-8 years	-0.15	-0.057	-0.24	-0.1	-0.19	-0.036	-0.11	0.016
Experience >8 years	-0.26	-0.013	-0.32	0.072	-0.33	0.011	-0.17	-0.043
Duration * Exp. 5-8 yrs	-0.013	0.0019	0.0017	0.0026	-0.0072	0.0028	-0.016	0.00099
Duration * Exp. >8 yrs	-0.013	-0.00059	-0.027	-0.001	-0.018	0.00044	-0.027	0.004
Constant	0.084	0.028	0.13	0.019	0.062	-0.012	0.059	-0.0038

Note: Data source: IAB: Regression done respectively on 6003, 7236, 11601 and 7430 observations. Simulated moments based on 1000 replications.

Table 11: Goodness of Fit: Number of Children by Age

Age	No Children		One Child		Two or more	
	Observed	Simulated	Observed	Simulated	Observed	Simulated
20	0.952	0.942	0.0449	0.0578	0.0028	0.000242
25	0.694	0.662	0.224	0.283	0.0822	0.0554
30	0.366	0.375	0.315	0.305	0.319	0.32
35	0.194	0.215	0.28	0.258	0.526	0.527
40	0.164	0.186	0.234	0.185	0.602	0.628

Note: Data source: GSOEP. Simulated moments based on 1000 replications.

Table 12: Goodness of Fit: Log Wage, Children and Occupation

Variable	Observed		Simulated
	Coeff	s.e.	Coeff
Age	0.13	0.007055	0.088
Age square	-0.0017	0.0001107	-0.0011
Children = 1	-0.49	0.03433	-0.29
Children $\geq$ 2	-1	0.03928	-0.33
Care	-0.058	0.02307	-0.15
Office Job	0.15	0.02028	0.12
Industry Job	0.0013	0.02266	-0.091
Care * Child=1	0.062	0.04902	0.1
Office * Child=1	-0.0075	0.03953	0.18
Industry * Child =1	0.1	0.04595	0.043
Care * Child$\geq$ 2	0.42	0.04891	-0.25
Office * Child$\geq$ 2	0.26	0.044	0.22
Industry * Child$\geq$ 2	0.063	0.04927	0.13
Constant	2.2	0.1088	3.2

Note: Data source: GSOEP. Simulated moments based on 1000 replications.

Table 13: Estimated Parameters: Wages and Utiltiy

Parameter	Sales	Care	Office	Industry
	Wage Equation			
Log Wage Constant	3.85	4.02	4.36	4.18
Experience	0.127	0.0788	0.0667	0.0602
Experience Square	-0.00309	-0.00245	-0.00173	-0.00183
	Atrophy Rate			
Constant	-0.171	-0.209	-0.191	-0.187
Experience $\in [5, 7[$	-0.0591	-0.0544	-0.0617	-0.0562
Experience >7 years	-0.0897	-0.048	-0.0542	-0.0501
	Utility of Work			
Utility of FT work	1.87	1.87	1.87	1.87
Utility of PT work	0.425	0.425	0.425	0.425
Utility of Occupation	1.19	1.1	0.946	1
Utility of Occupation if Children	0	0.108	0.108	0.115
Utility of Unemployement if # child=1	2.32	2.32	2.32	2.32
Utility of Unemployement if # child ≥ 2	2.77	2.77	2.77	2.77
Utility of Unemployement if age child ≤ 3	0.0293	0.0293	0.0293	0.0293
Utility of PT work and children	1.72	1.4	1.43	1.17
Utility of PT work and # children≥ 2	0.941	0.941	0.941	0.941
Utility of PT work and age child ≤ 3	0.351	0.351	0.351	0.351
	Utility of Children			
Utility of one child	-0.783	-0.783	-0.783	-0.783
Utility of two children	0.244	0.244	0.244	0.244

Table 14: Estimated Parameters: Probability of Occupation and Hours of Work Offers

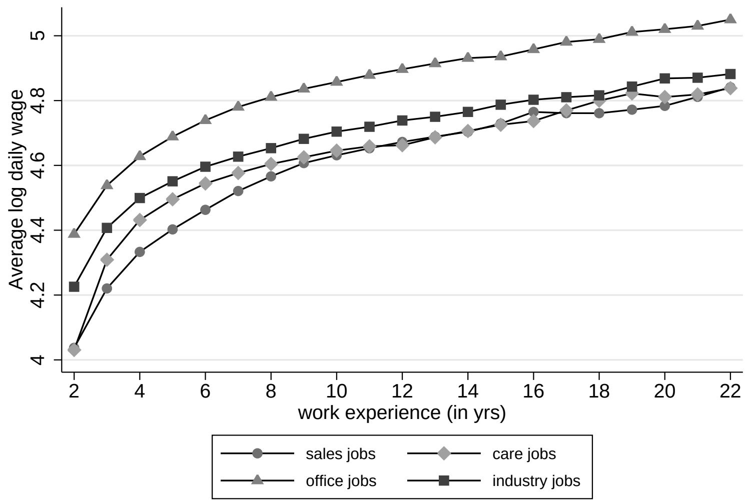
	Sales		Care		Office		Industry	
Pervious Status	PT	FT	PT	FT	PT	FT	PT	FT
Sales Job PT	0.63	0.054	0.053	0.059	0.051	0.054	0.049	0.052
Sales Job FT	0.0067	0.95	0.0083	0.0063	0.0062	0.0069	0.0064	0.0063
Care for People PT	0.096	0.081	0.41	0.086	0.084	0.079	0.084	0.082
Care for People FT	0.0088	0.0076	0.009	0.94	0.0083	0.0097	0.0082	0.0076
Office Job PT	0.079	0.077	0.087	0.081	0.42	0.093	0.088	0.076
Office Job FT	0.0023	0.0022	0.0024	0.0023	0.0026	0.98	0.0028	0.0026
Industry Job PT	0.053	0.051	0.055	0.054	0.056	0.057	0.61	0.07
Industry Job FT	0.004	0.0039	0.0037	0.0039	0.0049	0.0046	0.0054	0.97

Note: Quarterly offer rates.

Table 15: Estimated Parameters: Unobserved Heterogeneity

Parameter	Type 1	Type 2	Type 3	Type 4
Proportion in sample	0.665	0.0118	0.273	0.0504
Log wage intercept	0.0593	0.0593	0	0
Utility of Children	1.3	0	1.3	0

Figure 1: Wage - experience profile by occupation



Based on IABS sample

Figure 2: Accumulation of work experience by occupation

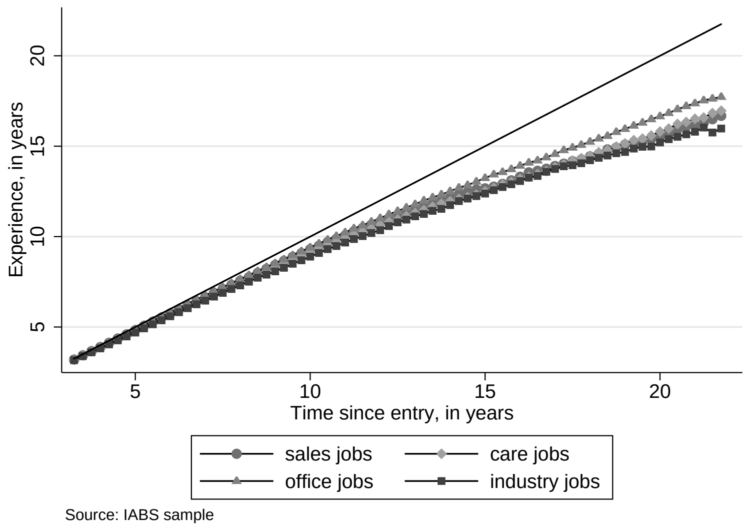


Figure 3: Participation and intensity of work by age and occupation

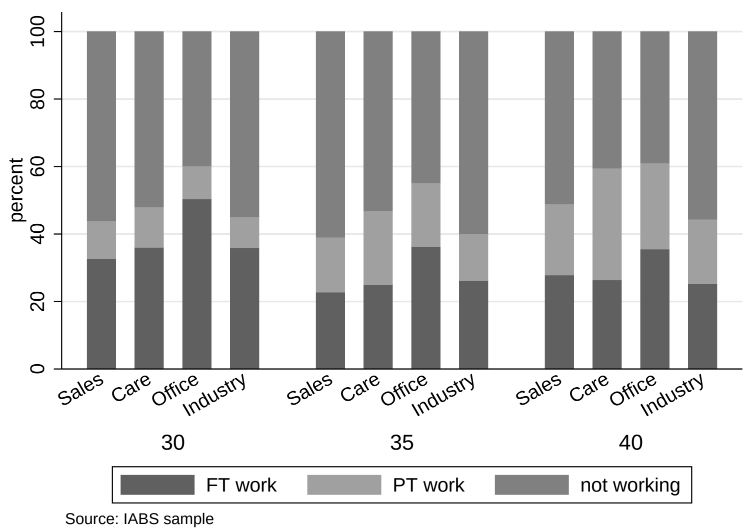
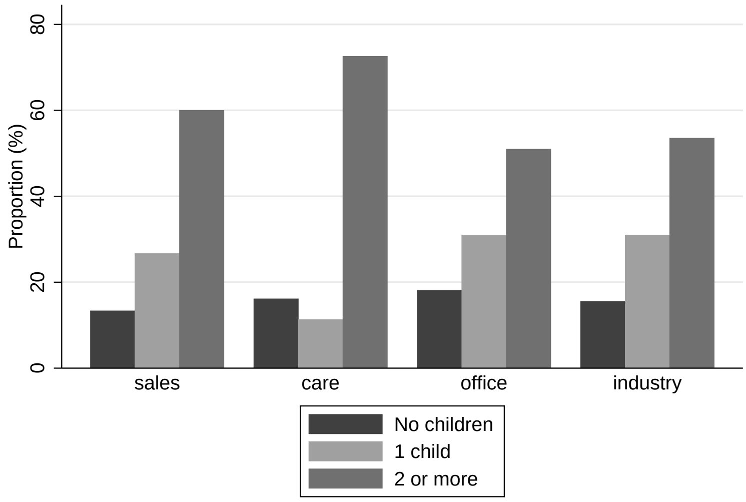
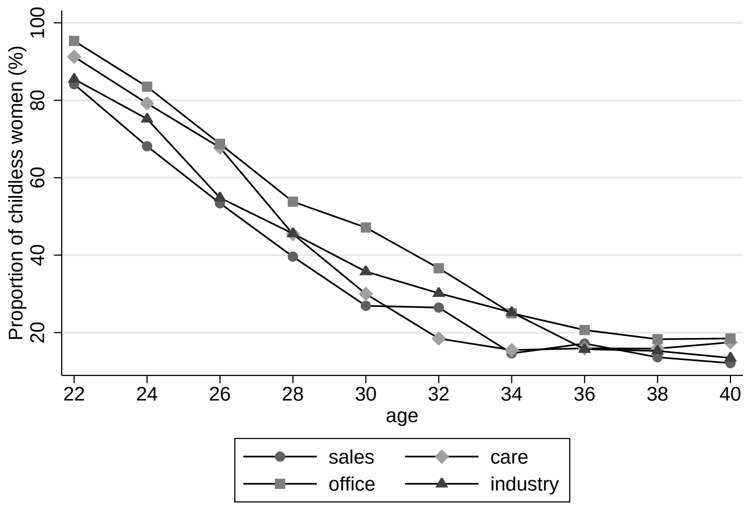


Figure 4: Fertility at Age 38 by Occupation



Source: GSOEP; last occupation by age 38

Figure 5: Timing of First Birth by Occupation



Source: GSOEP sample, by last occupation worked in at each age

Figure 6: Effect of Fertility on Wages

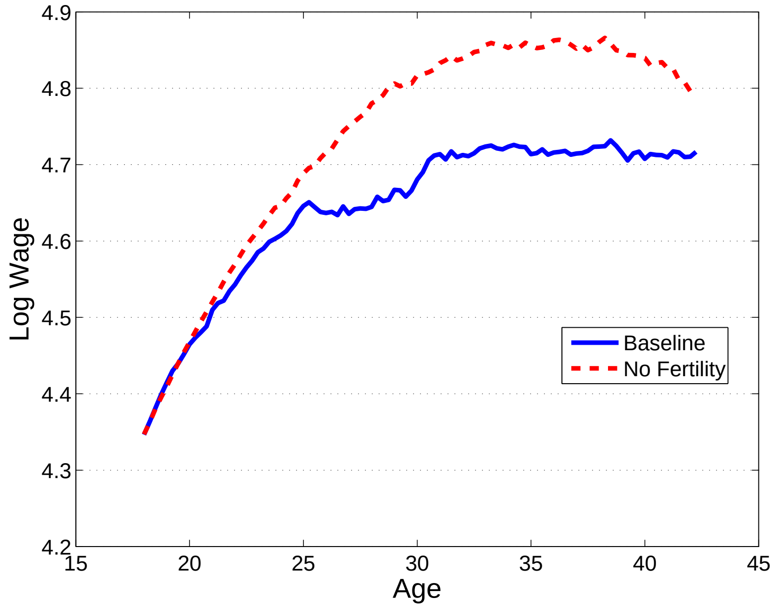


Figure 7: Effect of Fertility on Labor Supply

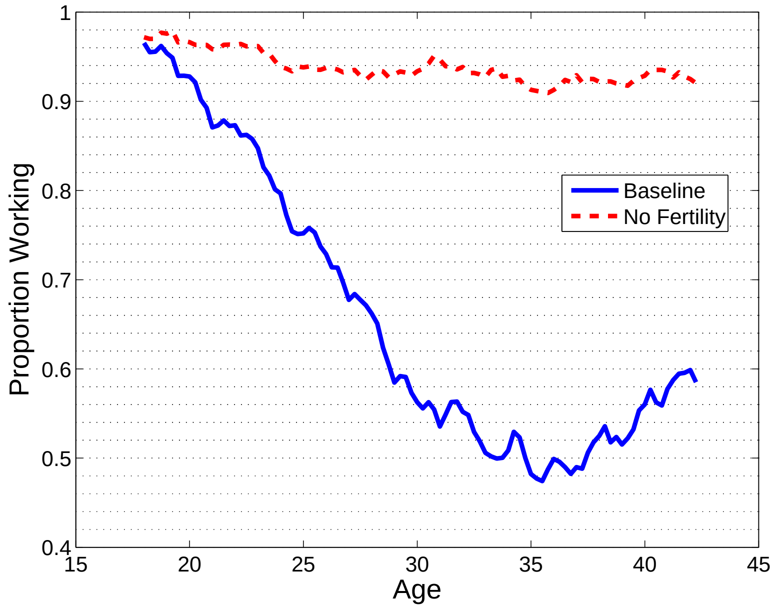


Figure 8: Effect of Fertility on Occupational Choices

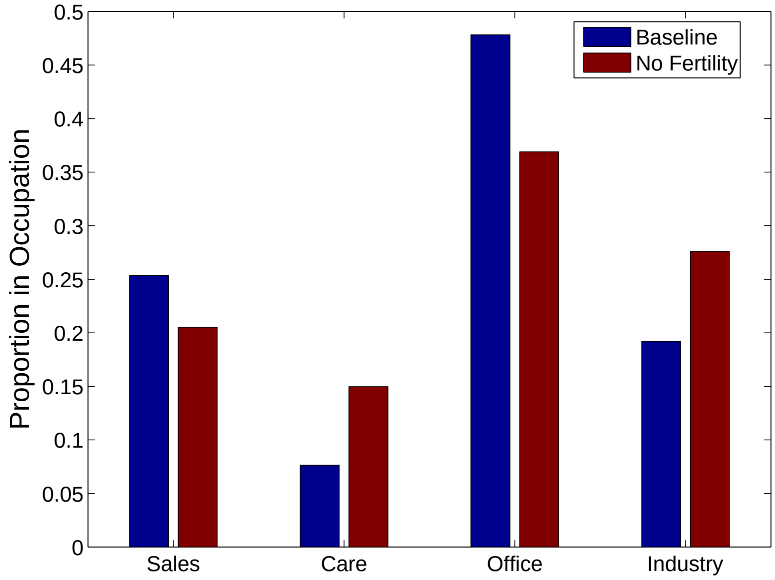


Figure 9: Effect of Atrophy on Fertility

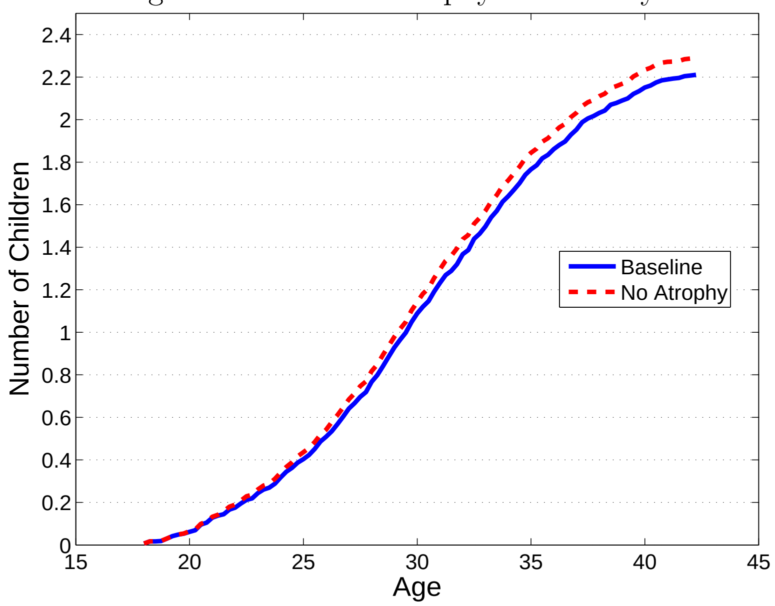


Figure 10: Effect of Atrophy on Occupational Choice

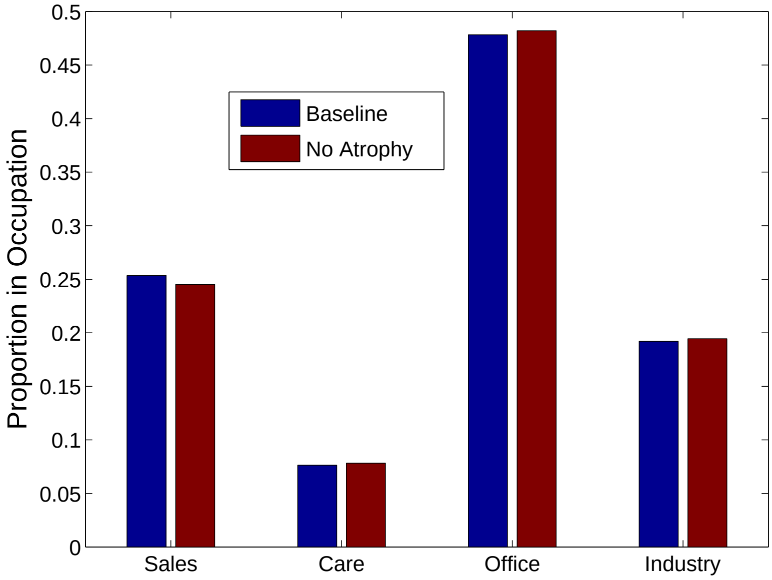


Figure 11: Effect of Steeper Wage Profiles on Fertility

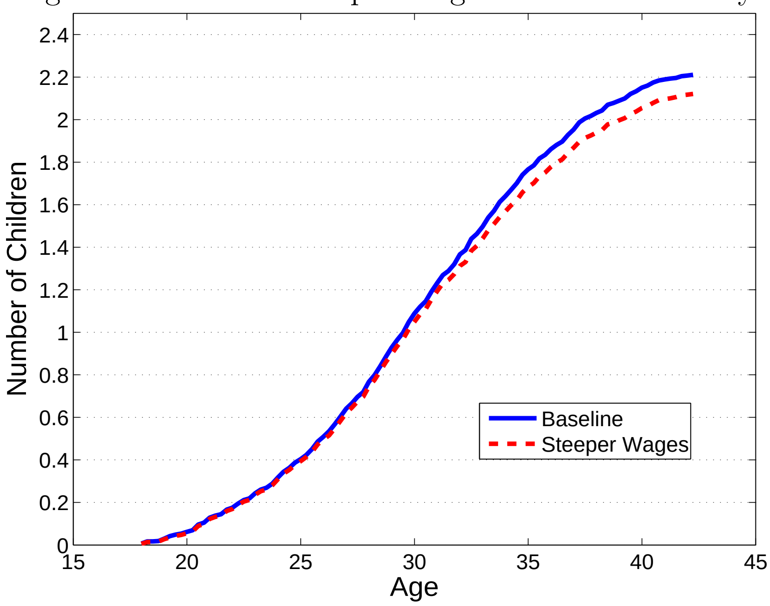


Figure 12: Effect of Longer Maternity Leave on Wages

Figure 13: Effect of Longer Maternity Leave on Labor Supply

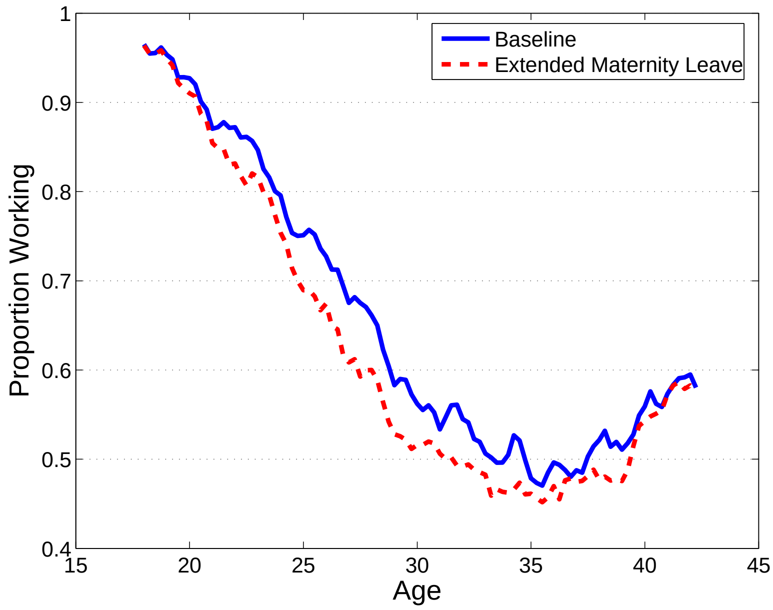


Figure 14: Effect of Longer Maternity Leave on Fertility