Job Security and Fertility Decisions

Marta C. Lopes*

May 15, 2019

For the latest version click here

Abstract: The restrictions on duration and number of allowed renewals implied by fixed--term contracts generate lower job security. In many countries, these contracts are particularly common among young women. In this paper, I study the impact of job security on fertility decisions. Using a policy reform, which took place in Portugal in 2003, I show that the lower job security associated with fixed-term contracts decreases the likelihood of giving birth. The negative effect is particularly strong for shorter contracts. To identify the different channels that explain these results, I build and estimate a dynamic life-cycle structural model where women decide both labour supply and fertility, conditional on the characteristics of the job contract. I then simulate two different labour market policies that have been discussed in the public debate. Imposing an automatic conversion into permanent contracts, with higher job security, at the end of the fixed-term contract limit, decreases the number of childless women by 8.3%. In contrast, applying contract-specific tax rates, penalizing fixed-term contract wages and subsidizing permanent contract wages, induces 20% of the women who are already mothers to have their second child. These results corroborate the reduced-form evidence, showing that job security is especially important at first birth and income is relatively more important for subsequent birth decisions.

JEL classification: J13, J22, J28, J41, J63

Keywords: fertility, labour supply, fixed-term contracts, structural estimation

*Nova School of Business and Economics, Universidade Nova de Lisboa (martalopes.2012@novasbe.pt)

Acknowledgements: this work was funded through FCT - Fundação para a Ciência e Tecnologia under the project Ref. SFRH/BD/121190/2016. I am deeply thankful to Pedro Portugal and Lars Nesheim, for their guidance and valuable discussions during this study. I also want to thank the comments and suggestions provided by Aureo de Paula, Cormac O'dea, Michela Tincani, Mónica Costa Dias, and Pedro Carneiro during the visiting period at University College London, and also by the participants of the 10th COSME Gender Workshop, the 1st Meeting of SEHO, the 11th Meeting of PEJ, the 32nd EEA congress, the 2nd WOLFE Workshop, the Ministry of Finance GPEARI Seminar, the 29th EALE Conference, the Ghent University Internal Seminar, the 23rd SOLE meeting, and the 32nd ESPE conference, and seminars at CEBI, UAB, IZA, Carlos III, IE, SOFI, MIAESR, ANU, and CEPAR. All remaining errors are my own.

1 Introduction

Technology change and globalization have motivated the flexibility of labour markets during the last decades. New forms of employment have been created, such as casual work, task-based contracts, and fixed-term contracts. These jobs are characterised by a higher degree of insecurity as the worker is not insured against lay-off at the end of the contract. Temporary employment is more common among young workers, until they learn about the worker-firm match quality, and women, who are more likely to move to non-market employment than men (Lazear and Rosen, 1990; Booth et al., 2002). Therefore, job security must be taken into account when young women make investment decisions, especially when they are irreversible, such as fertility choices (Becker, 1960).

The primary research question of this paper is: How does job security affect fertility decisions? Theoretically, there are three fundamental channels through which one might expect job insecurity could reduce fertility. First, if re-employment is more difficult, working on a contract with higher probability of dismissal means higher volatility in expected future earnings, which are crucial to support childcare costs over the life-cycle. Second, in case of wage differentials that compensate temporary labour for the lack of job security, women working on temporary contracts have a higher opportunity cost when substituting work for child-rearing. Finally, in case temporary arrangements are mainly used as screening devices prior to more secure jobs, women might delay their fertility decisions while they keep working on fixed-term contracts to accumulate tenure until promotion.

The empirical challenge is to distinguish whether a woman is working on a temporary job because she does not plan to give birth or whether she does not give birth because she holds a highly insecure job. To disentangle the two effects, I build and estimate a structural life-cycle model where women choose both fertility and labour supply, conditional on job security. The degree of job security corresponds to two different types of job contracts. Fixed-term contracts have a limited duration, a maximum number of renewals, and high probability of firing. Permanent contracts are open-ended but have a low probability of dismissal. This type of duality characterises the labour market in many European countries, where young women on fixed-term contracts account for almost half of the young female employees.[1]

The use of fixed-term contracts has increased significantly in many European countries to tackle the high unemployment rates in the end of the 1970s. In a contrasting policy direction, the employment protection of permanent contracts was reinforced to avoid job destruction (Cahuc and Postel-Vinay, 2002). Both measures resulted in an excessive use

[1] According to the Eurostat statistics, on average, 53% of the young (15-24 years old) women in the Euro area held temporary contracts in 2018. Slovenia ranked highest with 81.1% and high rates were also observed outside the Euro area in countries such as Croatia, with 67.8%.

of fixed-term contracts as the conversion rate into permanent contracts never exceeds 50% (Boeri et al., 2011). In this paper I am going to focus on a particular country. Portugal is an interesting case as it has the lowest rate of contract conversion (12%) among European countries and it has been classified as the strictest country in terms of employment protection for permanent contracts.[2] In the context of the research question in this paper, Portugal is also a relevant example as it only provides 6 weeks of mandatory paid maternity leave.[3] Optional benefits paid by Social Security are available but, in 2017, only 9% of the mothers opted for the extended maternity leave, according to the Social Security statistics.[4] In line with this, Portugal has the second highest employment rate among mothers with at least one child between 0 and 2 years old among OECD counties (73.2%).[5]

Considering the institutional background, I abstract from maternity leave policies and focus on the link between job security and fertility decisions. Using survival analysis, I provide preliminary evidence that fixed-term contracts are an important determinant of the delay of fertility choice. This effect is especially important for the first birth decision whereas the income/time trade-off (Becker, 1965) seems to be more relevant for the second birth decision. However, one should keep in mind the simultaneity issue, between fertility decisions and the type of contract accepted, and be cautious not to interpret these results as causal. Ideally, one would need to have exogenous variation on factors that affect women working on fixed-term contracts but does not affect the fertility decision directly. The case of Portugal allows me to study such variation.

In this paper I explore a 2003 policy reform that increased the potential accumulated duration of fixed-term contracts within the same firm from 3 to 6 years. The reform induced a higher probability of staying in the same firm on a fixed-term contract, but the conversion rate into permanent contracts did not change significantly between the pre- and post-reform periods. Therefore, this reform extended the period of job insecurity. In a reduced-form setting, I show that women on a contract under the new legislation had a lower probability of giving birth. However, this negative effect was attenuated for women working on fixed-term contracts with longer duration, as these have higher probability of conversion into permanent contracts. For validation purposes, I estimate the life-cycle model with pre-reform data and

[2]Classification attributed according to the OECD indicator, published in various *Employment Outlook* reports. See OECD (2018) for the latest reference.

[3]Average duration of mandatory paid maternity leave among OECD countries is 19 weeks. Australia also provide only 6 weeks of paid maternity leave, but women are compensated with additional 6 weeks of pre-birth leave. Most of the states in United States have no mandatory paid maternity leave.

[4]Optional benefits are available in two-tiers. The initial maternity leave benefit is 4 months and, since 2010, the extended maternity leave benefit allows women not to work for an additional 3 months.

[5]The country leading this ranking is Netherlands, with 73.5%, and the average among OECD countries is 53.9%. Note however that a big part of the remaining percentage is out of the labour force whereas inactivity rates in Portugal are lower than the average among OECD countries.

use the post-reform labour market conditions to simulate the implications of the reform. The model is able to reproduce the reduced-form results, confirming the conversion into a permanent contract to be an important channel affecting fertility decisions.

To explore the other two channels, I examine the application of two policy reforms that have been discussed in the public debate: a single contract with long probation period, and contract-specific tax rates. For the channel on future earnings expectations I implement a single contract where fixed-term workers are automatically converted into a permanent contract in case there is no dismissal during the probation period. This reform eliminates the dismissal spike at the end of the accumulated duration of fixed-term contracts and doubles the conversion rate. The model predicts an increase of the fertility rate by shifting births to periods where expected future earnings were less volatile (end of fixed-term contract and permanent contracts), and by decreasing the number of childless mothers. This result reinforces the reduced-form evidence that job security is especially important for the decision to have a first child. Note however that such reform would bring additional costs to the firms, which in turn could adjust the labour demand. For this purpose, I consider three alternative scenarios where there is a decrease of the permanent contract firing costs, a decrease in the wage seniority bonus, or a decrease on the hiring probability. In general, I conclude that the positive effect on fertility could be attenuated by each of these three adjustments, but large modifications would be required in order to bring it down to zero.

To test the wage differential channel I introduce contract-specific tax rates. Taxing fixed-term contract wages would have a nearly null effect on fertility rate, but would generate a shift from fewer children conceived during fixed-term contracts towards more children conceived during non-employment. This result sheds light on the hypothesis that women working on fixed-term contracts are less prone to give birth as the opportunity cost of child-rearing is higher when this type of contracts pay better to compensate for the lack of job security. For completeness, I also test the implementation of a credit on permanent contract wages together with the tax in fixed-term contract wages. The results show a considerable increase in fertility that is essentially generated by a compositional change of the number of children in the household. This policy reform does not change the number of mothers in the economy but rather increases the number of mothers with two children, thus indicating that more income helps to compensate for the lack of time at home in order to raise multiple children.

Literature Review This paper contributes to four distinct parts of the literature. The major contribution of this paper is that it adds to the scarce literature that relates job security and fertility decisions. Adsera (2004) was the first, to the best of my knowledge, to establish a relationship between unstable contracts and low fertility in Southern Europe. In a

two-period theoretical model the author shows that larger uncertainty in income, from either unemployment or marginal employment arrangements, transforms the fertility decision into a risky and costly choice.[6] In a reduced-form setting De la Rica and Iza (2005) found that fixed-term contracts for women in Spain delay the motherhood decision although the same seems not to be relevant for men. Auer and Danzer (2016) found an identical result for Germany, but both studies claim the results cannot be interpreted as causal as they lack exogenous variation on fixed-term contracts. This paper adds to this literature by exploiting exogenous variation in the rules of fixed-term contracts, by simulating additional policy reforms, and by using a country that has not been studied in this context before.

Second, this paper contributes to the literature using structural life-cycle models, which estimate the impact of different job characteristics on both fertility and labour supply decisions. Moffitt (1984) was the first to estimate a dynamic model of discrete choice where both fertility and wage profiles are endogenous over the life-cycle. The results revealed that shifts in the level of the lifetime wage profile are associated with both lifetime profiles of fertility rates and female employment rates. Building on this outcome, Blackburn et al. (1993) introduced investment in human capital and showed that this investment is proportionally related to the age of first birth. Francesconi (2002) contributed to the literature by distinguishing between part-time and full-time employment. When comparing lifetime utilities between recent mothers in part-time jobs with those that interrupted their career, the author found no substantial differences.

More recently new features of the labour market have been introduced in this literature. Edwards (2014) explored the impact of *flexitime* in the reduction of career interruptions related to fertility. The author found that flexible hours schedule is more valuable to women with children and even more so to women with infant children. Adda et al. (2017) incorporated occupational choices in the model and allowed skill atrophy to be occupation specific. The authors concluded that women in abstract occupations face higher atrophy rates, thus higher opportunity costs of not working. Therefore, women in these occupations tend to have children at a later stage than women in routine occupations. In a structural model, only Guner et al. (2018) and my work have included different types of job contract in a life-cycle analysis of fertility and labour supply choices. Our papers differ in many ways, the main difference being that I account for the duration and renewals of fixed-term contracts in the model. This allows me, not only to approximate the model to reality, but also to study the impact of different policies that affected these two rules over time.

[6] Outside the context of job security, but also accounting for idiosyncratic uninsurable earnings risk, Sommer (2016) concluded that increases in earnings risk are associated with reduction on the number of children and the delay of fertility decisions.

Third, and more generally, this paper also contributes to the literature that studies the impact of family policies on fertility and labour supply. Gauthier (2007) and Olivetti and Petrongolo (2017) provided an extensive literature review on parental leave, subsidised childcare, and in-work benefits. In a cross-country comparison, Ruhm (1998) and Thévenon and Luci (2012) concluded that paid parental leave can increase female employment in 3 to 4 percent, but the result was not always positive to every country. Schönberg and Ludsteck (2014) and Lalive and Zweimüller (2009) found a negative effect in maternal labour market attachment in the short-run, but a rather small impact in the medium run. The latter study has also built a structural model to simulate the combination of parental leave and subsidised childcare and concluded that this policy could actually increase maternal labour market attachment in the medium-run. Sheran (2007) also emphasised the reduction of childcare costs as generating positive impacts on both employment and fertility. Finally, Erosa et al. (2010) and Haan and Wrohlich (2011) studied the impact of tax-credits on labour income and concluded that this instrument was also beneficial for both outcomes. This paper provides an additional policy instrument, job security, that although not directly targeting family, it generates positive effects on both fertility and maternal employment.

Finally, this work is also related to the recent literature on the study of simulated policy changes to the dual system present in Europe. Pérez and Osuna (2014) analysed the introduction of a single-contract in Spain by eliminating the duality between fixed-term and permanent contracts and concluded that this policy would be more effective in reducing unemployment and job destruction than the decrease in severance payments. Cahuc et al. (2016) contrasted the decrease in severance payments in open-ended contracts with the taxation of temporary jobs in France and concluded that the second reform would generate opposite effects, by decreasing employment and reducing job creation. Sestito and Viviano (2016) evaluated the reforms of the Jobs Act in Italy that provided a subsidy on permanent hiring and a decrease in firing costs. The authors found that both measures shifted employment towards more permanent contracts and raised overall employment rates. Dolado et al. (2018) simulated a unified system of employment protection legislation in Spain and concluded that the welfare effects would be heterogeneous across different types of workers, being the older workers the ones with largest losses. This paper adds to this literature by discussing both the introduction of a single-contract with and without adjustments on the labour demand, and also the taxation of fixed-term contracts, in Portugal.

The remainder of the paper is organised as follows. Section 2 provides an overview of the job contracts legislation and describes the incidence of fixed-term contracts in Portugal. Section 3 presents the data used in both reduced-form analysis and in the model estimation. Section 4 provides some preliminary evidence with a survival analysis, and evaluates the

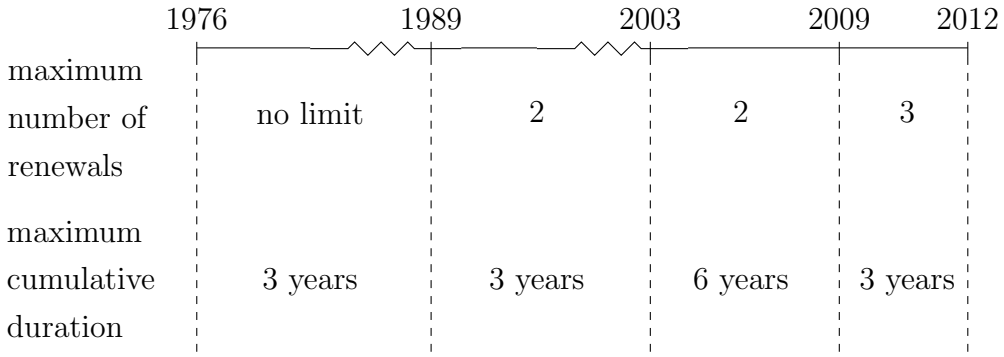
policy reform that affected the rules of fixed-term contracts in Portugal, after 2003. Section 5 describes the life-cycle dynamic discrete choice structural model. Section 6 is devoted to the estimation and identification issues. Section 7 presents the results, which include the parameters estimates, the fit of the model and an experiment for the model validation. Section 8 is dedicated to the policy counterfactuals. Finally, Section 9 concludes.

2 Institutional Background

2.1 Legislation of Fixed-term Contracts in Portugal

The regulation of employment contracts in Portugal dates back to 1937, but it was only in 1976 that fixed-term contracts (FTCs) became legislated. As explicit regulation on dismissals was implemented in that same year, this type of contract, with low firing costs, became an attractive screening device to the firms. Back then, there was no limit on the maximum number of renewals for the FTC. However, the period for which the worker could be employed for the same firm was limited to three years. Figure 1 summarises the legislation of FTC in terms of renewals and cumulative duration since 1976.[7]

Figure 1: Rules of FTC over time: maximum number of renewals and cumulative duration



Back in the 1980s, when the maximum number of renewals was unlimited, the FTC could either be a succession of short-term contracts or a three years single contract. Once the probation period was exhausted, the employer was obliged to convert the contract into a permanent contract (PC) in order to keep the worker in the same firm. Both renewals of FTC and conversions of FTC onto PC were automatic unless the employer explicitly communicated otherwise within a minimum of eight days before the end of the contract.

[7]The timeline finishes in 2012 as the legislation that was introduced after it is not straightforward to put in such a simple diagram, but for most of the workers in FTC, the legislation in place before 2012 still applies.

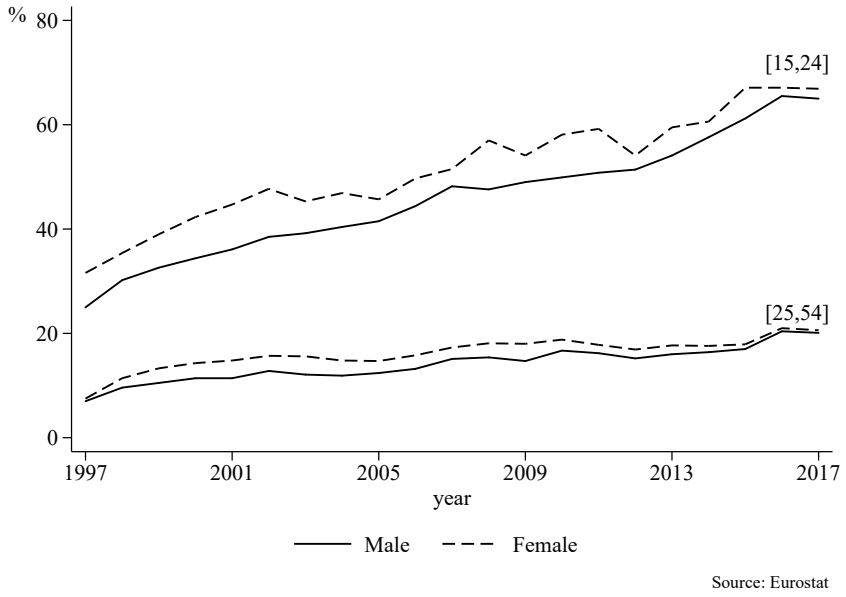
In 1989, after the integration of Portugal in the Economic European Community, the maximum number of renewals of FTC was capped at two, without changing the maximum duration of three years in the same firm. The period for the communication of non-renewal was extended to 15 days in cases of contracts with less than six months of duration and to 30 days in case of longer contracts. Short severance payments were also introduced in a ratio of two days for each month of FTC.

Before 2001, the replacement of a worker in a FTC job position required three months of interval between the firing date of the former worker and the hiring date of the new one. After 2001 the waiting period increased to six months; the severance payments have increased to three days for each month of the contract; and the minimum number of days for the communication of non-renewal decreased to five days only.

In 2003 the maximum number of renewals did not change, but the maximum duration of a FTC within the same firm was extended for up to six years, with the remark that the last renewal should have a duration between one and three years. More recently, in 2009, the maximum number of renewals was increased to three times while the maximum duration with renewals has reversed to three years, like in pre-2003.

2.2 Fixed-term Contracts Over Time, Gender, and Age

Figure 2: Percentage of fixed-term contract employees, by year, gender and age group



Portugal and Varejão (2009) showed that, in the context of the Portuguese dual labour market, firms look at the fixed-term contracts as an attractive device to screen workers with low firing costs. For that reason, the share of employees with FTC has always been relatively large (22% in 2017), especially when compared to other European countries (average 14.3% in 2017). This disparity is even larger for younger workers. In 2017, almost two-thirds of employees between 15 and 24 years old, in Portugal, had a fixed-term contract whereas the European average was only 44%. Figure 2 illustrates these trends by gender and age group during the last two decades.

According to Weiss and Gronau (1981), during the early stage of their careers, women are still deciding between market and home production. Therefore, women are more likely to defer investment in specific human capital. Under these conditions firms are "gender blind" at the hiring stage, but men are more likely to receive a promotion offer as their specific human capital grows faster (Lazear and Rosen, 1990). In other words, men with longer duration of fixed-term contract jobs may be perceived to have lower ability than women in the same position (Booth et al., 2002).

3 Data

In this section I describe the two main sources of data used in this paper. Most of the analyses rely on data from European Community Household Panel, presented in the first subsection, but in order to get more accurate estimates in terms of labour market transitions between different job contracts, I have also used the Portuguese Labour Force Survey, presented in the second subsection. This section includes details on sample construction as well mas a brief discussion on some descriptive statistics. In Appendix B, I provide a succinct description of two auxiliary datasets occasionally used throughout the paper: the National Household Budget Survey and the National Fertility and Family Survey.

3.1 European Community Household Panel

The European Community Household Panel (ECHP) is a longitudinal harmonised survey, coordinated by Eurostat. The panel includes data from 15 countries in the European Union and, for most countries, consists of 8 waves, between 1994 and 2001.[8] For the purpose of this study, I use the panel for Portugal between 1994 and 1999.[9]

[8]The 15 countries are: Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Spain, Sweden, Portugal, and the United Kingdom

[9]I have excluded the years 2000 and 2001 as there was a change in definition of fixed-term contracts. ECHP has a follow up for more recent years, the European Union Survey on Income and Living Conditions

The choice of this database is related to the reasonable amount of information both at the individual and household level for such a long period. The ECHP provides information on a broad set of questions related to demographics, income, social life, housing conditions, health, education, and employment. The Portuguese Labour Force Survey also includes both information on fixed-term contracts and fertility, but only follows each household for a period of six quarters.

Even though the information contained in the ECHP is relatively broad to answer the main research question of this paper, I complement it with the data from the Labour Force Survey conducted in Portugal during the same period. This survey provides clearer information on the duration and renewals of fixed-term contracts and includes a larger sample. With this additional information, I expect to improve the modelling of labour market transitions of women along the life-cycle.

3.2 Labour Force Survey

The Labour Force Survey (LFS) in Portugal (*"Inquérito ao Emprego"*) is a CPS-type household survey conducted by the Statistics Portugal (*INE - Instituto Nacional de Estatística*). Conducted on a quarterly basis, it asks information about approximately 45,000 individuals, in 15,000 households. Individuals aged 10 years old or less do not answer the survey, but are included in the database with information on demographics. Each survey respondent answers to around 150 questions about their participation in the labour market. The survey questions are divided into six broad topics including main activity, secondary activity, education and training, experience, job search, and labour market status in the previous year. In all sections, the survey follows the definitions of *Eurostat* making the labour market indicators comparable with other European countries.

In each quarter, one sixth of the sample is rotated out. Therefore, I can only compute transitions between labour market states for five sixths of the workers in the sample. However, measurement error is not a serious issue in this survey (Blanchard and Portugal, 2001). Inconsistencies in the observed labour-market transitions are negligible due to the low attrition rate and also to relatively low frequency of movements across labour market states.

To be consistent with the years selected in the ECHP data I have restricted the data in LFS to the same period. However, due to changes in the survey I cannot follow transitions that occurred between the last quarter of 1997 and the first quarter of 1998.

(EU-SILC), but this has no explicit information on the duration of the fixed-term contracts.

3.3 Construction of Samples and Descriptive Statistics

In both datasets I focus my analysis on women aged between 23 and 50 years old. As both of them are constructed on a rotation basis, I have two unbalanced panels. In the sample from ECHP I have 2,283 women and in the sample from LFS I have 34,988 women. Due to the restrictions I impose relative to the period and age, in both samples I have roughly about 50% of the women being observed in all periods. For all women I collect information on age, marital status, household composition, education, employment status, employment history, type of contract, and wages, of the woman and the husband, if available.

Some definitions should be mentioned for clarity. In this paper, a woman is employed if she holds a full-time job (either with fixed-term or permanent contract) with a certain firm that pays a given wage. I exclude part-time jobs as their proportion in Portuguese female employment is historically low, especially when compared with other countries.[10] For the purpose of this study, I also exclude self-employment, family business and contracts with undetermined ending date. All the employment-type restrictions accounted for about 24% of the employed female in the sample before restrictions.[11] Education is, throughout the paper, classified into two categories only: non-university and university, therefore, women with unknown education were also excluded (1.4%).

Table A1, in the Appendix, presents the main variables from the ECHP sample. This sample includes a relatively low percentage of women with university degree due to the period I am studying.[12] Slightly above 30% of the observations are non-workers and most of the employees hold a permanent contract. In terms of fixed-term contracts, most of them have duration of one year and zero renewals. This combination is reflected in the average tenure for all types of contracts – 20% of the workers have one year (or less) of tenure. In 2000's euros the average monthly wage is about 477, the minimum is 218.39 (minimum wage in 1994), and the maximum wage observed is about five times the mean wage. More than 70% of the observations are women with a partner and 34% are non-mothers. Regarding the number of children, about half of the observations are women with two children.

Table A2, in the Appendix, presents the main indicators that describe the female labour market in both samples. The two samples are fairly similar when it comes to the percentage of women holding a university degree, the percentage of non-workers (including inactive and

[10] Average part-time proportion of jobs held by female workers during 1994 to 1999 period was 14.3%, which is similar to the average rate over a longer period of time, whereas the average female part-time proportion in European countries is 26% and in the OECD countries is 24.5%.

[11] I follow Blundell et al. (2016a) and exclude women in all years starting from the one where the transition to one of the excluded categories is observed.

[12] According to the Portuguese Census the share of women above 15 years old with a university degree was 3.6% in 1991, 9.3% in 2001, and 16.9% in 2011.

unemployed), the average unemployment duration, the percentage of fixed term contracts and average tenure. Larger differences are found in the classification of fixed-term contracts. The duration of the contract in ECHP is split into 4 classes ("less than 6 months", "6 months to 1 year", "1 year to under 2 years" and "2 years or more") whereas it is defined in number of months in the LFS database. Given this difference between the two datasets, I should also expect some differences in the labour market flows, presented in Table A3. Transitions to non-employment and short fixed-term contracts are fairly similar, but major differences occur in transitions to longer fixed-term contracts and to permanent contracts. However, the difference becomes negligible when the last two categories are summed up.

4 Preliminary Evidence

In this section I present preliminary evidence on the relationship between job security (fixed-term vs permanent contracts) and fertility in Portugal, during 1994-1999. During this period, across age, the share of women that held permanent contracts presented a strong correlation (93%) with the share of women that become mothers. In fact, the average age at first contract conversion (from fixed-term to permanent contract), coincided with the average age at first birth, 30 years old, and both series (increasing along age) stagnated as the age of the woman approached the end of the fertility period.

Following De la Rica and Iza (2005), I do a survival analysis on the time to first and second birth. The authors used a proportional hazards model but did not account for the increasing childlessness in the last decades, especially in Southern European countries (Frejka, 2008). In this analysis, I use the discrete version of the proportional hazards model (complementary log-log) with two mass-point unobserved heterogeneity, which accounts for the fact that some women take much longer to give birth – denoted as the *later birth* group – and eventually, because the fertile period is limited, some of them do not give birth at all – either because they are biologically or behaviourally sterile, as justified in Heckman and Walker (1990).[13]

The following hazard model is estimated for first and second births:

$$h(t|x'_{it}\beta) = \begin{cases} 1 - \exp[-\exp(\gamma_1 \mathbb{1}FTC_{it} + \gamma_2 \mathbb{1}PC_{it} + x'_{it}\beta + \gamma_3 \ln(t))], \\ \qquad \text{if } i \text{ is a } \textit{later birth woman} \\ 1 - \exp[-\exp(m_{ebw} + \gamma_1 \mathbb{1}FTC_{it} + \gamma_2 \mathbb{1}PC_{it} + x'_{it}\beta + \gamma_3 \ln(t))], \\ \qquad \text{if } i \text{ is a } \textit{earlier birth woman} \end{cases} \tag{1}$$

[13] As I use two mass points, this model is equivalent to the split population model employed by Varga (2014) to study the time to birth as well.

where t indexes the years in which woman i is observed, $\mathbb{1}FTC_{it}$ is a dummy that takes the value 1 if the woman holds a fixed-term contract job, and 0 otherwise, $\mathbb{1}PC_{it}$ is a dummy that takes the value 1 if the woman holds a permanent-contract job, and 0 otherwise – being the base group the women not working (either inactive or unemployed) –, x_{it} is a set of controls that includes age, education, labour market experience, marital status, partner's income, and year and regional dummies (and in the case of second birth regression also includes the age of the first child), $\ln(t)$ captures the pattern of the duration dependence, and $m_z > 0$ distinguishes the two hazard rates in a discontinuous fashion. In this context likelihood of an individual with observed duration j is:

$$\mathcal{L}_{ij} = \pi S_{lbw}(j|x'_{ij}\beta)\left(\frac{h_{lbw}(j|x'_{ij}\beta)}{1-h_{lbw}(j|x'_{ij}\beta)}\right)^{\delta_i} + (1-\pi)S_{ebw}(j|x'_{ij}\beta)\left(\frac{h_{ebw}(j|x'_{ij}\beta)}{1-h_{ebw}(j|x'_{ij}\beta)}\right)^{\delta_i} \quad (2)$$

where $\pi \in (0,1)$ is the proportion of women that are *later birth*, $h_k(j|x'_{ij}\beta)$, k=lbw,ebw is the respective branch of (1), $S_k(j|x'_{ij}\beta)$ is the respective survival, and δ_i indicates whether the spell is censored or not.

The estimation sample is restricted to women, with a partner (either formally married or not), between 23 years old, when most of the women already finished schooling, and 40 years old, by when most of the women realized their completed fertility.[14]

Table 1 presents the results for the complementary log-log regressions, with and without two-points mass unobserved heterogeneity.

Two results stand out from column (1) of Table 1. First, the effect of having a fixed-term contract on the probability of giving first birth is substantially large and negative. Second, it is not clear whether, for first birth decision, women prefer to have a permanent contract and a more stable source of income, or whether they prefer not to work (base group) and dedicate more time to child-rearing.

To understand which aspect drives this relationship, I use an event study. In Figure 3, I plot the (first) birth rate of women in two different situations: those that have transitioned from a fixed-term contract to a permanent contract, and those that transitioned from a fixed-term contract to non-work.

While the transition to a permanent contract has a positive impact on first birth decision, the loss of income in the second type of transition seems to overcome the increase in time for child-rearing.[15]

[14]Note that restricting the women to have a partner and to be older than 23 years old mechanically decreases the number of women *at risk* of first birth. On the other hand, the fact that I do not restrict the age of first child mechanically increases the number of women *at risk* of second birth.

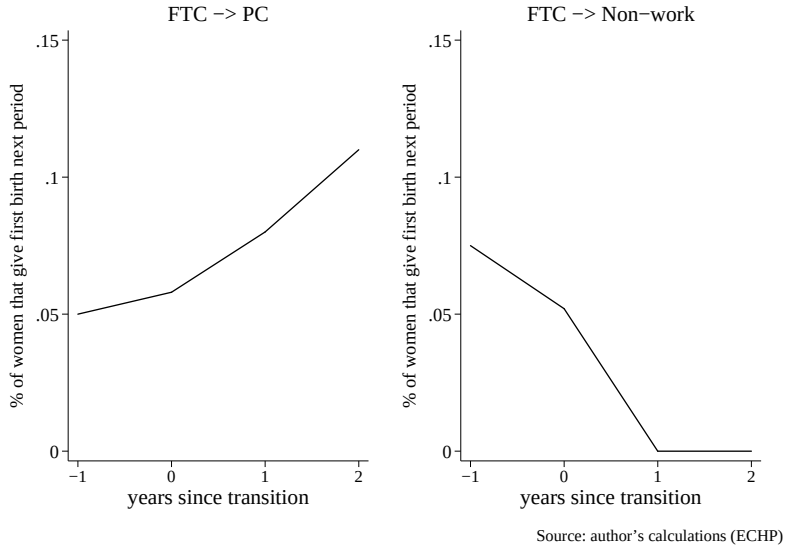
[15]These results are in line with Del Bono et al. (2012) that show a drop on fertility rate after job loss, which comes mainly from difficulty women face in re-establishing their careers.

Table 1: Estimates from complementary log-log regressions on first and second births, with and without two-point unobserved heterogeneity

Variable	First Birth		Second Birth	
𝟙 Permanent Contract (PC)	-0.105	-0.393	-0.666***	-1.895***
	(0.238)	(0.288)	(0.252)	(0.514)
𝟙 Fixed-term Contract (FTC)	-0.822***	-1.144***	-1.159**	-2.441***
	(0.313)	(0.348)	(0.554)	(0.719)
χ^2 PC – FTC	7.620	7.350	0.850	0.840
p-value	0.006	0.007	0.356	0.360
Constant	-18.806	-35.425	-8.648	-14.350
m_{ebw}		15.026		5.049
Prop. *later birth women*		0.195		0.588
Nr observations		972		1 925
Nr women		505		675

Notes: all regressions control for duration dependence (log form), age of the woman, university degree of the woman, husband's income, years of marriage, working experience of the woman, time effects, and regional effects. The second regression also controls for the age of the first child. Standard errors are reported in parentheses. * Significant at 10%, ** Significant at 5%, *** Significant at 1%

Figure 3: % of Women who give *first* birth next period, by transition from FTC



In order to explain what drives low fertility rates, one should also look at higher order births. I restrict my analysis to two births only as the number of mothers of three or more children is rather low in Portugal. In fact, this is also reflected in the proportion of women in *later birth* group, which is much larger for second than first births.

In columns (3) and (4) of Table 1 two main results stand out. For second birth, the fact that the woman is working has a negative and statistically significant impact, and this is not statistically dependent on the type of contract as the coefficient on the permanent contract is not statistically different from that for the fixed-term contract.

Two main results from this analysis should be kept in mind when modelling women's preferences. First, the different impact of job insecurity relative to the birth order. Second, the non-negligible proportion of women assigned to the *later birth* group.

As De la Rica and Iza (2005) reported, the survival analysis is important to get some evidence on the relationship between job security and fertility, but there is also a potential issue of simultaneity. Therefore, in the next subsection I explore exogenous variation in fixed-term contracts and look at its effect on fertility choices.

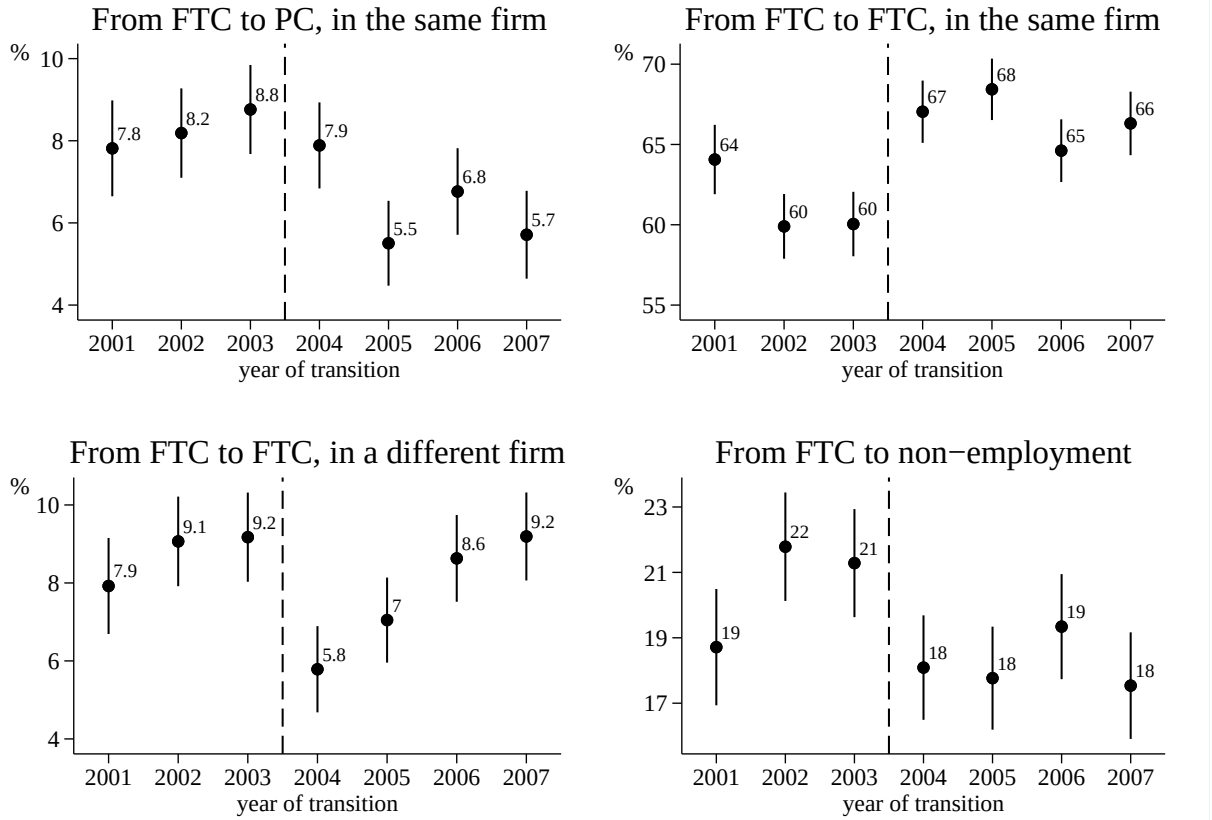
4.1 Policy Reform on the Potential Cumulative Duration of FTC

As explained in Section 2, in August 2003, the Portuguese government approved a law that changed the maximum duration rule of fixed-term contracts. Under the new scenario, in place since December 2003, a firm could keep an employee on a FTC for up to six years, while the cap on two renewals remained the same. In Figure 4, I plot the transitions from FTC to four different states: permanent contract within the same firm, FTC within the same firm, FTC in a different firm, and non-employment.[16]

The top left panel of the Figure 4 illustrates a decrease in the probability of conversion into permanent contracts after the reform. Note however that firms did not adjust immediately on this dimension as some workers that were converted in 2004 started the fixed-term contract before the reform and, therefore, the contracts of those workers were still constrained by the pre-reform rules. The top left panel sheds light on the most significant change. The probability of staying in the same firm on a fixed-term contract increased after the reform. This effect is also reflected in the two panels at the bottom. Transitions across firms decreased in the short-run and transitions to non-employment decreased slightly. In conclusion, it seems that employment levels improved slightly, but job security decreased. Therefore, the effect on fertility is not clear.

[16]For presentation purposes I exclude transitions to permanent contracts in other firms as these represent 1% or less for all the years in this analysis.

Figure 4: Transitions from fixed-term contracts to four different states, by year of transition



To study the impact of this reform I use the LFS sample. As explained in Section 3, this dataset is more accurate in terms of the job contracts' characteristics. Moreover, this dataset provides consistent definition of fixed-term contracts during the pre- (2001-2003) and post-reform (2004-2007) periods.[17] In Table 2, I provide the descriptive statistics of mothers' characteristics before and after the reform.[18] In this comparison I have only considered women, with a partner, who were employed on a FTC in their first year of the contract.

[17]The year 2000 was excluded from the analysis due to a difference in fixed-term contracts definition. As this change could potentially affect the years of 2001, I have also performed this exercise with a shorter period around the reform, 2002-2005. Because the results did not change I kept this version to provide more information on the medium-run effects.

[18]For a similar analysis see Lalive et al. (2014)

Table 2: Descriptive statistics of labour market characteristics before and after the reform

Variable	Pre	Post	Raw difference	w. Time Trend
Age	30.917	31.517	.6 *	.145
			(.351)	(.669)
𝟙 University degree	.115	.121	.006	.047
			(.027)	(.049)
Years since 1st job	13.104	14.311	1.208 **	.809
			(.539)	(.988)
Number of previous jobs	2.787	3.441	.654 *	.092
			(.336)	(.852)
Contract duration (months)	7.99	7.519	-.471	-.249
			(.385)	(.609)
𝟙 White collar	.572	.631	.059	.055
			(.036)	(.071)
Log(wage)	5.958	6.109	.135 ***	.009
			(.032)	(.066)
Nr observations	825	1 298		
Sample size	478	747		
Population size	151 657	240 692		

Notes: The table reports descriptive statistics of married women employed with a FTC in their first year of the contract. *Pre* includes women for which the contract started before the reform and *Post* includes women for which the contract started after the reform was implemented. Column (3) reports differences in means between both groups, and column (4) the differences between pre- and post- averages ,controlling for a linear time trend. * Significant at 10%, ** Significant at 5%, *** Significant at 1%

In the third column of Table 2 there are some statistically significant raw differences between the pre and post sample. Naturally in the post sample I find older women as I observe some women both during pre- and post-reform periods. As a consequence, the career is also longer for the women observed in the post-reform. Not surprisingly, the wages are also higher as I am not taking into account inflation and productivity growth in the raw-differences. To account for these patterns, I test these differences controlling for a linear time trend in the last column. As no difference is statistically significant, I conclude that none of these characteristics has changed discontinuously at the same time as the reform.

In this exercise I run two regressions:

$$\text{GiveBirth}_{it+1} = \alpha_0 + \alpha_1 \mathbb{1}_{\text{after}_{it}} + \beta X_{i,t} + u_{1it}$$
$$\text{GiveBirth}_{it+1} = \alpha_0 + \alpha_1 \mathbb{1}_{\text{after}_{it}} + \alpha_2 \text{Duration}_{it} + \alpha_3 \mathbb{1}_{\text{after}_{it}} \times \text{Duration}_{it} + \beta X_{i,t} + u_{2it}$$

The first one tests if women, with FTC starting after the reform was implemented (after December 2003), were less likely to give birth in the following year, controlling for the characteristics described above. The second regression tests whether the duration of the first contract in the firm affected the impact of the reform. Results are presented in Table 3.

Table 3: Regressions for the effect of the 2003 reform on birth likelihood

Dep Variable: Give birth next year	(1)	(2)
𝟙 Contract after reform	-.086 *	-.143 *
	(.047)	(.076)
Contract duration (months)		-.002
		(.004)
𝟙 Contract after reform × Contract duration (months)		.008 *
		(.005)
Age	.010 **	.010 **
	(.005)	(.005)
Log(husband wage)	-.009	-.012
	(.036)	(.037)
𝟙 One child	-.019	-.037
	(.036)	(.032)
𝟙 University degree	.018	.041
	(.024)	(.033)
Years since 1st job	-.004	-.005
	(.003)	(.003)
Number of previous jobs	.003***	.012**
	(.001)	(.005)
𝟙 White collar	-.025	-.040
	(.022)	(.025)
Log(wage)	-.011	-.040
	(.018)	(.025)
Year FE	Yes	Yes
Quarter FE	Yes	Yes
F-stat	2.03***	24.64***
Observations	2123	

Notes: The sample includes all married women in the first year of a FTC between 2001 and 2007. Robust standard errors are reported in parentheses. * Significant at 10%, ** Significant at 5%, *** Significant at 1%

The negative coefficient on the dummy, which equals one if the FTC started after the

reform, indicates the reform has negatively affected the probability of giving birth in the following year. The positive and statistically significant coefficient in the interaction term means that a longer FTC in the post-reform actually attenuates the decrease in the birth probability. This result might be explained by the fact that I have only included women in their first year of a contract in the sample as these might then give birth and still have time to come back to work and recover any career cost they might have had. The magnitude of the effect of the reform goes in line with the result of Milligan (2005) on the impact of an increase of 1000$ in childcare benefits in Canada, which is reassuring in terms of the size of the impact of this reform on fertility decisions.

Regarding the remaining coefficients, older women (during their fertile period) with fixed term contracts are more likely to give birth as they have less time to postpone their fertility decision. The number of previous jobs also reveals a positive and statistically significant effect, which might be related to smaller losses for experienced women interrupting their career to give birth. Finally, I want to stress that the non-significance of the husband wage might be explained by the large contribution of women's wage to the household income in Portugal (40%). This importance is also revealed in the larger magnitude (even though not significant) of the coefficient on the woman's wage.

From this analysis I conclude that both the type and duration of a fixed term contract are relevant to the fertility decision. Therefore, I incorporate both features in the dynamic discrete choice structural model that is presented in the next section.

5 Model

I develop a structural model to describe the dynamic decisions of women on fertility and labour force participation over the life-cycle. Fertility choices are taken conditionally on the existence of a partner (including both formal marriage and cohabitation), which may change over the life-cycle with certain marriage and divorce probabilities.

Labour supply decisions are taken conditionally on job offers, which arrive with a certain probability. Jobs differ both in wages and contract duration (one year fixed-term, two year fixed-term, or permanent). Note that I assume the workers do not choose the type of contract nor the duration. The reasons for this option are twofold. Firstly, I find in the LFS data that 74% of the women working on a fixed-term contract would have liked to have a permanent contract instead, but could not find one. Secondly, Portugal and Varejão (2004) show that, for Portugal, fixed-term contract workers receive, on average, lower returns to both experience and tenure, thus meaning workers are not compensated over time for the higher risk of job loss associated.

Following Van der Klaauw (1996), Eckstein and Wolpin (1989), and Hotz and Miller (1988) I assume that women can only work full-time. The percentage of part-time workers in Portugal is small in comparison to other countries, as highlighted in the Section 3. According to André (1991) this phenomenon is due to the residential proximity of relatives, which are essential to support employed women and to the sizeable contribution of women's labour income to household income in Portugal. Below, I describe the main components of my model.

5.1 Timing and Decisions

Time is discrete, and a period lasts for a year in order to match the data frequency. The decision horizon for each woman starts at age 23, after school, and terminates at age 50, when the number of old-age pensioners increases substantially in the data. Note however that fertility decisions can only be taken until the age of 40, the age at which I assume a woman is no longer fecund.[19]

In every period, a woman has to decide both on fertility (n_{it}) and work (p_{it}). Fertility choices are only conditioned on the existence of a partner (h_{it}). I assume complete and costless control over the ability to give birth at each age, like Wolpin (1984), Moffitt (1984), Happel et al. (1984), and Cigno and Ermisch (1989). However, I impose a restriction of a maximum of two children (k_{it}) who must be born in separate years as I exclude the possibility of twins in my model.[20] Working choices are conditional on the offers received and lay-off outcomes at the beginning of the period.

5.2 Job Contracts and Wages

Jobs are characterised by monthly net wages and contract duration, which can be fixed or permanent. Both wages and contracts' rules follow the labour market characteristics in Portugal during the period of 1994 to 1999. To match the data frequency and the distribution of fixed-term contracts duration I allow fixed-term contracts to have the duration of one or two years.[21] Fixed-term contracts can be renewed twice, as long as the maximum duration

[19] The starting age follows the same reasoning as Eckstein and Lifshitz (2011). Alternatively one could follow Van der Klaauw (1996), which starts the model in the first year of school-leaving. I chose 23 as starting age because according to Portuguese data there is a big drop in school attendance after 22. Moreover, according to the Fertility Survey only 5% of women in Portugal gave birth to the first child before 23 years old. Regarding the age which terminates the fertile period I follow Francesconi (2002). Also, according to Fertility Survey only 5% of the women in Portugal had the first child after 40 years old.

[20] According to *Instituto Nacional de Estatística* the number of households with more than two children was 6.5% and the less than 2% of births were twins.

[21] According to the law, the fixed-term contracts are even allowed to have duration of three years, but I have excluded them from the model as their existence is rather low in the market.

with renewals, does not exceed three consecutive years. To control for the maximum number of renewals I also include years of tenure in both contracts rather than years of experience, as experience is not contract-specific and creates extra computational burden to the model. Once the maximum duration for fixed-term contracts is exhausted, the worker is either promoted to a permanent position or laid off. The promotion rate is lower than the renewal rate of fixed-term contracts in order to incorporate the fact the permanent contracts have higher firing costs associated, when compared to fixed-term contracts.

In order to match these labour market dynamics I allow the following combination of contracts: one-year contracts can be renewed twice if replaced with similar contracts, or once if replaced with a two-year contract; two-year contracts can be renewed once if replaced with a one-year contract; in case the worker achieves the maximum number of renewals and keeps working in the following year, the fixed-term contract is replaced with a permanent one. Note however that a worker has always the chance to receive a permanent job offer, and therefore does not necessarily have to wait for the end of the maximum fixed-term duration.[22] I also allow for hirings into positions with permanent contracts to match the cases where the probation period/fixed-term contract is less than one year.

Women's wages follow a functional form that is contract-specific (FTC, fixed-term contract, or PC, permanent contract):[23]

$$\ln(w_{it}^{FTC}) = \alpha_1^{FTC} + \alpha_2^{FTC} S_{i23} + \alpha_3^{FTC} \mathbb{1}(D_{it} = 2) + \alpha_4^{FTC} R_{it} + \eta_{it}^{FTC} \tag{3}$$

$$\ln(w_{it}^{PC}) = \alpha_1^{PC} + \alpha_2^{PC} S_{i23} + \alpha_3^{PC} t_i + \alpha_4^{PC} t_i^2 + \alpha_5^z X_{it} + \eta_{it}^{PC} \tag{4}$$

where S_{i23} is equal to 1 in case the woman had a university degree at 23 years old, zero otherwise; t_i is the age, which proxies for labour market experience and in this model has values between 1 and 18; $\mathbb{1}(D_{it} = 2)$ is a dummy that takes the value of one if the fixed-term contract has the duration of two years; X_{it} accounts for the number of years of tenure, which can be equal to 1, 2 or 3, where 3 actually means 3 or more years of tenure; R_{it} is the number of renewals, which can be 0, 1 or 2; finally, η_{it}^{PC} and η_{it}^{FTC} capture random variations in wages, which are independent of the decision taken. Exponentiation of the r.h.s. or log of the l.h.s. ensures non-negative wages.

Note that both specifications depend on schooling, but differ in the other determinants. I expect the average wage for fixed-term contracts to be higher to compensate for the absence of employment protection and for schooling returns to be larger for permanent contracts, as these should represent a better match between the worker skills and the firm needs (Dias da

[22] According to Portugal and Varejão (2010), promotions to permanent positions are more likely to occur in the first two years of the fixed-term contract.

[23] See Francesconi (2002) for a similar approach.

Silva and Turrini, 2015). To match the features of the data, fixed-term contract wages do not depend on tenure, but rather on their duration and number of renewals. Both coefficients associated to these variables should be positive as both of them can be interpreted as investments in human capital at the firm. In a sense, longer duration contracts and more renewals also capture the positive effect of tenure, which is included in permanent contracts, as a sign of the quality of the match between the worker and the firm (Booth et al., 2002). Age also enters the permanent contracts' specification as a way to capture that, over time, the appeal for the outside option is decreasing (Pinheiro and Visschers, 2015).

The random components of wages are i.i.d technology shocks with zero mean, finite variance, and a nonzero contemporaneous covariance between them. These assumptions are consistent with the fact that the data used for estimation does not cover a long period (6 years), and that during this period the variation of wages was flat.[24] In subsection 6.1 I discuss the estimation procedure for wages.

5.3 Job Offer and Dismissal Probabilities

At most one job offer arrives each period with a certain probability. Even though I do not allow for search-on-the-job I do allow for job offer arrivals in the same period the woman is dismissed.[25] In case the woman was working in the previous period, the probability of getting a job offer is given by π_o^W, which depends on education, age, type of contract held before, tenure, and renewals. In case the woman was not working in previous period, the probability is defined by π_o^{NW}, which depends on unemployment duration (UD), education, and age. In Figure 5, I provide a diagram that represents the possible transitions in the labour market modelled here, each of them with a different probability.

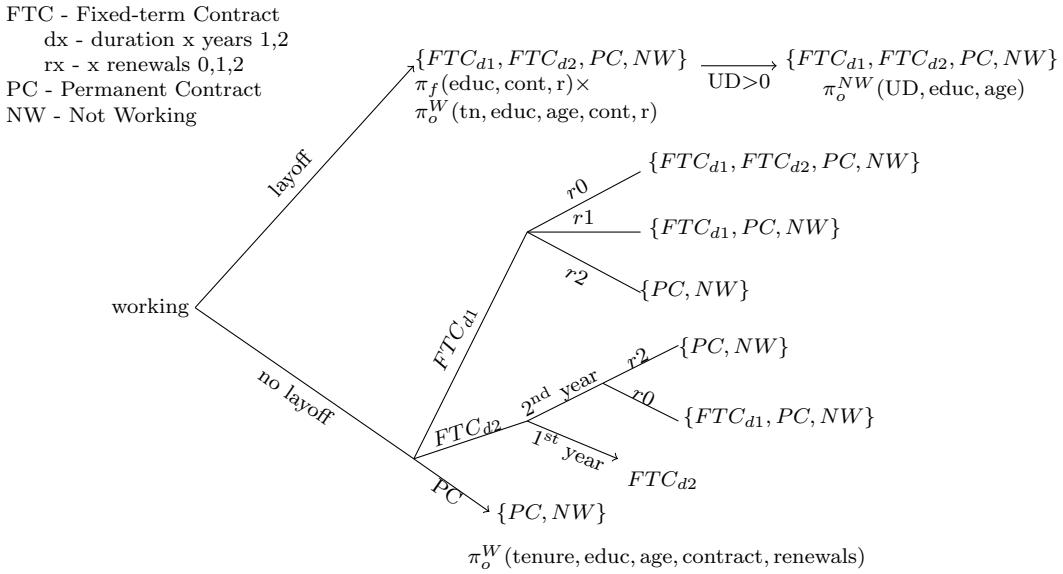
Unemployed women can potentially get any type job contract offer. Women that have been dismissed at the end of last period are not penalised. However the arrival rate decreases with the duration of unemployment (1, 2, or 3, or more years). Women working on fixed-term contracts can always be promoted as long as the duration of the contract has elapsed. Transitions from a one-year contract to a permanent contract will be less frequent than transitions from a two-year contract to a permanent contract (Gagliarducci, 2005). Job offers of fixed-term contracts with a duration of one year may also arrive if the number of renewals has not reached the maximum. Once the woman knows in which final point of the tree she is, then she decides whether to participate in the labour market.

Conditionally on being employed, the worker is dismissed with a given probability, which

[24] See Blundell et al. (2016b) for a similar approach.

[25] Contrary to Llull and Miller (2016) and Edwards (2014) I do not allow women to receive job offers while employed, but I do differentiate between whether they were dismissed in the same year or not.

Figure 5: Possible labour market transitions, by layoff, contract duration, and renewals



depends on the schooling level at age 23 ($S_{i,23} = 1$ in case of a University degree), on tenure ($X_{i,t}$) (weighted by the number of renewals ($R_{i,t}$) in case of a fixed-term contract as for permanent contracts $R_{i,t}$=0), and also on the duration of the contract (D_{it}). All the coefficients are expected to be negative as a complement to their positive impact on wages and promotion probability.

$$P(\text{dismissal}) = \frac{\exp(\pi^d)}{1+\exp(\pi^d)} \tag{5}$$
$$\pi^d = \varsigma_0^d + \varsigma_1^d S_{i,23} + \varsigma_2^d X_{i,t}(1+R_{i,t}) + \varsigma_3^d \mathbb{1}(D_{i,t}=2) + \varsigma_4^d \mathbb{1}(D_{i,t}=3)$$

For simplicity, I assume that this probability is also the probability of non-renewal. Therefore, if at the end of a fixed-term contract the worker was not dismissed, this means that the firm neither offered her a renewal of the fixed-term contract nor a permanent contract.

5.4 Partner

In this model I do not distinguish between formal marriage and cohabitation, hence *marriage* means getting a partner with whom the woman will potentially have children.[26] I define the probability of marriage as a function of the age of the woman and the type of job

[26]I analyse both married and cohabiting couples because, according to Portuguese census data, around 20% of the births in Portugal during the period of analysis were conceived out of formal marriage.

contract she holds.

$$P(\text{marriage}) = \frac{\exp(\pi^m)}{1+\exp(\pi^m)} \tag{6}$$
$$\pi^m = \theta_0^m + \theta_1^m t_i + \theta_2^m t_i^2 + \theta_3^m \mathbb{1}(D_{i,t} \in [1,2]) + \theta_4^m \mathbb{1}(D_{i,t} = 3)$$

Contrary to other models, such as Adda et al. (2017), marriage does not depend on schooling. As this is a permanent characteristic in this model and few women have a high university degree in the data, there is not enough variation to include schooling as a determinant of marriage.

The probability of *divorce* (leaving a partner) is defined as a function of the number of children (k_{it}) only and it is assumed to be zero in the year of birth (when the youngest child reaches one year old ($a_{it} = 1$)). As for couples without children this probability is constant to reflect the lack of statistical significant evidence I found for correlation between divorce and age of the woman. This probability is thus expressed in the following way:

$$P(\text{divorce}) = \begin{cases} 0 & \text{,if } a_{it} = 1 \\ \dfrac{\exp\left\{\theta_0^d + \theta_1^d k_{i,t}\right\}}{1+\exp\left\{\theta_0^d + \theta_1^d k_{i,t}\right\}} & \text{,if } a_{it} \neq 1 \end{cases} \tag{7}$$

5.5 Utility Function

The decision to participate in the labour market depends on the contract duration, but the disutility from work does not, except when the woman has children. Therefore, I simplify notation hereafter by defining $p_{i,t}$ to be equal to one when the woman works and zero otherwise, regardless of the time of contract. Note that the utility will depend on the choice of labour supply, but not directly on the choice of fertility, as children are only born in the period after the decision. However, different idiosyncratic shocks arrive according to each of the four possible decisions. The utility of woman i at period t takes the following form:

$$\begin{aligned} U_{it} = {} & c_{it} + \gamma_1 p_{i,t} c_{it} + \gamma_2 k_{i,t} c_{it} + (\gamma_3 + \zeta_i^p) p_{i,t} + (\gamma_4 + \zeta_i^n) k_{it} + \gamma_5 k_{it}^2 \\ & + \gamma_6 (D1_{i,t} + D2_{it}) \times k_{it} + \gamma_7 D3_{i,t} \times k_{it} \\ & + \gamma_8 (D1_{i,t} + D2_{it}) \times \mathbb{1}(a_{i,t} = 1) + \gamma_9 D3_{i,t} \times \mathbb{1}(a_{i,t} = 1) \\ & + \gamma_{10} \mathbb{1}(k_{i,t} = 2) \times \mathbb{1}(a_{i,t} = 1) + \sum_{j=1}^{4} \mathbb{1}(\text{choice j}) \epsilon_{it}^j \end{aligned} \tag{8}$$

Consumption is denoted by c_{it}, which represents the level of a composite good for which the price was normalised to 1. Following the female labour supply literature (Van der Klaauw, 1996; Francesconi, 2002; Keane and Wolpin, 2010; Eckstein and Lifshitz, 2011), consumption enters linearly in the utility function and there are no assets, thus neither borrowing nor saving are allowed in the model. Following Edwards (2014), I allow for income effects through the interaction of consumption with the choice of labour supply (γ_1) and with the number of children (γ_2). The first interaction accounts for the consumption-leisure substitution effect and the intuition for the second interaction is the fact that consumption choices might be influenced by the presence of children in the household (e.g. different film choices at the cinema). The disutility from work does not depend on the type of contract, but differs with taste (ζ_i^p).[27] I also introduce heterogeneity (ζ_i^n) in the utility derived from the number of children (γ_4). See the next subsection for a description of the unobserved heterogeneity process.

In the second row, I allow for utility from children to vary with the type of job contract in order to represent the preliminary evidence I found in Section 4. In a fixed-term contract, I expect the woman to derive a lower utility from children, as she is unsure about whether she will be working in the near future and be able to bear the costs of children. In the third row I allow interactions between each type of job contract and the fact that the woman has a one-year-old child (infant), which may require greater investments both in terms of time and money, than in other periods of children's lives. I also allow the utility from children to vary with this feature in order to control for the birth spacing that is observed in the data. γ_{10} is restricted to be negative in order to capture the additional difficulties that a second child may bring.[28] Finally, ϵ_{it}^j are choice-specific random preference shocks, which follow a type I extreme value distribution: $F(\epsilon_{it}^j) = \exp\left\{-\exp\left\{-\epsilon_{it}^j/\tau\right\}\right\}$ with mean $\tau\gamma$ and variance $\tau^2\pi^2/6$.

5.5.1 Permanent Unobserved Heterogeneity

In terms of unobserved heterogeneity, I follow Heckman and Singer (1984), and allow women to belong to one of 4 different types, as reported in Table 4. At age 23, when individuals start to be modelled, each woman draws a random permanent preference for work-fertility from a multinomial distribution, which depends on tenure, presence of a partner, and number of children. HW stands for high taste for children and high taste for work, HU for high children for fertility, but low taste for work, LW for low taste for children, but high

[27] There is no utility level associated with not working because I assume this as the baseline in my model.

[28] In the National Fertility Survey, 60% of the mothers of one child reported the "additional problems and complications" of subsequent children to be important for their decision to not have more children.

Table 4: Unobserved permanent heterogeneity

	work	non-work
high fertility	HW	HU
low fertility	LW	LU

taste for work, and LU for low taste for both children and work. In the first two cases ζ_i^k is positive and when the taste for work is high ζ_i^p is also positive; otherwise they are both zero. These parameters act as taste shifters towards working and fertility choices.

5.6 Budget Constraint

The household budget constraint depends on the guaranteed minimum income (GMI), the husbands' income (y), the woman's wage (w), the unemployment benefits (ub), and the children's costs (CC). It takes the following form:

$$c_{i,t}^H = GMI(h_{i,t}, p_{i,t}, k_{i,t}) + y_{i,t}h_{i,t} + w_{i,t}p_{i,t} + ub_{i,t}(1 - p_{i,t}, X_{i,t}) - CC(p_{i,t}, h_{i,t}, k_{i,t}, a_{i,t}) \quad (9)$$

Household consumption is defined as $c_{i,t}^H = c_{i,t} \times (1 + 0.5 \times h_{i,t} + 0.3 \times k_{i,t})$. That is, the woman's consumption ($c_{i,t}$) scaled by the "number of adult equivalent" given by the "OECD modified scale", that is, 1 plus 0.5 for a second adult plus 0.3 for each child in the household (Hagenaars et al., 1994).[29]

As the model does not allow for either borrowing or saving, the income of the household does not depend on assets. In order to ensure non-negative consumption and to take into account the welfare benefits available in Portugal, I also include the guaranteed minimum income (GMI), which depends on the presence of a partner, the labour supply choice and on the number of children. Once the woman has a partner I assume he works full-time as, in the data, 93% of the partners of women in the age range between 23 and 50 years old are working full-time. However, instead of considering husband's wage I consider husband's wage I consider husband's personal income to account for the fact that 27% of the husbands are self-employed. To avoid increasing the state space I also express husband's income in terms of the woman's observables, namely on her schooling level and age.[30]

$$\hat{y}_{it} = \hat{\alpha}_1^h + \hat{\alpha}_2^h S_{i,23} + \hat{\alpha}_3^h t_i \quad (10)$$

[29]Contrary to Adda et al. (2017) I will not estimate the weights of the OECD modified scale. Also, according to Burniaux et al. (1998), sensitivity analyses suggest that while the composition of income poverty is affected by the use of different equivalence scales, trends over time are much less affected.

[30]See Van der Klaauw (1996), Sheran (2007), or Adda et al. (2017) for similar specifications.

The woman is also entitled to unemployment benefits in case she was laid off in the previous year, i.e., $p_{it} = 0$ and $X_{it} = 1$. Note that in case the woman decided not to work conditional on having received a job offer she is not entitled to unemployment benefits. In terms of duration of the unemployment benefits I do not allow the woman to receive them for more than a year, which is not a strong assumption considering the rules in Portugal during the period in analysis – the maximum potential duration for individuals between 23 and 30 years old was 12 months and for individuals between 30 and 40 years old was 18 months, regardless of previous working experience. For older individuals, the potential duration of unemployment benefits could go up to 2 years and a half, but because they have to comply with the obligations to find a job, most of the beneficiaries did not take more than one year of unemployment benefits.

Finally, I introduce a cost for childcare, CC, which depends on the labour supply of the mother, the presence of the father in the household, the number of children, and the age of the youngest child. In case the mother is not working the childcare costs are lower as she has time to look after the child. However, the costs are not assumed to be zero in order to capture the large utilization of formal childcare in Portugal, which is not free.[31] Therefore, the costs are larger if there are infants present in the household. In case the husband is not present in the household the costs are reduced to account for possible cash transfers from the father, whose income is not entering in the budget constraint directly.

5.7 Dynamic Decision Problem

Each year the woman makes her decisions conditional on the following state space

$$\Omega_{i,t} = \left(p_{i,t-1}, n_{i,t-1}, k_{i,t}, h_{i,t}, a_{i,t}, S_{i,23}, D_{i,t}, X_{i,t}, R_{it}; \epsilon_{i,t}, \eta^z_{i,t}, \zeta^p_i, \zeta^n_i\right) \tag{11}$$

which includes, work choice, fertility choice, children, husband, age of the youngest child, university degree, duration of the contract, tenure, renewals of the contract, shocks on preferences and wages, and unobserved heterogeneity in tastes for work and fertility.

The value function for woman i in period t is given by:

$$V^j_t(\Omega_{it}) = \max_{j \in J(\Omega_{i,t})} U^j_{it}(\Omega_{it}) + \beta E_t(V_{t+1}(\Omega_{t+1})|j \in J, \Omega_t) \tag{12}$$

where β is a discount factor, and E_t is the expectation operator conditional on information

[31] See the *Education at a Glance* reports produced by OECD. In the 2018 edition, Portugal was the country with the third largest private expense on pre-schooling, where more than 90% of the children are enrolled.

in period t.[32] Note that J, the set of possible choices, may not be equal in every period as it depends on the arrival of job offers, on the existence of a partner, on the number of children (limited to a maximum of 2), and on the age of the woman (no longer fertile from age 40 onwards). In Appendix C, I present all the possible conditional value functions.

5.7.1 Terminal Condition

By the age of 40, women make their last fertility decision in the model. However, as noted by Adda et al. (2017) children have costs in the life-cycle career of the woman. Therefore, I include 10 additional years of labour supply decisions in the model in order to capture these costs before women start to retire. At the age of 50 I assume that the future value is function of children still present in the household, and on the type of the last job contract.

6 Estimation

The parameters of the model are recovered in two steps. First, I estimate the equations that describe the evolution of the exogenous elements in the model. These include the dynamics of marriage, divorce, lay-off, job offers, and the earnings for wives and husbands. The discount factor and the costs of childcare are externally set. Second, the remaining parameters related to the utility function are estimated by a combination of the Method of Simulated Moments (MSM) and Indirect Inference. Details of estimation for the exogenous elements in the model can be found in Appendix D, except for wages and probabilities estimation for which the estimation is described in the next subsection.

6.1 Wages and Offer/Lay-off Probabilities

When estimating wages one should take into account selection for work as the wages of workers might be higher than the potential wages of non-workers. In this paper I estimate wages of women using a Heckman (1979) selection correction approach. This estimation is done in a two-step procedure where the first step is a probit for work choice and the second-stage is the wage equation, which accounts for the correlation between unobservables of work choice and unobservables of wages (Mills ratio). In the probit, I include the variables in the model that do not directly determine wages, but are important determinants for the labour supply decision. Results in Table D4 indicate the number of children as an important variable to take into account when women choose to work whereas being married seems to

[32] β is set to 0.98, following Attanasio et al. (2008).

be less relevant. For both contracts, the Mills ratio turned out to be close to zero and non significant.

The results on selection should be taken with a grain of salt as the variables chosen as exclusion restrictions might not be the best determinants of work choice. For robustness purposes I have also estimated the selection equations accounting for additional variables that existed in the data, but do not enter the structural model. Personal non-labour income includes private transfers and returns from investments whereas social transfers include unemployment benefits, family-related allowances, sickness/invalidity benefits, education-related allowances, social assistance and housing allowance. Social transfers are quite important in the context of Portugal, which reduce poverty risk for around half.[33] Following the evidence in the literature showing that female participation rises when households move into home ownership, I have also included dummies for rent-free housing, rented housing, and second-home ownership (Del Boca and Lusardi, 2003). Results corroborate the evidence in the literature and also emphasise the importance of home allowances in Portugal. Even after including all these variables, there is no evidence of selection into work.

Although there is no evidence for selection, both estimates of fixed-term contract wages and permanent wages presented in Table D3 are the ones resulting from the selection correction approach. For husband's wage no correction is done as the model assumes the husband always works and the average participation rate in the data is 93%. As justified in the model description, all wages refer to full-time work as part-time is not particularly relevant in Portugal, especially during the estimation period. For accuracy, the wages estimation is also restricted to wages above the minimum wage defined by law in each year.

In terms of offer probabilities, each node of the tree presented in Figure 5 is assigned a value that depends on the type of contract, contract duration, number of renewals, unemployment duration, schooling and age.[34] Lay-off probabilities instead follow a functional form that depends on university degree, tenure, and type of contract. Results are presented in Table D2. Note that job offers are not directly observed in the data (estimation uses transitions observed in the Labour Force Survey), but lay-offs can be distinguished from quits and therefore, only this type of job separation is used in the last estimation.

[33] For a similar approach with United States data, see Low et al. (2018)

[34] For presentational purposes the results on offer probabilities' estimates are omitted from this paper, but are available upon request.

6.2 Method of Simulated Moments and Indirect Inference

The estimation of the parameters in the utility function is done by combining MSM and indirect inference.[35] Firstly, assuming an initial set of parameters in order to calculate all the possible conditional value functions, I solve the model backwards (starting at the age of 50). Secondly I simulate the choices of 2985 women (5 times the number of women I have aged 23 years old following Blundell et al. (2016a)), over the life-cycle and save them in a panel data format. Initial conditions are taken from the data. Decisions are made at the end of each period conditional on both observables and outcomes from random draws, which are known at the beginning of each period.

Using both datasets (real and simulated) I compute the moments that are described in the next subsection as well as the coefficients with respect to the indirect inference approach. Finally, using the method of Bound Optimization by Quadratic Approximation (Powell, 2009), the parameters are the solution of the following problem:

$$\min_{\theta}(M(\theta) - M_R)' W_R^{-1} (M(\theta) - M_R) \tag{13}$$

where θ is the vector of parameters to be estimated; $M(\theta)$ is the vector of moments computed from the simulated data; M_R is the vector of moments computed from the real data; W is the weighting matrix, which contains sample variances of M_R in the diagonal and hence the moments with greater variance will be less important. The sample variances were bootstrapped with 10000 iterations.[36]

6.3 Moments

The moments used for the utility function parameters are listed in Table 5.

The proportion of non-workers, FTC, and PC workers, by age group, identifies the disutility from work; the proportion of non-mothers, mothers of one child, mothers of two children, by age group, and the quantiles of age at first birth and second birth, identify the utility from children; the proportions of women with a one-year-old child who do not work, work on a FTC, or work on a PC identify the complementarity between newborns and work; the coefficients on the OLS regression of household income net of childcare costs on age, number of children, and work identify the complementarity between consumption and work and the complementarity between consumption and children; and finally the coefficients OLS regres-

[35] See Pakes and Pollard (1989) and Duffie and Singleton (1993) for MSM and Gourieroux et al. (1993) for indirect inference

[36] Under the regulatory conditions stated in Pakes and Pollard (1989) and Duffie and Singleton (1993), the estimator $\hat{\theta}$ is consistent and asymptotically normally distributed.

Table 5: Moments

Description	#
Proportion of women with a one-year-old child in each contract	4
Transitions between each labour market status	16
Proportion of non-mothers by age group	3
Proportion of mothers of one child by age group	3
Proportion of mothers of two children by age group	3
Proportion of non-workers by age group	5
Proportion of workers in fixed-term contracts by age group	5
Proportion of workers in permanent contracts by age group	5
Proportion of married women with children by age group	5
Quantiles of age at first birth and second birth	10
OLS regression coefficients of household income net of childcare costs on age, number of children and work	3
OLS regression coefficients of children (0/1) on age, $\mathbb{1}$(husband), and contract	4
OLS regression coefficients of children (1/2) on age, $\mathbb{1}$(husband), and contract	4

Note: the age groups are [23,30],]30,35],]35,40],]40,45],]45,50]. When calculating the proportion of mothers I do not consider the age groups outside the fertile age. OLS regressions also account for year fixed effects.

sion of children (0/1) on age, and non-work, FTC, PC, and the coefficients OLS regression of children (1/2) on age, and non-work, FTC, PC, identify the complementarity between the type of contract and children. Additional moments that relate outcome variables with endogenous decisions, such as the transitions between each labour market status and the proportion of married women with children by age group are also included in the estimation as they are crucial to identify the dynamics in the model (Eisenhauer et al., 2015).

7 Results

In the first subsection I report and discuss the estimates of the parameters in the utility function. Afterwards, I present the fit of the model, both in aggregate statistics and in life-cycle graphs, which depict the main outcomes along the life-cycle.

7.1 Parameter Estimates

Parameter estimates for the utility function and respective standard errors are shown in Table 6. Despite the fact that I assume a utility function that is linear in consumption, there is evidence for complementarity between consumption, labour and the number of children, as both parameters (γ_1 and γ_2) give a negative value.

The contribution of children to the utility function indicates a quadratic shape (γ_4 and γ_5), which sheds light on the larger proportion of single-child mothers relative to two-child

Table 6: Utility function parameters:

Parameter	Value	Standard Error
γ_1	-0.45	(0.03)
γ_2	-0.01	(0.01)
γ_3	-0.52	(0.06)
γ_4	2.63	(0.83)
γ_5	-0.21	(0.13)
γ_6	-0.50	(0.19)
γ_7	0.42	(0.05)
γ_8	-1.03	(0.21)
γ_9	-0.61	(0.18)
γ_{10}	-2.05	(0.87)
Unob.Heterogeneity		
ζ^p	0.18	(0.00)
ζ^n	0.10	(0.04)
Proportions (%)		
HW	18.40	
HU	20.17	
LW	35.59	
LU	25.84	

ones. Illustrating the usual spacing between the first and second births, γ_{10} is a relatively large negative value.

The interplay between labour supply and fertility decisions is reflected in γ_6, γ_7, γ_8, and γ_9. The first two parameters have opposite signs reflecting the stronger preference for children when the woman is permanently employed. As the job security is lower in a fixed-term contract the woman is likely to face an income shock, which might have (negative) implications in terms of children (monetary) investment, therefore, the coefficient associated with children during the period of fixed-term employment (γ_6) is negative. Note however that the magnitude (in absolute terms) of the parameter associated to children while the woman is permanently employed (γ_7) is smaller than that for fixed-term employment to highlight the fact that, while employed, the mothers will have less time to spend with their children.

When I look at these interactions in the presence of an infant (i.e., the youngest child is one-year-old), the coefficient associated to permanent employment (γ_9) is no longer positive, highlighting the importance of time investment in children in the first year of life. However, to compensate for the lack of time while employed, the mothers might choose formal child-care. Such costs become relatively more expensive if the mother becomes unemployed in the

following years as the income necessary to keep such monetary investment might decrease (with a larger probability) in case she holds a fixed-term contract (γ_8).[37]

Finally, in terms of unobserved heterogeneity, the types that have relatively stronger preference towards working have less disutility from labour force participation (ζ^p) and the types that are more prone to have children enjoy it more (ζ^n) over the life-cycle. The proportions for each type are presented at the end of the table. From these I observe that the groups with relatively more taste for children (HW and HU) are less than 40% of the sample and the groups with relatively more taste for work (HW and LW) represent more than half of it. As expected the most representative group is the one with lower taste for children and higher taste for work (LW, with 35.59%).

7.2 Model Fit

In Table 7, I list the proportions of women according to different characteristics, both in actual and simulated data.In the third column I provide the p-value resulting from the t-test that compares the means between the data and the model.

Table 7: Comparison of means between actual and simulated data

	Actual	**Simulated**	**t-test p-value**	χ^2 **p-value**
Non-employment Rate	.3323	.3282	.27	
Employment FTC 1 year	.0544	.0425	.05	.000
Employment FTC 2 year	.0170	.0151	.18	
Employment PC	.5964	.6141	.07	
Fertility Rate	.0370	.0354	.27	
Fert. Rate, non-employment	.2450	.3186	.07	.000
Fert. Rate, FTC	.1125	.0555	.08	
Fert. Rate, PC	.6425	.6259	.31	
% Women with no children	.3470	.2940	.02	
% Mothers of 1 child	.3127	.3825	.01	.000
% Mothers of 2 child	.3404	.3235	.07	
% Working mothers	.6555	.6486	.21	

This model achieves reasonably good fit in terms of the labour market indicators. Figure 6 shows the fit on labour supply along the life-cycle. Employment in permanent contracts is

[37]Remember from subsection 5.6 that there is a high take-up of formal childcare in Portugal.

the one that presents a better fit, which is consistent with the the fact that this group has the closest match in terms of fertility rate (Table 7).

Figure 6: Model fit: Labour market status distribution along the life-cycle

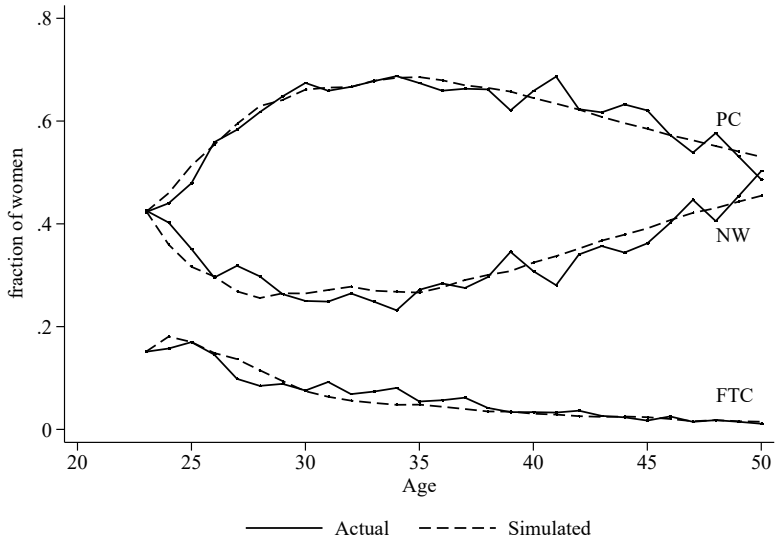
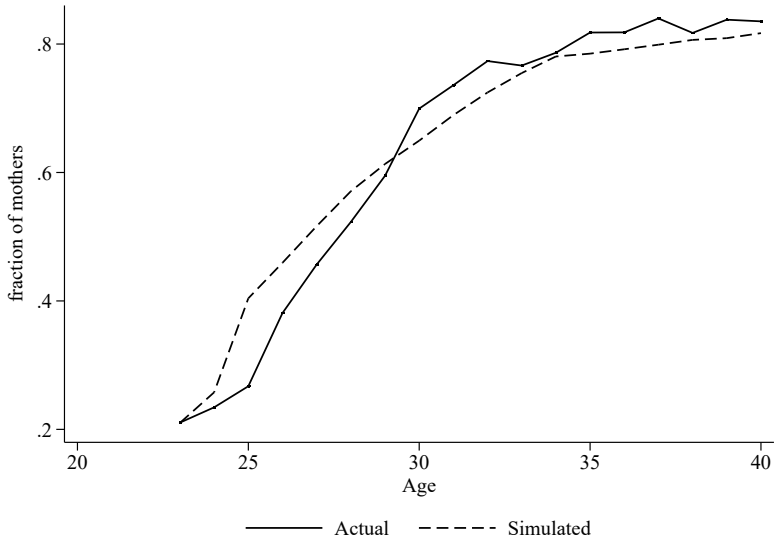


Figure 7: Model fit: cumulative fertility choice along the life-cycle



On average, the model predicts fertility rate reasonably well. Figure 7 illustrates the fit of motherhood along the life-cycle. Despite some local disparities, especially between 23 and 25 years old, the model is able to capture the general concavity of this indicator.[38]

[38] An extension of the model that could improve the fit on fertility would be to include the value for quality

7.3 Model Validation

To validate the model, estimated with data between 1994 and 1999, I extend the maximum duration of successive FTC in the same firm to 6 years, as in the reform of 2003. In this exercise, I take out the restrictions on renewals that previously limited the FTC cumulative duration to 3 years. For example, in the baseline, a 2-year contract would only be renewed into a 1-year contract or it would be converted into a permanent contract, if such an offer arrived. In this simulation, I allow the 2-year contract to be renewed twice with the same duration before it is eventually converted into a permanent contract.

As I change the structure of the labour market, but only model the labour supply I should also adapt the probabilities for each transition in the labour market. To achieve this, I re-estimate the same functional forms of the probabilities using LFS data between 2004 and 2008 in order to capture the legislation in place at the time, which was precisely the one set in this experiment. I could use data up until 2009, when legislation changed again, but I decided not to do so in order to avoid the contaminating the results by the crisis in Portugal at that time, even though I control for general trends by including dummies for both cohorts and years in all the regressions. Table 8 presents the results of the first experiment compared to the baseline of the model and also to the actual data from the Labour Force Survey.

Table 8: Model Validation

	Baseline 1994-1999	**Prediction** 2004-2008	**Actual Data** 2004-2008
Employment (%)	67.18	60.81	59.28
Permanent contracts (%)	91.42	82.14	81.77
FTC converted into PC (%)	9.33	2.82	4.21
Fertility rate	1.23	1.17	1.18
Childless at the end of fertile period (%)	17.05	19.19	21.22

As expected, and in line with Güell and Rodríguez Mora (2010), I observe a lower employment rate (a fall of almost 10%) when the prevalence of fixed-term contracts is higher. Such an effect is also observed in the significant decrease of contract conversions. The higher degree of job uncertainty should have repercussions in terms of fertility. Indeed, I observe lower fertility rate, and a higher proportion of childless women. Such predictions go in line with the channel of promotion as an important determinant of the fertility decision. To check whether this validation is also in line with the reduced-form evidence presented in

of the children and children investment decisions (Becker and Tomes, 1976; Chiswick, 1986; Del Boca et al., 2014; Carneiro and Ginja, 2016). Note however that the availability of data on early child investment and child performance in Portugal is very limited

subsection 4.1, I have run the same regression using the baseline version of the model as the pre-period and the simulated version of the model as the post-period. Results on the coefficients of interest are presented in the graph 11 in the Appendix. As I have achieved a reasonable model validation, in the next section I set up two experiments for policies that have been discussed in the literature of job security.

8 Policy Experiments

In this section I predict the impact of two counterfactuals on labour supply and fertility decisions: (1) A single contract with a 3-year probation period; (2) A higher tax rate on fixed-term contracts compensated by a decrease on the tax on permanent contracts.[39]

8.1 Single Contract

To evaluate the outcome of the first policy experiment I simulate two other extreme scenarios: one without permanent contracts and another without fixed-term contracts. As the fertility mechanism under study is the level of job security, the outcomes of these two scenarios should work as bounds to the impact of the new policy experiment.

To eliminate all the permanent contracts, I force the ones in the simulated data, to be defined as 2-year fixed-term contracts instead. In terms of probabilities I keep the same estimates and sum the probability of a permanent contract to that of a 2-year fixed-term contract for consistency. As I do not adjust the rest of the labour market characteristics (restrictions on the number of renewals, lay-off probabilities and wages) one should expect the unemployment rate to increase as the duration of fixed-term contracts is exhausted and the rate of job offer arrivals is not adjusted.

To complement the previous counterfactual I eliminate all the fixed-term contracts by converting them into permanent ones since the period t=1. Once again, I do not adjust the rest of the labour market characteristics as these are assumed to be exogenous in the model. Therefore, in a situation with extremely low job insecurity one should expect the employment rate to go up.

Table 9: Job security bounds: average levels and deviations from baseline on fertility

	Baseline	FTC Only	(Δ)	PC Only	(Δ)
Fertility rate	1.23	0.84	(-32 %)	1.38	(12 %)
Childless women at age 41 (%)	17.25	25.03	(45 %)	14.4	(-17 %)

[39]All policy experiments are implemented permanently from t = 1 with no prior announcement. All policies only affect women as the model does not include men working on fixed-term contracts.

After computing the bounds for the extreme cases of job security, I simulate the single contract with a probation period of three years. During this period, I assume employers have the right to terminate the contract as if it was a fixed-term contract (which can be interpreted as a reduction in the severance payments for the short tenure dismissals), but following the probation period, employers are required to employ the workers permanently. Such a design is in line with what was adopted in Italy in 2015.[40] Under these conditions I expect job security to be low in the first years of the single contract (fixed-term contract part), but also a higher conversion into the permanent position of the single contracts. Given the two counteracting forces, ex-ante, the direction of fertility change under this scenario is not clear. The results are summarised in Table 10, which exhibits the average effects of the counterfactual on eight main statistics.

Table 10: Single Contract experiment: average levels and deviations from baseline

	Baseline	Single C.	(Δ%)
Employment (%)	67.18	73.12	(8.8 %)
Permanent contracts (%)	91.42	94.6	(3.5 %)
FTC converted into PC (%)	9.33	28.58	(206 %)
Fertility rate	1.23	1.28	(4.1 %)
Childless women at age 41 (%)	17.25	15.82	(-8.3 %)
Kids conceived during FTC (%)	5.55	5.07	(-8.7 %)
Kids conceived during unemp. (%)	31.86	27.02	(-15.2 %)

This policy affects essentially the complementarity between employment and fertility choices. The percentage of births during employment is predicted to increase from 68% to 73%.[41] This result is mainly due to the increase in the percentage of births during permanent contracts (8.5%) as the number of births during fixed-term contracts has decreased. The overall effect on fertility rate is 4.1%. The magnitude of this result is remarkable as I compare with the results on childcare cost reduction in the literature.Haan and Wrohlich (2011) found a 4.6% effect from a 20% increase in overall childcare benefits in Germany, and Sheran (2007) found an 8.3% effect from a decrease of 60% on childcare costs in the United States. For completeness, I have also simulated these two policies and the effects on fertility rate are respectively 4.2% and 11%. This means that improving the job security would be an effective

[40] See Lepage-Saucier et al. (2013) for a discussion of other alternatives.

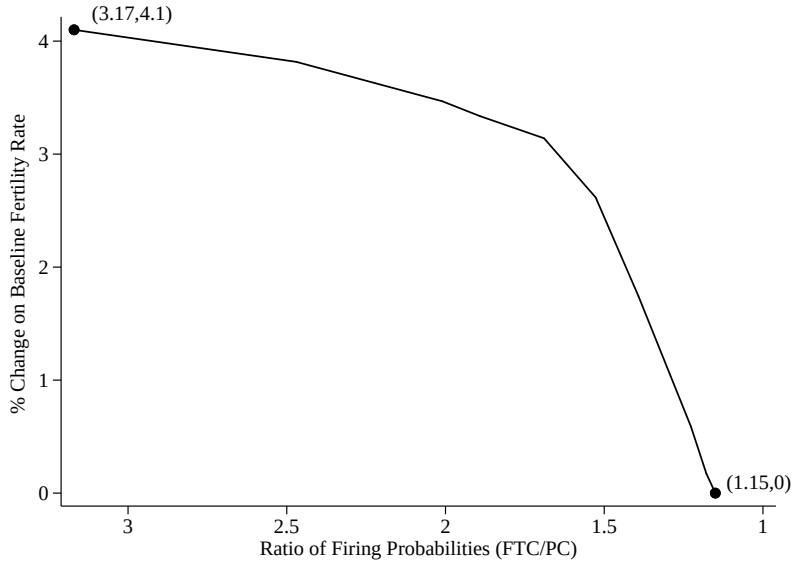
[41] According to the OECD, in 1999, in Portugal, the employment rate for women between 25 and 54 years old, with at least one child between 0 and 2 years old, was 73.4% whereas that with no children (between 0 and 14 years old) was 69.4%. Only Slovenia, Croatia and Denmark presented the same difference whereas, for example, the United States presented a difference of 7.3 p.p. towards more childless working women. Eurostat presents the same evidence for more recent years as well as for women between 25 and 49 years old.

way of increasing fertility without relying on heavy costs of childcare subsidies.

According to my simulations, the rate of conversion is predicted to double under the rules of the single contract. As a consequence, the employment rate also increases. As this is a partial equilibrium model one could be concerned about the overshooting on the employment rate, but even with a general equilibrium model Dolado et al. (2018) predicted an increase in the total employment rate in the scenario of a single contract for Spain, which is similar to Portugal in these features of the labour market. Under such scenario, the higher fertility rate together with a higher female labour supply would contrast with the policies of job protection that took place in Germany in the 80s and 90s and decreased the labour market attachment for mothers, especially in the short-run (Schönberg and Ludsteck, 2014).

For robustness, I test the sensitivity of the result to labour demand adjustments.[42] As the increase in the share of permanent contracts would bring large costs to the firms, I test the sensitivity of the result with respect to adjustments in the firing probabilities on permanent contracts, on the new hiring probabilities on fixed-term contracts, and on the seniority wage differential.

Figure 8: Sensitivity to a Decrease on the Ratio of Firing Probabilities



[42]This analysis is important as the feedback effects of the policy reform on labour demand could potentially reverse the conclusions drawn above by the partial equilibrium experimental evaluation (Lise et al., 2004)

Figure 9: Sensitivity to a Decrease on the Probability of New FTC Hiring

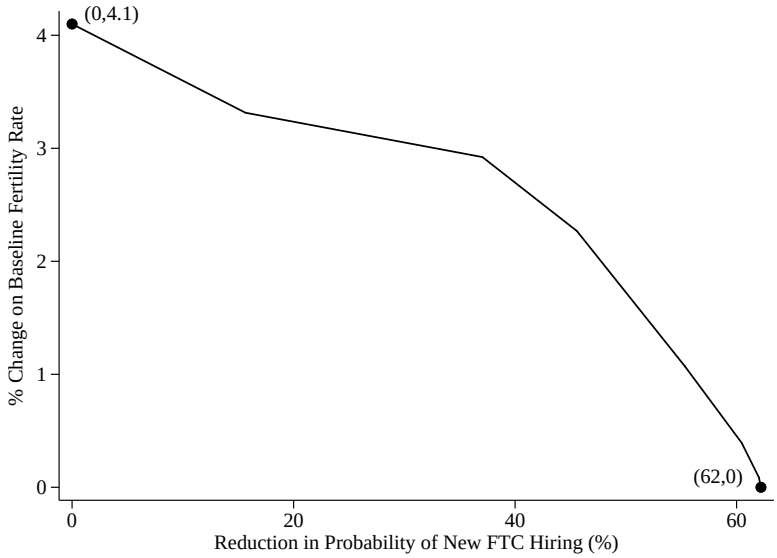
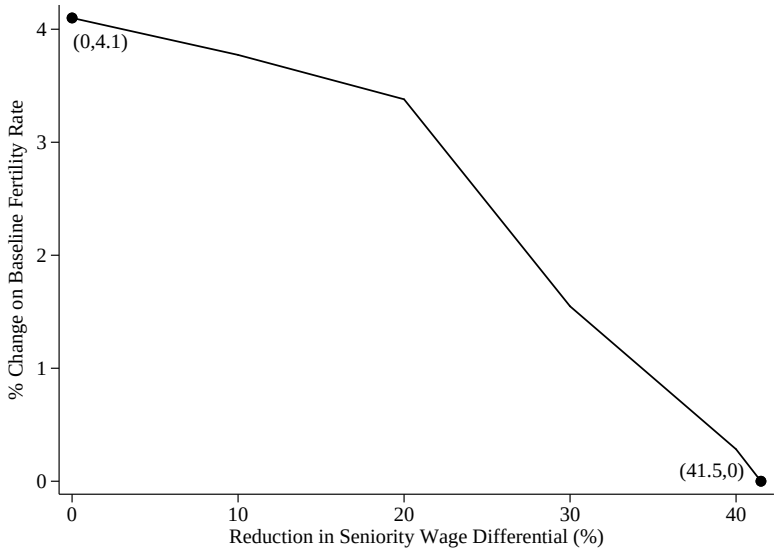


Figure 10: Sensitivity to a Decrease on the Seniority Wage Differential



In the first test I change the ratio of firing probability of permanent contracts relative to that of fixed-term contracts, as a proxy for the decrease in severance payment for permanent contracts. As Figure 8 depicts, there would have to be a reduction of around 3 times the actual ratio of firing probabilities for the positive effect on fertility to disappear. Dolado et al. (2018) predict a decrease from 3.32 to 2.66, for Spain.

Another adjustment that firms might choose is to decrease the new hirings on fixed-term contracts to compensate for the increase the labour force on permanent contracts within

each firm. Figure 9 shows there would have to be a reduction of 62% in the rate of new FTC hiring to cancel out the positive effect on fertility. Dolado et al. (2018) actually predict an increase on hiring of 0.045%, for Spain.

Finally, firms could adjust the seniority wage differential. As the conversion rate between a fixed-term and a permanent contract increases, firms would, everything else constant, employ the permanent workers for longer. In that case, firms might have an incentive to decrease the wage seniority in the firm. According to Figure 10, there would have to be a reduction of 41.5% in the seniority wage differential in order to cancel the positive effect of single contract on fertility rate. According to Dolado et al. (2018), the average wage of workers aged 55 to 64 years old should decrease by 14% while the average wage of workers between 25 and 54 years old should increase 2.6%, which once again indicates that, even if there is a labour market adjustment, the impact on fertility rate should still be non-negligible.

In conclusion: even though the effect of a single contract on fertility might vary according to the different responses of the demand side of the labour market, there is still a high chance the effect is still positive under labour market adjustments.

8.2 Contract-specific Tax Rates

As it was observed with the sensitivity tests to the previous policy, the wages also play an important role in a dual labour market. In the data, fixed-term contracts compensate for the job insecurity with higher wages whereas permanent contracts take some time to catch up those levels as they start at a lower amount for the same tenure. As a way to decrease the share of fixed-term contracts and increase the duration of job spells, some European countries such as France, Italy, Portugal, and Spain, introduced supplements on the income taxes for fixed-term contracts. Even though the idea is the same across countries, the rules vary a lot. In France, the most penalised contracts were those shorter than a month (whereas the ones between one and three months were less penalised); in Portugal, the penalization targeted those shorter than two weeks; in Spain, those shorter than one week, and only Italy applied the same penalization to all fixed-term contracts regardless of their duration. Moreover, in both France and Italy the penalization was refunded in case the contract resulted in a conversion to a permanent one whereas Portugal and Spain did not include that option.

In this subsection I simulate the impact of two different policies, one in which I penalise the wages of fixed-term contracts by 5%, and another in which that penalization is compensated with a credit of 5% on the permanent contracts. Note that as I do not model firms decisions I have two options to simulate this policy in the model: adjust net wages accordingly, or adjust probabilities of hiring in the same direction. As it was shown with

the previous experiment, the decrease in the probability of hiring workers on a fixed-term contract, compensated by the increase of hiring workers on a permanent contract would increase fertility as the share of permanent contracts would increase. Therefore, I opt to show the effects of an adjustment in net wages. Results are presented in Table 11.

Table 11: Policy experiments: average baseline and deviations from baseline

	Baseline	Tax FTC	(Δ%)	Tax FTC/ Credit PC	(Δ%)
Employment (%)	67.18	66.9	(-0.4%)	72.98	(8.6%)
PC/employment (%)	91.42	91.71	(0.3%)	92.31	(1.0%)
FTC 1 year/employment (%)	6.33	6.07	(-4.1%)	5.66	(-10.6%)
FTC 2 year/employment (%)	2.25	2.22	(-1.3%)	2.02	(-10.2%)
Fertility Rate	1.23	1.229	(-0.1%)	1.32	(7.3%)
Mothers of 1 child (%)	43.23	43.29	(0.1%)	34.4	(-20.4%)
Mothers of 2 children (%)	39.73	39.73	(0.0%)	48.56	(22.2%)
Conceived during FTC (%)	5.55	3.36	(-39.5%)	3.9	(-29.7%)
Conceived during unemp. (%)	31.86	33.9	(6.4%)	23.25	(-27.0%)

Even though I do not use a general equilibrium model, the prediction of employment decrease as a result of a higher income tax on fixed-term contracts is in line with Cahuc et al. (2016). However, as I did not differentiate the tax by duration, I observe a decrease in both types of fixed-term contracts included in the model. Because the effect of the reduction in the proportion of fixed-term contracts was counteracted with the increase in unemployment the overall impact on the fertility rate was nearly null.

On the contrary, if such a tax would be compensated by a credit on the wages for permanent contracts the effect on fertility would be much larger than that predicted by the single contract. This magnitude comes closer to the 11% impact found by Whittington et al. (1990) on a reform of the personal exemption for dependents in income tax, in United States.

Note that the increase in fertility rate is driven by the increase in the percentage of women with two children and by the decrease in the percentage of women with one child, that is, the percentage of childless women at the end of the fertile period would be exactly the same. This result corroborates what the evidence showed in the reduced-form results: job security plays a larger role in the decision of having children, whereas income seems to be more relevant to deciding how many children to have. This result is in line with the fact that the percentage of children conceived during a permanent contract is much larger under the last policy experiment than under the single contract scenario.

8.3 Welfare Analysis

Despite the positive effect of both single contract and tax/credit policies on the fertility rate, it is important to check if women were better off under the counterfactual scenarios. In this subsection I evaluate the different policy experiments in terms of percentage change in welfare and lifetime consumption. Welfare is defined as lifetime utility and measured in consumption equivalent units. Lifetime income is the total income earned by the household throughout the life-cycle.

The results on Table 12 show that both reforms yield a similar average impact in terms of employment rate, but while the first brings a larger impact on the duration of employment spells, the second has a larger impact on welfare. The last result is driven not only by the larger impact on the fertility rate, but also by the larger effect on lifetime income, as the utility function in the model is assumed to be linear.

Table 12: Policy Experiments: Changes in Welfare and Lifetime Consumption

	Average	High F High W	High F Low W	Low F High W	Low F Low W
A. Single Contract					
Δ % in Employment Rate	8.85	4.76	3.90	10.71	13.46
Δ % in Employment Duration	19.41	2.39	10.32	23.68	33.78
Δ % in Fertility Rate	4.07	1.37	1.24	6.73	2.58
Δ % in Welfare	3.10	1.22	0.98	5.50	3.26
Δ % in Lifetime Income	6.30	3.61	2.77	8.00	9.17
B. Tax FTC / Credit PC					
Δ % in Employment Rate	8.63	0.24	8.82	0.87	35.64
Δ % in Employment Duration	10.68	1.75	12.28	2.90	38.85
Δ % in Fertility Rate	7.26	-0.12	2.17	0.38	38.79
Δ % in Welfare	5.85	1.81	3.16	2.94	18.59
Δ % in Lifetime Income	11.04	6.10	9.77	6.90	24.67

In terms of the impact across the different groups of unobserved heterogeneity, three results should be emphasised. First, the difference on the impact on employment duration comes mainly from the larger impacts on the groups with high taste for work (low taste for leisure). Second, in both policy experiments, the result on fertility comes essentially from the groups with low taste for fertility. Finally, the first policy caused a larger impact on fertility rate on the group with high taste for work (low taste for leisure), whereas the second policy change in fertility comes especially from the group with low taste for work (high taste for leisure). This difference is also reflected in terms of welfare but not in terms of lifetime income.

9 Conclusions

In this paper, I study the impact of labour market duality on the fertility decision. First, I provide reduced-form evidence that women working on fixed-term contracts delay maternity until they find a permanent contract that boosts their job security. This effect is particularly strong for the decision on having a first child. However, this analysis cannot provide a causal relationship due to the presence of simultaneity in the woman's decisions on labour supply and fertility. By observing a childless woman on a fixed-term contract, it is not possible to identify whether the woman is solely focussing on her career by choosing a contract type that has a higher degree of job insecurity, or whether the woman is childless because she holds a job where the likelihood of being fired is higher.

As a source of exogenous variation, I use a policy change that has modified the rules of fixed-term contracts in Portugal in 2003. Under the new rules, a firm was entitled to keep the worker in a fixed-term contract for six years, rather than three. As there was no explicit change regarding the conversion into permanent contracts, this policy change has basically extended the period for which the job security is low. Comparing women's decisions before and after the policy change I study the impact of this reform on the likelihood of giving birth. The results indicate that women working on a fixed-term contract that started after the reform, with lower prospects of permanent employment had, on average, a lower probability of giving birth, keeping everything else constant. However, the negative effect was reduced when the duration of the contract was longer, as longer contracts tend to have a higher conversion rate.

Following the reduced-form evidence, I develop a dynamic structural model in which women take their decisions, conditionally on the type of job contract they hold, if any. The main goals of the model are twofold: to study the channels through which the type of contract (fixed-term or permanent) or absence of job affect fertility decisions along the life-cycle; and to simulate counterfactual scenarios of different job security. The model is estimated with a combination of the method of simulated moments and indirect inference, using data for Portugal between 1994 and 1999, and validated with an out-of-sample prediction for the period between 2004 and 2008, after the reform.

Both policy counterfactuals come from adaptations of actual policy changes in Italy in 2015. The first experiment simulates the creation of a single contract in which fixed-term contracts are automatically converted into permanent contracts in case the woman is not fired during a probation period of three years. Results show that this policy could increase fertility in Portugal by 4.1%. As this policy change could potentially bring high costs to the firms, I perform three sensitivity analyses with respect to possible adjustments in the labour

market. In case firms decrease the ratio of firing probability of permanent contract to that of fixed-term contract, as a way to incorporate a decrease in severance payment for permanent contracts, the effect on fertility rate would still be positive. In fact, a negative result would only arise in case the ratio was close to unity. Another possible adjustment one could think of would be the reduction in the seniority wage differential. According to the results, there would have to be a reduction of about 40% for the effect in fertility to disappear. Finally, firms would have to reduce new FTC hiring rate by 62% to completely offset the positive effect on fertility rate.

As evidenced by the first policy counterfactual, wage dynamics are also important determinants of the dual labour market. In an alternative policy experiment I simulate the effect of taxing fixed-term contracts and the effect of compensating this taxation by a credit on permanent contracts. According to the simulation results, this policy would bring no effect to the percentage of childless women, but rather change the composition of fertility in the households by increasing the number of mothers with two children, as opposed to one. Hence, the results of the counterfactual analysis corroborate the evidence found in the reduced-form results: job security plays a role in fertility decisions, especially for the first child, whereas income seems to be more relevant for deciding the number of children.

References

Adda, J., Dustmann, C., and Stevens, K. (2017). The career costs of children. *Journal of Political Economy*, 125(2):293–337.

Adsera, A. (2004). Changing fertility rates in developed countries. the impact of labor market institutions. *Journal of Population Economics*, 17(1):17–43.

André, I. M. (1991). The employment of women in portugal. *Iberian Studies*, 20(1-2):28–41.

Attanasio, O., Low, H., and Sánchez-Marcos, V. (2008). Explaining changes in female labor supply in a life-cycle model. *The American Economic Review*, 98(4):1517–1552.

Auer, W. and Danzer, N. (2016). Fixed-term employment and fertility: Evidence from german micro data. *CESifo Economic Studies*, 62(4):595–623.

Becker, G. S. (1960). An economic analysis of fertility. In *Demographic and economic change in developed countries*, pages 209–240. Columbia University Press.

Becker, G. S. (1965). A theory of the allocation of time. *The Economic Journal*, pages 493–517.

Becker, G. S. and Tomes, N. (1976). Child endowments and the quantity and quality of children. *Journal of Political Economy*, 84(4, Part 2):S143–S162.

Blackburn, M. L., Bloom, D. E., and Neumark, D. (1993). Fertility timing, wages, and human capital. *Journal of Population Economics*, 6(1):1–30.

Blanchard, O. and Portugal, P. (2001). What hides behind an unemployment rate: comparing portuguese and us labor markets. *American Economic Review*, pages 187–207.

Blundell, R., Costa Dias, M., Meghir, C., and Shaw, J. (2016a). Female labor supply, human capital, and welfare reform. *Econometrica*, 84(5):1705–1753.

Blundell, R., Pistaferri, L., and Saporta-Eksten, I. (2016b). Consumption inequality and family labor supply. *American Economic Review*, 106(2):387–435.

Boeri, T. et al. (2011). Institutional reforms and dualism in european labor markets. *Handbook of Labor Economics*, 4:1173–1236.

Booth, A. L., Francesconi, M., and Frank, J. (2002). Temporary Jobs: Stepping Stones or Dead Ends? *The Economic Journal*, 112(480):F189–F213.

Burniaux, J.-M. et al. (1998). Income distribution and poverty in selected OECD countries. *OECD Economics Department Working Papers*, No. 189, OECD Publishing, Paris.

Cahuc, P., Charlot, O., Malherbet, F., Benghalem, H., and Limon, E. (2016). Taxation of temporary jobs: Good intentions with bad outcomes? IZA working paper No. 10352.

Cahuc, P. and Postel-Vinay, F. (2002). Temporary jobs, employment protection and labor market performance. *Labour economics*, 9(1):63–91.

Carneiro, P. and Ginja, R. (2016). Partial insurance and investments in children. *The Economic Journal*, 126(596).

Chiswick, B. R. (1986). Labor supply and investment in child quality: A study of jewish and non-jewish women. *The Review of Economics and Statistics*, pages 700–703.

Cigno, A. and Ermisch, J. (1989). A microeconomic analysis of the timing of births. *European Economic Review*, 33(4):737–760.

De la Rica, S. and Iza, A. (2005). Career planning in spain: do fixed-term contracts delay marriage and parenthood? *Review of Economics of the Household*, 3(1):49–73.

Del Boca, D., Flinn, C., and Wiswall, M. (2014). Household choices and child development. *The Review of Economic Studies*, 81(1):137–185.

Del Boca, D. and Lusardi, A. (2003). Credit market constraints and labor market decisions. *Labour Economics*, 10(6):681–703.

Del Bono, E., Weber, A., and Winter-Ebmer, R. (2012). Clash of career and family: Fertility decisions after job displacement. *Journal of the European Economic Association*, 10(4):659–683.

Dias da Silva, A. and Turrini, A. (2015). Precarious and less well paid? wage differences between permanent and fixed-term contracts across the eu. *European Economy, Economic Papers*, 544.

Dolado, J. J., Lalé, E., and Siassi, N. (2018). From dual to unified employment protection: Transition and steady state. Available at SSRN: http://dx.doi.org/10.2139/ssrn.2702404.

Duffie, D. and Singleton, K. J. (1993). Simulated moments estimation of markov models of asset prices. *Econometrica*, pages 929–952.

Eckstein, Z. and Lifshitz, O. (2011). Dynamic female labor supply. *Econometrica*, 79(6):1675–1726.

Eckstein, Z. and Wolpin, K. I. (1989). Dynamic labour force participation of married women and endogenous work experience. *The Review of Economic Studies*, 56(3):375–390.

Edwards, R. (2014). Women's labor supply-motherhood and work schedule flexibility. *mimeo*.

Eisenhauer, P., Heckman, J. J., and Mosso, S. (2015). Estimation of dynamic discrete choice models by maximum likelihood and the simulated method of moments. *International Economic Review*, 56(2):331–357.

Erosa, A., Fuster, L., and Restuccia, D. (2010). A general equilibrium analysis of parental leave policies. *Review of Economic Dynamics*, 13(4):742–758.

Francesconi, M. (2002). A joint dynamic model of fertility and work of married women. *Journal of Labor Economics*, 20(2):336–380.

Frejka, T. (2008). Overview Chapter 2: Parity distribution and completed family size in Europe: Incipient decline of the two-child family model. *Demographic research*, 19(4):47–72.

Gagliarducci, S. (2005). The dynamics of repeated temporary jobs. *Labour Economics*, 12(4):429–448.

Gauthier, A. H. (2007). The impact of family policies on fertility in industrialized countries: a review of the literature. *Population Research and Policy Review*, 26(3):323–346.

Gourieroux, C., Monfort, A., and Renault, E. (1993). Indirect inference. *Journal of Applied Econometrics*, 8(S1):S85–S118.

Güell, M. and Rodríguez Mora, J. V. (2010). Temporary contracts, incentives and unemployment. CEPR Discussion Paper No. 8116.

Guner, N., Kaya, E., and Sanchéz Marcos, V. (2018). Labor market frictions and lowest low fertility. *mimeo*.

Haan, P. and Wrohlich, K. (2011). Can child care policy encourage employment and fertility?: Evidence from a structural model. *Labour Economics*, 18(4):498–512.

Hagenaars, A., de Vos, K., Zaidi, M., and of the European Communities, S. O. (1994). *Poverty Statistics in the Late 1980s: Research Based on Micro-data*. Luxembourg: Office for Official Publications of the European Communities.

Happel, S. K., Hill, J. K., and Low, S. A. (1984). An economic analysis of the timing of childbirth. *Population Studies*, 38(2):299–311.

Heckman, J. and Singer, B. (1984). A method for minimizing the impact of distributional assumptions in econometric models for duration data. *Econometrica*, pages 271–320.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica*, 47(1):153–161.

Heckman, J. J. and Walker, J. R. (1990). Estimating fecundability from data on waiting times to first conception. *Journal of the American Statistical Association*, 85(410):283–294.

Hotz, V. J. and Miller, R. A. (1988). An empirical analysis of life cycle fertility and female labor supply. *Econometrica*, pages 91–118.

Keane, M. P. and Wolpin, K. I. (2010). The role of labor and marriage markets, preference heterogeneity, and the welfare system in the life cycle decisions of black, hispanic, and white women. *International Economic Review*, 51(3):851–892.

Lalive, R., Schlosser, A., Steinhauer, A., and Zweimüller, J. (2014). Parental leave and mothers' careers: The relative importance of job protection and cash benefits. *Review of Economic Studies*, 81(1):219–265.

Lalive, R. and Zweimüller, J. (2009). How does parental leave affect fertility and return to work? evidence from two natural experiments. *The Quarterly Journal of Economics*, 124(3):1363–1402.

Lazear, E. P. and Rosen, S. (1990). Male-female wage differentials in job ladders. *Journal of Labor Economics*, 8(1):S106–S123.

Lepage-Saucier, N., Schleich, J., and Wasmer, E. (2013). Moving towards a single labour contract: pros, cons and mixed feelings. *OECD Economic Department Working Papers*, No. 1026, OECD Publishing, Paris.

Lise, J., Seitz, S., and Smith, J. (2004). Equilibrium policy experiments and the evaluation of social programs. National Bureau of Economic Research Working Paper 10283.

Llull, J. and Miller, R. (2016). Internal migration in dual labor markets. Technical report, Society for Economic Dynamics.

Low, H., Meghir, C., Pistaferri, L., and Voena, A. (2018). Marriage, labor supply and the dynamics of the social safety net. National Bureau of Economic Research Working Paper No. 24356.

Milligan, K. (2005). Subsidizing the stork: New evidence on tax incentives and fertility. *Review of Economics and Statistics*, 87(3):539–555.

Moffitt, R. (1984). Profiles of fertility, labour supply and wages of married women: a complete life-cycle model. *The Review of Economic Studies*, 51(2):263–278.

OECD (2018). *OECD Employment Outlook 2018*.

Olivetti, C. and Petrongolo, B. (2017). The economic consequences of family policies: Lessons from a century of legislation in high-income countries. *Journal of Economic Perspectives*, 31(1):205–30.

Pakes, A. and Pollard, D. (1989). Simulation and the asymptotics of optimization estimators. *Econometrica*, pages 1027–1057.

Pérez, J. I. G. and Osuna, V. (2014). Dual labour markets and the tenure distribution: Reducing severance pay or introducing a single contract. *Labour Economics*, 29:1–13.

Pinheiro, R. and Visschers, L. (2015). Unemployment risk and wage differentials. *Journal of Economic Theory*, 157:397–424.

Portugal, P. and Varejão, J. (2004). Matching workers to jobs in the fast lane: the operation of fixed-term contracts. Bank of Portugal WP 2004-10.

Portugal, P. and Varejão, J. (2009). Why do firms use fixed-term contracts? IZA Discussion Papers 4380.

Portugal, P. and Varejão, J. (2010). The hidden side of temporary employment: fixed-term contracts as a screening device. Bank of Portugal WP 2010-29.

Powell, M. J. (2009). The bobyqa algorithm for bound constrained optimization without derivatives. Cambridge NA Report NA2009/06, University of Cambridge, Cambridge.

Ruhm, C. J. (1998). The economic consequences of parental leave mandates: Lessons from europe. *The Quarterly Journal of Economics*, 113(1):285–317.

Schönberg, U. and Ludsteck, J. (2014). Expansions in maternity leave coverage and mothers' labor market outcomes after childbirth. *Journal of Labor Economics*, 32(3):469–505.

Sestito, P. and Viviano, E. (2016). Hiring incentives and/or firing cost reduction? evaluating the impact of the 2015 policies on the italian labour market. Bank of Italy Occasional Paper No. 325.

Sheran, M. (2007). The career and family choices of women: A dynamic analysis of labor force participation, schooling, marriage, and fertility decisions. *Review of Economic Dynamics*, 10(3):367–399.

Sommer, K. (2016). Fertility choice in a life cycle model with idiosyncratic uninsurable earnings risk. *Journal of Monetary Economics*, 83:27–38.

Thévenon, O. and Luci, A. (2012). Reconciling work, family and child outcomes: What implications for family support policies? *Population Research and Policy Review*, 31(6):855–882.

Van der Klaauw, W. (1996). Female labour supply and marital status decisions: A life-cycle model. *The Review of Economic Studies*, 63(2):199–235.

Varga, M. (2014). The effect of education, family size, unemployment and childcare availability on birth stopping and timing. *Portuguese Economic Journal*, 13(2):95–115.

Weiss, Y. and Gronau, R. (1981). Expected interruptions in labour force participation and sex-related differences in earnings growth. *The Review of Economic Studies*, 48(4):607–619.

Whittington, L. A., Alm, J., and Peters, H. E. (1990). Fertility and the personal exemption: implicit pronatalist policy in the united states. *The American Economic Review*, 80(3):545–556.

Wolpin, K. I. (1984). An estimable dynamic stochastic model of fertility and child mortality. *Journal of Political Economy*, 92(5):852–874.

Appendices

A Data: European Community Household Panel and Labour Force Survey

Table A1: Descriptive statistics of ECHP

Variable	**Mean**	**Std Dev**	**Min**	**Max**
Age	35.479	8.174	23	50
University degree	0.105	0.307	0	1
Not working	0.325	0.469	0	1
Working				
FTC (1 year)	0.081	0.274	0	1
FTC (2 years)	0.025	0.155	0	1
0 FTC Renewals	0.872	0.334	0	1
1 FTC Renewals	0.059	0.236	0	1
2 FTC Renewals	0.069	0.253	0	1
PC	0.894	0.308	0	1
Contract tenure 1 year	0.200	0.400	0	1
Contract tenure 2 years	0.064	0.245	0	1
Contract tenure 3+ years	0.735	0.441	0	1
Full-time Monthly Wage in 2000's euros	476.745	269.561	246	2544
With partner	0.723	0.447	0	1
No children	0.338	0.473	0	1
Mothers				
1 child	0.473	0.499	0	1
2 children	0.527	0.499	0	1
Years in sample	4.502	1.559	2	6
N. individuals		2283		
N. panel observations		10277		

Note: the minimum value observed for wages is the minimum wage in 1994 in 2000's euros.

Table A2: Comparisson between ECHP and LFS - Labour Market Indicators

	ECHP		LFS	
Variable	**Mean**	**Std Dev**	**Mean**	**Std Dev**
University degree	0.105	0.307	0.106	0.308
Not working	0.325	0.469	0.343	0.475
Unemployment Duration	1.907	0.946	1.857	0.856
FTC (1 year)	0.081	0.274	0.073	0.261
FTC (2 years)	0.025	0.155	0.046	0.210
0 FTC Renewals	0.872	0.334	0.866	0.341
1 FTC Renewals	0.059	0.236	0.099	0.299
2 FTC Renewals	0.069	0.253	0.035	0.184
PC	0.894	0.308	0.880	0.325
Contract tenure 1 year	0.200	0.400	0.215	0.411
Contract tenure 2 years	0.064	0.245	0.075	0.263
Contract tenure 3+ years	0.735	0.441	0.710	0.454
N. individuals	2283		34988	
N. panel observations	10277		125484	

Note: read section 3.3 for explanation of main differences

Table A3: Comparisson between ECHP and LFS - Labour Market Flows

From/To	Non-employment	FTC (1 year)	FTC (2 years)	PC
ECHP				
Non-employment	0.858	0.040	0.007	0.095
FTC (1 year)	0.145	0.501	0.063	0.290
FTC (2 years)	0.051	0.095	0.416	0.438
PC	0.049	0.015	0.005	0.932
ES				
Non-employment	0.876	0.053	0.017	0.053
FTC (1 year)	0.171	0.551	0.119	0.159
FTC (2 years)	0.071	0.050	0.656	0.223
PC	0.032	0.010	0.005	0.954

Note: read section 3.3 for explanation of main differences

B Auxiliary Data

To calibrate the childcare costs in the model, I used the National Household Budget Survey of 1994/1995, 2000, and 2005/2006. The first two years calibrated the baseline version of the model as well as the policy simulations whereas the latter was used in the validation of the model. This cross sectional survey is collected every 5 years by the National Statistics Institute, in Portugal. Each household is asked about their expenditure, net revenues, and household composition. Unfortunately the survey does not provide monetary information on assets but rather descriptive information on the house and durables.

For each survey year I have selected the households based on the same criteria as for the ECHP and LFS, presented in subsection3.3: households with at least one female between 23 and 50 years old that is either employed under a fixed-term or permanent contract, or not employed. To construct the measures of interest I used all the expenses related to (both formal and informal) education of children.

To grasp some insights about women's preferences I have used the National Fertility and Family Survey for the years of 1997 and 2013. This cross sectional survey has no fixed periodicity and was not collected in any other years. Even though my model is designed according to the characteristics of the Portuguese Economy during the period of 1994-1999, the second wave of this survey is particularly useful as it also contains information on the type of the job contract.

The National Fertility and Family Survey gives information on household composition, education, labour market status, respondent's parents, marital history, children history, desired children, fertility disruptions, and general opinions about family.

C Conditional Value Functions

According to the model presented in the paper, the number of choice possibilities in each period depends on the existence of a partner and on the arrival of job offers/renewals and not necessarily on the choice that was made in the previous period.[43] Hence, for simplicity in this section, the conditional value functions related to fertility choices will not incorporate the labour supply decision and vice-versa.[44]

In what follows $V_{i,t}^{N_k}$ denotes the value function associated to the decision of choosing to giving the k^{th} birth in the next period. Not choosing to have a new child is denoted by $\bar{N}$. In case the woman gives birth, the state space will be denoted as $\Omega_{i,t}^{k}$.

[43]Note that because each period is one year and the maternity leave in Portugal is no more than 4 months then I can allow for the woman to give birth and work in the same period.

[44]Note that conditional value functions related with fertility decisions are assumed to be zero once the woman has two children and/or is older than 40 years old.

In case the woman is not married, she will get a partner with probability μ, which depends on the age of the woman and on the duration of the job contract the woman holds in that period. In case she is married she will lose the partner with probability ρ, which solely depends on the number of children.[45]

Value of being single

$$V_{i,t}^{\bar{m}}(\Omega_{it}) = \; U_{it}^{\bar{m}}(\Omega_{it}) + \beta\Big\{\mu\,\mathbb{E}\max\Big[V_{t+1}^{N}(\Omega_{t+1}), V_{t+1}^{\bar{N}}(\Omega_{t+1})\Big] + (1-\mu)\,\mathbb{E}\Big[V_{t+1}^{\bar{N}}(\Omega_{t+1})\Big]\Big\}$$

Value of having a partner

$$V_{i,t}^{m}(\Omega_{it}) = \; U_{it}^{m}(\Omega_{it}) + \beta\Big\{\rho\,\mathbb{E}\max\Big[V_{t+1}^{\bar{N}}(\Omega_{t+1})\Big] + (1-\rho)\,\mathbb{E}\Big[V_{t+1}^{N}(\Omega_{t+1}), V_{t+1}^{\bar{N}}(\Omega_{t+1})\Big]\Big\}$$

Value of choosing to have the first child

$$V_{i,t}^{N_1}(\Omega_{it}) = \; U_{it}(\Omega_{it}) + \beta\Big\{\,\mathbb{E}\max\Big[V_{t+1}^{N_2}(\Omega_{t+1}^{k}), V_{t+1}^{\bar{N}}(\Omega_{t+1}^{k})\Big]\Big\}$$

Value of choosing to have the second child

$$V_{i,t}^{N_2}(\Omega_{it}) = \; U_{it}(\Omega_{it}) + \beta\Big\{\,\mathbb{E}\Big[V_{t+1}^{\bar{N}}(\Omega_{t+1}^{k})\Big]\Big\}$$

In terms of labour supply conditional values functions I denote $V_{i,t}^{P_{d,r}}$ denotes the value function associated to the decision of working on a contract of duration d and renewals r. Not working is denoted by $\bar{P}$. In case the woman is receiving unemployment benefits, the state space will be denoted as $\Omega_{i,t}^{ub}$.

In case the woman decides to work she is fired with a probability δ, which depends on the duration of the current contract, the tenure of the current contract and the number of renewals. In every period, regardless of her employment status, each woman receives at most one offer with duration D with probability λ^D, which depends on the duration of the last contract in case she was just fired (if not this duration is set to zero), the tenure of the current contract in case she was just fired or the number of years in unemployment in case she was fired in a previous period, and her age.

[45] I have tried different reduced form specifications for the probability of divorce and the years of marriage turned out to be non-significant in all cases.

Value of working on a fixed-term contract with $d = 1, r = 0$

$$V_{i,t}^{P_{1,0}}(\Omega_{it}) = U_{it}^{P_{1,0}}(\Omega_{it}) + \beta\Bigg\{ \left(1 - \sum_{D=1}^{3} \lambda_D\right) \mathbb{E}\left[V_{t+1}^{\bar{P}}(\Omega_{t+1}^{ub})\right]$$

$$+\delta \sum_{D=1}^{3} \left(\lambda^D \, \mathbb{E} \max\left[V_{t+1}^{P_{D,0}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right]\right)$$

$$+(1-\delta) \sum_{D=1}^{3} \left(\lambda_D \, \mathbb{E} \max\left[V_{t+1}^{P_{D,1^*}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right]\right) \Bigg\}$$

Note that when the renewal is to a 2-year contract, the firm cannot use more renewals at the end of that contract

Value of working on a fixed-term contract with $d = 1, r = 1$

$$V_{i,t}^{P_{1,1}}(\Omega_{it}) = U_{it}^{P_{1,1}}(\Omega_{it}) + \beta\Bigg\{ \left[\left(1 - \sum_{D=1}^{3} \lambda_D\right) + (1-\delta)\lambda_2\right] \mathbb{E}\left[V_{t+1}^{\bar{P}}(\Omega_{t+1}^{ub})\right]$$

$$+\delta \sum_{D=1}^{3} \left(\lambda_D \, \mathbb{E} \max\left[V_{t+1}^{P_{D,0}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right]\right)$$

$$+(1-\delta) \left(\lambda_1 \, \mathbb{E} \max\left[V_{t+1}^{P_{1,2}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right] + \lambda_3 \, \mathbb{E} \max\left[V_{t+1}^{P_{3,1}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right]\right) \Bigg\}$$

Value of working on a fixed-term contract with $d = 1, r = 2$

$$V_{i,t}^{P_{1,0}}(\Omega_{it}) = U_{it}^{P_{1,0}}(\Omega_{it}) + \beta\Bigg\{ \left[\left(1 - \sum_{D=1}^{3} \lambda_D\right) + (1-\delta)(\lambda_1 + \lambda_2)\right] \mathbb{E}\left[V_{t+1}^{\bar{P}}(\Omega_{t+1}^{ub})\right]$$

$$+\delta \sum_{D=1}^{3} \left(\lambda_D \, \mathbb{E} \max\left[V_{t+1}^{P_{D,0}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right]\right)$$

$$+(1-\delta)\lambda_3 \, \mathbb{E} \max\left[V_{t+1}^{P_{3,2}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right] \Bigg\}$$

Value of working on a fixed-term contract with $d = 2, r = 0, x = 1$

$$V_{i,t}^{P_{2,0}}(\Omega_{it}) = U_{it}^{P_{2,0}}(\Omega_{it}) + \beta\Bigg\{ \left[\left(1 - \sum_{D=1}^{3} \lambda_D\right) + (1-\delta)\lambda_1\right] \mathbb{E}\left[V_{t+1}^{\bar{P}}(\Omega_{t+1}^{ub})\right]$$

$$+\delta \sum_{D=1}^{3} \left(\lambda_D \, \mathbb{E} \max\left[V_{t+1}^{P_{D,0}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right]\right)$$

$$+(1-\delta)\left(\lambda_2 \, \mathbb{E} \max\left[V_{t+1}^{P_{2,0}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right] + \lambda_3 \, \mathbb{E} \max\left[V_{t+1}^{P_{3,1}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right]\right) \Bigg\}$$

Value of working on a fixed-term contract with $d = 2, r = 0, x = 2$

$$V_{i,t}^{P_{2,0}}(\Omega_{it}) = U_{it}^{P_{2,0}}(\Omega_{it}) + \beta\Bigg\{ \left[\left(1 - \sum_{D=1}^{3} \lambda_D\right) + (1-\delta)\lambda_2\right] \mathbb{E}\left[V_{t+1}^{\bar{P}}(\Omega_{t+1}^{ub})\right]$$

$$+\delta \sum_{D=1}^{3} \left(\lambda_D \, \mathbb{E} \max\left[V_{t+1}^{P_{D,0}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right]\right)$$

$$+(1-\delta)\left(\lambda_1 \, \mathbb{E} \max\left[V_{t+1}^{P_{1,2}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right] + \lambda_3 \, \mathbb{E} \max\left[V_{t+1}^{P_{3,1}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right]\right) \Bigg\}$$

Value of working on a fixed-term contract with $d = 2, r = 1$

$$V_{i,t}^{P_{2,0}}(\Omega_{it}) = U_{it}^{P_{1,0}}(\Omega_{it}) + \beta\Bigg\{ \left[\left(1 - \sum_{D=1}^{3} \lambda_D\right) + (1-\delta)(\lambda_1 + \lambda_2)\right] \mathbb{E}\left[V_{t+1}^{\bar{P}}(\Omega_{t+1}^{ub})\right]$$

$$+\delta \sum_{D=1}^{3} \left(\lambda_D \, \mathbb{E} \max\left[V_{t+1}^{P_{D,0}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right]\right)$$

$$+(1-\delta)\lambda_3 \, \mathbb{E} \max\left[V_{t+1}^{P_{3,2}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1})\right] \Bigg\}$$

Value of working on a permanent job contract ($d = 3$)

$$V_{i,t}^{P_3}(\Omega_{it}) = U_{it}^{P_3}(\Omega_{it}) + \beta \Bigg\{ \delta \left(1 - \sum_{D=1}^{3} \lambda_D \right) \mathbb{E}\left[V_{t+1}^{\bar{P}}(\Omega_{t+1}^{ub}) \right]$$

$$+\delta \sum_{D=1}^{3} \left(\lambda_D \, \mathbb{E} \max \left[V_{t+1}^{P_{D,0}}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1}) \right] \right)$$

$$+(1-\delta) \, \mathbb{E} \max \left[V_{t+1}^{P_3}(\Omega_{it+1}), V_{t+1}^{\bar{P}}(\Omega_{it+1}) \right] \Bigg\}$$

D Auxiliary Estimations

Externally set parameters: I set the discount factor β to 0.98 (see Blundell et al. (2016a) and Attanasio et al. (2008)). I set the mean of the extreme value distribution to 0 and the scale to 0.2. I also set the children's cost to be the averages spent by age of youngest child and number of children from the Family Expenditure Survey of 1995. The probabilities for job offers are estimated from the Labour Force Survey sample. Results are not presented here for presentational purposes, but are available upon request.

Table D1: Partner probabilities estimates:

	P(Marriage)	P(Divorce)
Age	0.041	
	(0.069)	
Age^2	-0.008*	
	(0.005)	
PC	0.694***	
	(0.185)	
FTC	0.498*	
	(0.261)	
N. Kids		-0.776***
		(0.164)
Constant	-2.450***	-3.373***
	(0.219)	(0.198)
Observations	1799	4338

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table D2: Lay-off probability estimates:

	P(Laid-off)
Univ. Degree	-1.806***
	(0.273)
Tenure	-0.660***
	(0.048)
FTC (2 years)	-0.423***
	(0.162)
PC	-1.320***
	(0.104)
Constant	-0.670***
	(0.096)
Observations	23826

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table D3: Wages estimates:

	FTC Wage	PC Wage	Husband's Wage
$\mathbb{1}$ FTC (2 years)	0.069**		
	(0.034)		
Nr. renewals	0.022		
	(0.025)		
$\mathbb{1}$ Univ. Degree	0.491***	0.828***	0.548***
	(0.034)	(0.050)	(0.018)
Age		.015***	.010 ***
		(0.003)	(0.001)
Age^2		-0.002*	
		(0.000)	
Constant	5.725***	5.369***	6.045***
	(0.053)	(0.076)	(0.018)
N	415	4651	4029

All regressions refer to full time wages and control for time effects.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table D4: Selection Equations Estimates:

	FTC		PC	
Number of children	-.193***	-.211***	-.077***	-.086***
	(.053)	(.054)	(.022)	(.022)
𝟙 Married	.161*	.164*	.037	-.018
	(.087)	(.09)	(.038)	(.039)
Personal non-labour income (000s €)		-.145		-.033
		(.167)		(.033)
Social Transfers (000s €)		-.001		-.042***
		(.012)		(.005)
𝟙 Rent-Free House		.052		-.107**
		(.106)		(.047)
𝟙 Rented House		.459***		.132***
		(.078)		(.036)
𝟙 Second Home		.073		.046
		(.125)		(.055)
Mills Ratio	-.01	.013	-.016	-.023
	(.039)	(.036)	(.095)	(.047)
N	4021		8257	

All regressions include the explanatory variables from the wage equations as well as age and time effects. The instruments included in first and third columns are the ones included in the structural model as well, whereas the instruments included in second and fourth columns exist in the data but are not part of the model. The latter serve as robustness checks for selection. The base group for house ownership is owners with no second-house. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

E Model Validation - Replicating the reduced-form results

Figure 11: Model vs Reduced-form in Itention to Treat Exercise: Coefficients of Interest