It's a Long Way Back: Frictional Re-Entry and the Child Penalty

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Abstract

I re-evaluate the determinants of the child penalty from the perspective of labour-market flows. Women are almost 2 times more likely than men to exit employment into non-participation instead of unemployment, and 4 times more likely when they have children. Re-entry into employment from non-participation requires returning to search and subsequently finding a job. The first step to unemployment involves an activation friction, while the second involves the standard matching friction. Men only face the matching friction. To quantify the contribution of these frictions on the child penalty, I develop and estimate a three-state search model with endogenous human capital accumulation and exogenous fertility. Calibrating the model to U.S. data, I show that in general equilibrium, the friction on the way into search (activation friction) accounts for almost all of the employment gap. A full childcare subsidy increases mothers' employment by about 20 percent, while job-protected unpaid maternity leave only achieves and increase of around 5 percentage points.

Keywords: Gender gaps, labour force participation, human capital, search and matching

JEL codes: J16, J21, J24, J64

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1 Introduction

Career interruptions and reductions in working time associated with childbearing and caregiving weaken female labour-market attachment and erode human capital, thereby depressing women's wages and employment prospects over the life cycle (Erosa, Fuster, and Restuccia (2016) and Adda et al. (2017)). Women exit employment more than men, particularly following childbirth, and they do so in a different manner. Mothers leave employment for non-participation about four times more than fathers, while their transitions into unemployment are virtually identical. It is then not that women simply leave employment more than men, it is where women leave employment to that differs. Since re-entry into a job runs disproportionately back through unemployment, women first need to move from non-participation into unemployment (i.e. start searching), before they can find a job. Thus, transitioning from non-participation to employment, women face two costs. A participation or activation friction when moving from non-participation into active job search and a matching friction when moving from unemployment into employment. Non-participation is not the same as unemployment. Men typically only face the matching friction. This sequential return process is costly relative to direct return as it increases non-employment time. The consequence of this is lost earnings and a longer period of human capital depreciation, and, in turn, a longer job search process. The job-finding rate out of unemployment for women is up to 30% lower than for men. Hence, child penalties are a consequence of women dropping out of the labour force more than men following child birth, and facing re-entry frictions upon return disproportionately more than men. To disentangle the contribution of these mechanisms, this paper develops a search model of unemployment with endogenous human capital accumulation, a stochastic lifecycle, and frictional re-entry though unemployment.

In the model workers move among employment, unemployment, and non-participation. Workers differ by gender, education, human capital, and whether they have a young child or not. Human capital accumulates during employment and depreciates when non-employed. A key feature of the model is that a worker who enters non-participation cannot return directly to employment, although they can move directly from employment to non-participation. This is because jobs are found only through search. Re-entry requires first becoming an active jobseeker and then forming a new match. This separates the conventional cost of time spent outside employment from the additional frictions encountered on the way back to work. The model also allows potential child-related withdrawal to affect equilibrium wages, as the opportunity cost of market work can differ by child presence, which affects the propensity to quit employment. Firms take into account the expected duration of a match when setting

female wages. If mothers are more likely to leave employment for non-participation, female matches may be less durable in expectation and therefore less valuable to firms. Under the model's firm-indifference wage rule this can generate a female wage below the corresponding male wage even when productivity is gender-symmetric and no exogenous gender wage wedge is imposed. Anticipated fertility transmits this mechanism to those who have not yet had a child.

Estimating the model to individual-level data from the United States, I decompose the components of the child penalty women face in earnings. This penalty is made up of an employment and a wage penalty. The employment penalty is the extensive margin of the child penalty, which is affected by the activation and matching frictions outlined above. The wage penalty is the mean wage difference among those who are employed, which is made up of firms offering lower wages as a compensation for shorter expected match duration with women, and human capital loss while out of work. For non-college mothers, the employment penalty dominates the total child penalty, accounting for about 70 percent of the earnings gap, while for college mothers the employment and wage penalty are roughly equal. In the employment penalty, frictional re-entry accounts for essentially all of the penalty in both skill groups. The majority of the wage penalty for college-educated mothers reflects the firm-side wage reduction, while for non-college women it is mostly lower human capital.

Counterfactual policy experiments show the importance of the distinction between activation and matching frictions. A childcare subsidy that reduces the time cost of children, thereby reducing the opportunity cost of working, can reduce the gender gap in employment and earnings substantially, raising employment by almost 20 percentage points and earnings by 40%. On the other hand, the effects of job-protected parental leave are relatively more muted. The increase in employment is around 5 percentage points, and earnings increase by 10% for non-college-educated women, while they increase by 22% for college-educated women. Guaranteeing returns for mothers is not equivalent to reducing the opportunity costs associated with child care. It is crucial that policy focuses on reducing the frictions mothers face to re-entry.

1.1 Related Literature

This paper is related to three strands of the literature: quantitative theories of the child penalty and gender wage gaps, work on gender differences in labour-market flows, and equilibrium search models of gender inequality.

The paper builds on quantitative work studying how childbirth affects women's careers through labour supply and human-capital accumulation. The empirical literature has documented that the arrival of children generates persistent gender gaps in employment, hours, and wages (Kleven et al., 2019). Quantitative models have shown how these differences can accumulate over the life cycle. Papers emphasise the effect of lower hours after childbirth on human-capital accumulation (Erosa, Fuster, and Restuccia, 2016) and gender differences in home-production responsibilities that affect hours, occupational choice, and wages (Erosa, Fuster, Kambourov, et al., 2022). Adda et al. (2017) show that the career cost of children reflects skill losses during employment interruptions and sorting into occupations that are more compatible with fertility. Together, these papers show how differences in market work following childbirth can translate into persistent differences in earnings.

I retain this link between withdrawal from work, human capital, and wages, but focus on what happens when mothers try to return. In the existing life-cycle models, an employment interruption is costly mainly because of the time spent away from work and the associated loss of experience, skills, or occupational opportunities. I take this into account, and add that being outside employment also changes the process through which a worker returns. A worker in non-participation must first become an active jobseeker and then find a job. The model separates the cost of spending time out of work from the frictions involved in re-entering employment.

This distinction connects the paper closely to the literature on labour-market flows. The paper closest is Albanesi and Şahin (2018), who use a three-state search model to study the evolution of the gender unemployment gap. They show that changes in labour force attachment are central to understanding the convergence of male and female unemployment rates. I use the same distinction between employment, unemployment, and non-participation, but apply it to the child penalty. The distinction between the three labour market states matters because the evidence in Section 2 points precisely to the non-participation margin: conditional on unemployment, women do not have systematically lower job-finding rates, but mothers are much more likely to enter non-participation and much less likely to leave it.

Finally, the paper relates to work studying how gender differences in labour supply and job search interact with firms and equilibrium wages. Albanesi and Olivetti (2009) show how differences in home production and firms' expectations about labour-market attachment can jointly generate gender differences in labour contracts even without underlying productivity differences. Flabbi and Moro (2012) estimate a search and bargaining model in which workers value job flexibility and firms incur a cost of providing it, linking differences in

job preferences to wage outcomes. More recently, Morchio and Moser (2026) develop an equilibrium search model with endogenous firm pay and job amenities and find an important role for compensating differentials in the gender pay gap. Di Nola et al. (2026) combine household specialisation and job search with firms that set wages in anticipation of households' labour-supply decisions.

My mechanism is narrower. I do not model joint household decisions, occupational amenities, or gender-specific productivity. Instead, care-giving affects the opportunity cost of market work and the probability that a worker withdraws from employment. A higher propensity to withdraw shortens the expected duration of a match and lowers its value to the firm. Through wage determination, differences in expected attachment can therefore generate a gender wage gap even when male and female workers are equally productive. Because firms also anticipate future transitions into the child-rearing state, the same mechanism can affect women before they have children. Expected match durability is the firm-side link between child-related withdrawal and wages.

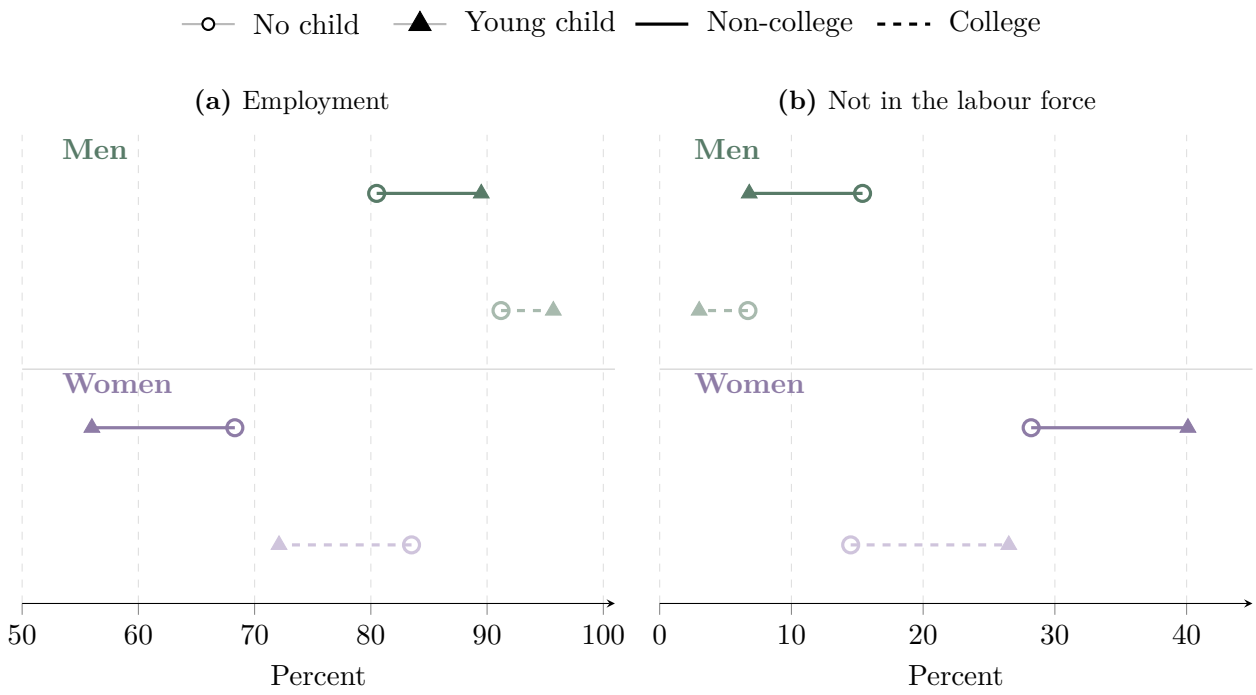
Thus, the contribution of the paper is to connect three margins that are usually studied separately: child-related withdrawal from employment, frictional re-entry through non-participation, and the effect of expected labour-market attachment on equilibrium wages. Quantitatively, I use the model to ask how much of the child penalty comes from withdrawal and the associated loss of human capital, how much comes from the process of returning to employment, and how these differences in attachment feed back into the gender wage gap. After this decomposition, I provide family policy counterfactuals to evaluate the impact of different family policies that target the different margins of the child penalty.

The rest of the paper is organised as follows, Section 2 gives an empirical justification for the mechanisms I employ in the model. Section 3 outlines the three-state search model in detail, which I calibrate in Section 4. In Section 5 I provide a decomposition of the mechanisms at play and other counterfactuals, and Section 6 wraps up.

2 Empirical Evidence

I use the IPUMS-CPS between 2015–2019 to document key empirical facts for men and women aged 25–54, with and without a college degree. I distinguish between parents and childless individuals. Women, both with and without a college degree, are employed less than men and are out of the labour force more than men (Figure 1). However, this difference is magnified by the presence of a child. More fathers are employed and fewer are out of the labour force. The reverse is true for women. I compute the parenthood gap as the difference between the employment change associated with having a young child for men and the corresponding change for women. For non-college-educated, it is over 20 percentage points for non-college-educated individuals, and almost 16 percentage points for college-educated individuals.

Figure 1. Labour Market Attachment by Parenthood



Notes: The figure reports employment and non-participation rates for men and women aged 25–54 in the 2015–2019 IPUMS-CPS. Open circles denote individuals without children; filled triangles denote individuals with a young child. Green shades correspond to men and lavender shades to women. Within each gender, darker solid lines denote non-college individuals and lighter dashed lines denote college individuals.

This child penalty in employment and labour force participation is, although striking, not new. A crucial question is how these stocks come about, and whether differences in flows tell a similar story. To characterize the flows into and out of employment, I compute transition

rates separately by gender, education, and the presence of a young child. Conditional on being unemployed, women do not exhibit a systematic disadvantage in returning to employment. The gender difference emerges at the non-participation margin: women are more likely to leave employment for non-participation and substantially less likely to return to employment once outside the labour force.

Table 1 shows exactly this for mothers and fathers. Job-finding rates from unemployment do not show a systematic female disadvantage, but women exit employment to non-participation much more frequently and leave non-participation to employment much less frequently. So the issue is twofold. More women than men leave employment after child arrival, but this exit goes directly into non-participation rather than unemployment. Once in non-participation, the state is highly persistent: more than 91 percent of women remain outside the labour force in the following period, compared with roughly 79–80 percent of men (see Table A2 in the appendix). Here, direct transitions from non-participation to employment do not conflict with the assumption of the model that out-rules them for two reasons. Firstly, at monthly frequency, the transitions in the data can miss labour-market transitions into unemployment occurring between interviews, the time aggregation bias (Shimer, 2012). Secondly, there are also known misclassification biases in the CPS employment–unemployment–non-participation flows (Abowd and Zellner, 1985).

Table 1. Selected Labour Market Transition Rates

	Non-college		College	
Transition	Men	Women	Men	Women
Job finding: $U \to E$	0.3110	0.2228	0.2918	0.3304
Exit from labour force: $E \to N$	0.0113	0.0424	0.0051	0.0246
Re-entry from non-participation: $N \to E$	0.1356	0.0527	0.1569	0.0621

Notes: Entries report transition probabilities across employment (E), unemployment (U), and non-participation (N) for individuals with children present. The sample consists of men and women aged 25–54 in the 2015–2019 IPUMS-CPS. The table reports the transitions most relevant for distinguishing job finding from unemployment from labour force exit and re-entry. The full transition matrix is reported in Appendix Table A2.

If women are in non-participation much more than men, they face different barriers to re-entry. From non-participation, there are two frictions associated with returning to employment. First, there is an activation friction: individuals outside the labour force must begin searching for a job. Second, there is the matching friction associated with finding a job once searching. Men, who are much less likely than women to move directly from employment

into non-participation, face the matching friction but are less exposed to this additional activation margin.

The aim of the structural model is to rationalise these two frictions and the gendered withdrawal into non-employment, and to understand which of these is the key barrier to re-entry and the largest contributor to wage penalties following childbirth.

3 Model

The evidence in Section 2 suggests that the main gender difference in labour-market dynamics is not job finding conditional on unemployment. It is the movement into and out of non-participation. To differentiate these, I build a three-state search-and-matching model with employment (E), unemployment (U), and non-participation (N). Re-entry from N takes place in two steps. A non-participant must first return to active search, moving from N to U, and then find a job, moving from U to E. As in Section 2, I refer to the first step as the activation margin and to the second as the matching margin. Separating the two allows the model to distinguish a low propensity to search from a low probability of finding a job conditional on search.

Two additional features connect these flows to the child penalty. The value of time outside the labour market is heterogeneous and changes over the life cycle, including with the presence of a young child. This generates endogenous movements between participation and non-participation. Human capital accumulates in employment and depreciates out of work, so that persistent non-employment also affects subsequent wages. Finally, firms take expected match duration into account when setting wages. Differences in labour-force attachment can generate a gender wage gap even though men and women have the same production technology and, within education groups, face the same matching technology.

The model builds on the standard search-and-matching framework of Mortensen and Pissarides (1994) and Rogerson et al. (2005), with three labour-market states as in Albanesi and Şahin (2018). I describe the key parts of the model below, the full characterisation of the problem, the transition rules, and the stationary equilibrium are in Appendix C.

3.1 Environment

Workers and child-rearing status. A worker is characterized by gender $j \in \{m, f\}$, education $i \in \{u, s\}$, and child-rearing status $c \in \{0, 1\}$. I use $i = u$ for non-college and $i = s$ for college workers, and $c = 1$ denotes the presence of an own child under age five. I collect these characteristics in $\omega = (j, i, c)$. Gender and education are permanent, while child-rearing status changes over the life cycle.

Child-rearing is a temporary state and a worker without a young child enters the child-rearing state with probability ρ_{enter} each period. A worker with a young child leaves that state with probability ρ_{exit} as the youngest child ages out of the under-five window. Child-rearing is a temporary state and not a permanent worker type. A worker ages out of working age at rate ρ_{death} to be replaced by a worker of the same gender-skill group who is childless and with human capital at its initial value.

Value of non-market time. Workers differ in the value they place on time outside the labour market, their opportunity cost of working, denoted by $x \geq 0$. It captures leisure, home production, and care-giving. With probability λ_ω, the worker receives a new draw $x' \sim F_\omega$; otherwise the current value persists. The distribution F_ω is a generalized Pareto distribution with shape parameter K_ω.

I allow the opportunity-cost process to differ by gender, education, and child-rearing status. In particular, the presence of a young child changes the distribution of non-market time for women. This is the model's main channel through which children affect labour-force participation: a sufficiently high value of x makes withdrawal from the labour market attractive, while a sufficiently low draw can induce a non-participant to begin searching again.

Production and human capital. A worker of education i and human capital k produces

$$y_i(k) = y_i^0 k. \tag{1}$$

Human capital accumulates while employed and depreciates during non-employment. Depreciation can differ between unemployment and non-participation and across education groups. I denote the corresponding rates by δ_i^U and δ_i^N. The human-capital process is described in Appendix C and calibrated in Section 4.

Matching. Unemployed workers search and firms post vacancies. Matching takes place in education-specific markets. Let u_i denote searchers and v_i vacancies in market i. Matches are produced according to

$$M_i(u_i, v_i) = \mu_i u_i^{\alpha} v_i^{1-\alpha}. \tag{2}$$

With market tightness $\theta_i = v_i/u_i$, the job-finding and vacancy-filling probabilities are

$$p_i = \mu_i \theta_i^{1-\alpha}, \qquad q_i = \mu_i \theta_i^{-\alpha}. \tag{3}$$

Men and women with the same education search in the same market and face the same p_i.

3.2 Workers

The individual state is (r, x, k, ω), where $r \in \{E, U, N\}$ is labour-market status. Let w denote the wage paid by a job. Flow payoffs are

$$\begin{aligned} e_\omega(x, k; w) &= w + (1 - \varepsilon)x, \\ u_\omega(x, k) &= b + (1 - s)x, \\ n_\omega(x, k) &= x. \end{aligned} \tag{4}$$

Employment pays the wage but leaves less time for non-market activities. An unemployed worker receives benefit b and devotes a fraction s of time to search. A non-participant receives the full value of non-market time, but no other monetary payoffs.

Let $E_\omega(x, k; w)$, $U_\omega(x, k; w)$, and $N_\omega(x, k; w)$ denote the values of employment, unemployment, and non-participation and define

$$\begin{aligned} T_\omega(x, k; w) &\equiv \max\{E_\omega(x, k; w), U_\omega(x, k; w), N_\omega(x, k; w)\}, \\ S_\omega(x, k; w) &\equiv \max\{U_\omega(x, k; w), N_\omega(x, k; w)\}, \\ O_\omega(x, k; w) &\equiv \max\{E_\omega(x, k; w), U_\omega(x, k; w)\}. \end{aligned} \tag{5}$$

Let $\delta_\omega^{\text{sep}}$ denote the exogenous separation probability and p_i the job-finding probability in education market i. Conditional on no child-state transition, there are three continuation

values associated with each current labour-market state.

$$\begin{aligned}\mathcal{C}^E_\omega(x,k;w) = (1-\lambda_\omega)\left[(1-\delta^{\text{sep}}_\omega)E_\omega(x,k;w) + \delta^{\text{sep}}_\omega S_\omega(x,k;w)\right] \\ + \lambda_\omega \int \left[(1-\delta^{\text{sep}}_\omega)T_\omega(x',k;w) + \delta^{\text{sep}}_\omega S_\omega(x',k;w)\right]\, dF_\omega(x'),\end{aligned} \tag{6}$$

The first term in the continuation value of employment, Equation (6), shows that, if there is no new draw of the opportunity cost and no separation shock, workers remain employed. If there is a separation shock, workers choose between unemployment and non-participation. The second line of Equation (6) is what happens when workers do receive a shock to their opportunity cost. If the do not lose their jobs, they may choose between all three states, and if they do receive a separation shock, they again choose between unemployment and non-participation, but this time with a different value of the opportunity cost. The continuation value of unemployment,

$$\begin{aligned}\mathcal{C}^U_\omega(x,k;w) = (1-\lambda_\omega)\left[(1-p_i)U_\omega(x,k;w) + p_i O_\omega(x,k;w)\right] \\ + \lambda_\omega \int \left[(1-p_i)S_\omega(x',k;w) + p_i T_\omega(x',k;w)\right]\, dF_\omega(x'),\end{aligned} \tag{7}$$

also depends on redraws of the opportunity cost. If there is no redraw and no job offer arrives, the worker stays unemployed. If a job offer arrives, the worker chooses between employment and staying unemployed. The second row again shows the values after a shock to the opportunity cost. If there is no job offer, the individual chooses between unemployment and non-participation, if there is a job-offer, the worker again chooses between all three states. Finally, in non-participation, the individual has less choices,

$$\mathcal{C}^N_\omega(x,k;w) = (1-\lambda_\omega)N_\omega(x,k;w) + \lambda_\omega \int S_\omega(x',k;w)\, dF_\omega(x'). \tag{8}$$

If no new opportunity cost shock arrives, the individual stays where they are, in non-participation. If there is a shock to the opportunity cost, the individual may decide to move to unemployment or stay in non-participation. There is no opportunity to move directly from non-participation to employment, but an opportunity to move from employment directly to non-participation.

A change in child-rearing status changes the relevant opportunity-cost distribution but does not remove the labour-market feasibility restriction. Define

$$\begin{aligned}
\mathcal{H}^E_\omega(x,k;w) &\equiv T_{\omega'}(\widetilde{x}_{\omega\to\omega'},k;w),\\
\mathcal{H}^U_\omega(x,k;w) &\equiv p_i O_{\omega'}(\widetilde{x}_{\omega\to\omega'},k;w)+(1-p_i)S_{\omega'}(\widetilde{x}_{\omega\to\omega'},k;w),\\
\mathcal{H}^N_\omega(x,k;w) &\equiv S_{\omega'}(\widetilde{x}_{\omega\to\omega'},k;w),
\end{aligned} \tag{9}$$

where $\omega' = (j, i, 1-c)$. In particular, a worker who was in N does not move directly to E when child-rearing status changes.

The Bellman equations can then be written compactly as

$$E_\omega(x,k;w) = e_\omega(x,k;w) + \beta\,\mathbb{E}_E\Big[(1-\rho_c)\mathcal{C}^E_\omega(x,k';w)+\rho_c\mathcal{H}^E_\omega(x,k';w)\Big], \tag{10}$$

$$U_\omega(x,k;w) = u_\omega(x,k) + \beta\,\mathbb{E}_U\Big[(1-\rho_c)\mathcal{C}^U_\omega(x,k';w)+\rho_c\mathcal{H}^U_\omega(x,k';w)\Big], \tag{11}$$

$$N_\omega(x,k;w) = n_\omega(x,k) + \beta\,\mathbb{E}_N\Big[(1-\rho_c)\mathcal{C}^N_\omega(x,k';w)+\rho_c\mathcal{H}^N_\omega(x,k';w)\Big]. \tag{12}$$

The expectation $\mathbb{E}_s$, for $s \in \{E,U,N\}$, is taken over the human-capital transition associated with the worker's current labour-market state. With probability $1-\rho_c$, child-rearing status remains unchanged and continuation is given by $\mathcal{C}^s_\omega$; with probability ρ_c, child-rearing status changes and continuation is given by $\mathcal{H}^s_\omega$. These continuation operators incorporate the arrival of a new draw of non-market time and, where relevant, separation, job finding, and the worker's subsequent labour-market choice. The distinction between $\mathcal{C}^s_\omega$ and $\mathcal{H}^s_\omega$ allows the worker's continuation value to change when she enters or leaves the child-rearing state. In particular, a change in child status changes the distribution of non-market time relevant for subsequent participation decisions, while leaving gender and education unchanged.

The acceptance cutoff $x^a_\omega(k)$ makes an unemployed worker indifferent between employment and unemployment; the participation cutoff $x^n_\omega(k)$ makes the worker indifferent between unemployment and non-participation; and the quit cutoff $x^q_\omega(k)$ makes an employed worker indifferent between employment and non-participation. Thus,

$$E_\omega(x^a_\omega,k) = U_\omega(x^a_\omega,k), \qquad U_\omega(x^n_\omega,k) = N_\omega(x^n_\omega,k), \qquad E_\omega(x^q_\omega,k) = N_\omega(x^q_\omega,k). \tag{13}$$

An unemployed worker accepts an offer when x is sufficiently low, a non-participant begins searching when $x \leq x^n_\omega(k)$, and an employed worker withdraws when x becomes sufficiently high. The full cut-off rules are given in Appendix C.

This structure generates the two frictions that matter for re-entry. A worker in N must first receive an opportunity cost draw that makes search worthwhile. Only after returning to U does she face the matching probability p_i. The activation margin is governed by the opportunity-cost process $(F_\omega, \lambda_\omega)$, while the matching margin is governed by (μ_i, θ_i). A worker who loses a job and enters unemployment directly faces the matching friction but not the activation friction.

3.3 Firms and Wage Determination

A filled job with a worker of type ω and human capital k produces $y_i(k)$ and pays wage w. Let $J_\omega(k, w)$ denote its value to the firm. Match value depends on current profits and on expected duration. A match can end either through an exogenous separation or because a new draw of x induces the worker to leave employment. Workers who are more likely to withdraw generate shorter expected matches and lower firm values, holding productivity and wages fixed.

Vacancies are created subject to free entry. Let c_i be the vacancy-posting cost and $\bar{J}_i$ the expected value of a match formed in education market i. Free entry implies

$$c_i = \beta q_i(\theta_i)\bar{J}_i, \tag{14}$$

which determines market tightness and hence the common job-finding probability p_i within each education group.

Wages. Male wages are determined by Nash bargaining. Writing $S^W_{m,i,c}(k, w)$ for the worker's surplus from the match, the male wage satisfies

$$w^*_{m,i,c}(k) = \arg\max_w \left[S^W_{m,i,c}(k, w)\right]^\gamma \left[J_{m,i,c}(k, w)\right]^{1-\gamma}. \tag{15}$$

Following Albanesi and Şahin (2018), I use the male Nash wage as the benchmark for the value of a filled job and set the female wage so that a firm is indifferent between a male and

female match with the same education, human capital, and child-rearing status:

$$J_{f,i,c}\Big(k, w^*_{f,i,c}(k)\Big) = J_{m,i,c}\Big(k, w^*_{m,i,c}(k)\Big)\,. \tag{16}$$

This wage-setting rule isolates the attachment channel. Men and women have the same productivity conditional on (i,k) and face the same matching technology. A gender wage gap can still arise because a worker who is more likely to leave employment creates a shorter expected match. Equalizing the firm's value of the match then would require a lower wage.

A filled job with a worker of type $\omega = (j,i,c)$ and human capital k produces $y_i(k)$ and pays wage w. The wage is fixed over the life of the match. Let $J_\omega(k,w)$ denote the value of the filled job to the firm. With $\omega' = (j,i,1-c)$, the match value satisfies

$$\begin{aligned} J_\omega(k,w) = y_i(k) - w \\ + \beta(1-\delta^{\text{sep}}_\omega)\sigma_\omega(k;w)\,\mathbb{E}_E[(1-\rho_c)J_\omega(k',w) + \rho_c J_{\omega'}(k',w)]\,. \end{aligned} \tag{17}$$

A higher propensity to leave employment lowers σ_ω, the probability the match survives a period conditional on no exogenous separation, which lowers the value of the match. Although child-rearing status is temporary, a firm hiring a woman without a young child can take into account the possibility that she enters the child-rearing state during the life of the match. If this implies a higher propensity to leave employment, this generates an anticipatory component of the gender wage gap.

3.4 Stationary Equilibrium

A stationary equilibrium consists of worker value functions and policy rules, wages, education-specific market tightnesses, and an invariant distribution over labour-market status, human capital, non-market time, and worker type. Workers behave optimally given wages and job-finding probabilities; wages satisfy the bargaining and firm-indifference conditions; vacancy creation satisfies free entry in each education market; and the distribution of workers is invariant under the resulting labour-market, human-capital, and child-rearing transitions. Appendix Section C outlines the equilibrium conditions in more detail.

4 Calibration

I estimate the model in two steps. Parameters that are either standard or directly identified from the data are fixed outside the model. The remaining sixteen parameters governing labour-force participation and matching are estimated jointly by Simulated Method of Moments (SMM).

4.1 Externally Calibrated Parameters

Separation rates δ_{ω}^{EU} are set equal to the observed monthly $E \to U$ transition rates in the CPS, separately by gender, education, and the presence of a young child. Human capital, g_{emp} grows while employed at rate g^i, differentially by skill-group, at a monthly rate estimated using the wage growth observed in the ASEC panel. Human-capital depreciation during non-employment, δ_u and δ_n are also allowed to vary by education and labour-market state. I estimate the depreciation rates from ASEC cross-sectional wage profiles by duration out of employment. The monthly discount factor is $\beta = 0.996$. I set the matching elasticity to $\alpha = 0.5$ and the worker bargaining weight to $\gamma = \alpha$. Vacancy posting costs are proportional to flow output, with $c_i = \kappa y_i^0$. The vacancy cost, κ, is normalised to place non-college tightness to order one. Unemployment benefits are constant at $b = 0.40$. The lifecycle transition rates into and out of the child states, ρ_{enter} and ρ_{exit}, are estimated directly from the CPS transition rates. The retirement transition, ρ_{death}, is set to $1/480$, an assumed 40-year working life. Out of the total time endowment, T, a 0.625 go to working (10 out of 16 hours) if employed, 0.125 to job search if searching (2 out of 16 hours), following Albanesi and Şahin, 2018.

Table 2 summarises the parameters calibrated outside the SMM.

Table 2. Externally Calibrated Parameters

Parameter	Value	Source or target
δ_{ω}^{EU}	By type	CPS $E \to U$ transition rate
g_{emp}, non-college	0.0018	ASEC panel wage growth
g_{emp}, college	0.0031	ASEC panel wage growth
δ_u, non-college	0.0263	ASEC wage-duration profile
δ_n, non-college	0.0143	ASEC wage-duration profile
δ_u, college	0.0379	ASEC wage-duration profile
δ_n, college	0.0132	ASEC wage-duration profile
β	0.996	Monthly discount factor
α	0.5	Matching elasticity
γ	0.5	Hosios condition
κ	15	Vacancy-cost normalisation
b	0.40	Unemployment replacement rate
ρ_{enter}	1/281	CPS young-child share
ρ_{exit}	1/55, 1/71	CPS child-spell durations
ρ_{death}	1/480	Working-life duration

Notes: Human-capital depreciation is estimated separately for unemployment (u) and non-participation (n), and by education. Separation rates are set equal to their empirical counterparts for each gender–education–child-status group.

4.2 Parameters Estimated by SMM

I estimate sixteen parameters jointly. The arrival rate of an opportunity-cost shock is λ_{ω}, which I estimate separately by gender, education, and child-rearing status. Together with the participation threshold, they determine the transition from non-participation into active search. The shape parameters, K_{ω} are also estimated separately for men and women and by education. For men, the shape of the opportunity-cost distribution varies by education but is common across child-rearing states. For women, I allow the shape to vary both by education and by the presence of a young child. The remaining two parameters are matching efficiencies, μ_i, one for each education-specific labour market. Men and women with the same education face the same matching technology. This restriction is consistent with the evidence in Section 2: the systematic gender difference appears at the non-participation margin more than in job finding conditional on unemployment.

I target 21 moments. For each of the eight gender–education–child-status groups, I target labour-force participation and the monthly transition rates $N \to U$ and $E \to N$. I also target the $U \to E$ rate for each gender–education group and the aggregate gender pay gap. The mapping between moments and parameters follows directly from the mechanisms of the model. Labour-force participation and $N \to U$ discipline the opportunity-cost distribution and the activation margin. The $E \to N$ rates discipline withdrawal from the labour force. The $U \to E$ rates discipline matching efficiency, while $E \to U$ pins down separation rates outside the SMM. The gender pay gap disciplines the wage consequences of these labour-market dynamics and human-capital accumulation.

This separation between participation and matching is central to the identification strategy. As shown in Section 2, women do not have systematically lower job-finding rates conditional on unemployment. The large gender differences instead appear in entry into and re-entry from non-participation. The $N \to U$ and $E \to N$ moments therefore identify the participation margin separately from the matching friction identified by $U \to E$.

4.3 Parameter Estimates and Model Fit

Table 3 shows the estimated parameters. It is useful to go through some of these in more detail. The rate of arrival of a new opportunity cost draw, λ, varies a lot by skill group and by whether a child is present or not. For unskilled individuals, the draw of the opportunity cost is less persistent when a child is present in the household. For unskilled men, the draw lasts about 15 months when a child is present, and almost double that (28) months when no child is present. Similarly, for unskilled women, the duration of a draw is 27 months when a child is present, and about 10 months longer without no young child. On the other hand, for skilled individuals, the state is more persistent when a child is present (21 months versus 15 for skilled men; 10 versus 8 years for skilled women). For college women, the draw is almost permanent. The shape parameter of the Pareto distribution, K, shifts the distribution of the opportunity cost. A high K shifts the distribution up, raising its median. Skilled women have a higher median opportunity cost draw, which is very persistent when they have a child. Conversely, without young child, the median of their opportunity cost is low, but also very persistent. Skilled women stay in their opportunity cost state for longer than any other gender-skill group. Non-college-educated women, on the other hand, have less persistent draws when they have a child, relative to being childless, with a higher mean. The two skill groups reach their child penalty differently: Non-college mothers have a moderately heavier

tail, with draws that turn over faster. They leave more often but also come back. College mothers have a much heavier tail, with draws that almost never turn over. Once out, they stay out. For skilled and unskilled men, on the other hand, the distribution is unchanged by the presence of the child. What differs is only how often a new draw arrives.

Parameter	Description	UnM	UnF	SkM	SkF
λ (child)	Opp.-cost volatility, child-present	0.0689	0.0378	0.0468	0.0081
λ (no child)	Opp.-cost volatility, no child	0.0362	0.0261	0.0663	0.0119
K (child)	GPD shape, child-present	0.146	0.849	0.876	2.227
K (no child)	GPD shape, no child	0.146	0.268	0.876	0.085
μ	Matching efficiency (by skill market)	0.854	0.854	0.098	0.098
Externally fixed — separation rate δ ($E \to U$), by type:					
δ (child)	Separation rate, child-present	0.0126	0.0131	0.0037	0.0053
δ (no child)	Separation rate, no child	0.0128	0.0108	0.0053	0.0059

Table 3. Estimated Parameters

Table 4 shows how the model fits the data. In general, the model reproduces the main features of the data. The model matches the ordering of participation across all of them: women participate less than men in every skill–child cell, mothers less than non-mothers, and college women more than non-college women. The model also reproduces the re-entry patterns at the centre of the paper. Non-college mothers return from non-participation at the same rate as women without children, whereas college mothers return at roughly half that rate, as in the data. Within each skill group, mothers withdraw from employment most often and fathers least often. Although productivity is gender-symmetric and there is no wage wedge, the model generates a gender pay gap of 13.6 percent, against 16.5 percent in the data, entirely through the firm's valuation of less durable matches.

			LFP		$N \to U$		$E \to N$	
Skill	Gender	Children	Data	Model	Data	Model	Data	Model
Non-college	Men	no child	84.6	86.6	4.5	5.1	1.9	1.0
		young child	93.2	88.3	7.7	8.7	1.1	1.1
Non-college	Women	no child	71.8	71.1	2.9	3.5	3.0	2.1
		young child	59.9	59.3	3.0	3.7	4.2	2.6
College	Men	no child	93.3	91.8	4.9	6.9	1.0	0.9
		young child	97.0	92.0	3.8	4.7	0.5	0.8
College	Women	no child	85.5	87.5	2.9	2.8	1.7	1.7
		young child	73.5	72.7	1.4	0.9	2.5	1.9

Aggregate targeted moments

		$U \to E$ (%)	
Skill	Gender	Data	Model
Non-college	Men	29.1	29.7
	Women	22.7	23.6
College	Men	27.9	32.5
	Women	30.4	26.2
Gender pay gap (male/female)		1.165	1.136

Table 4. Model Fit: Labour Market Moments

Table 5 shows the fit of the unemployment rates by skill group, which are implied by the flow moments, but not directly targeted. College workers have lower unemployment than non-college workers in every gender–child cell, and non-college mothers have the highest unemployment rate both in the data and in the model. However, the model overstates unemployment levels for each skill group, except college women with a young child, but matches its structure.

			Unemp. rate	
Skill	Gender	Children	Data	Model
Non-college	Men	no child	4.8	6.1
		young child	3.9	7.8
Non-college	Women	no child	4.9	7.1
		young child	6.5	8.9
College	Men	no child	2.3	3.6
		young child	1.3	2.1
College	Women	no child	2.4	3.2
		young child	2.0	1.6

Table 5. Model Fit: Unemployment Rates

5 Counterfactuals

This section presents the decomposition exercise as well as three policy counterfactuals, that provide subsidies for childcare and guaranteed return after child-related absences.

5.1 Decomposing the Child Penalty

In this section, I decompose the gap between mothers and fathers of young children, in employment (percentage points) and in per-capita earnings (percent), by removing the two frictions on the return from non-participation, in Table 6. Removing the activation friction lets a non-participant start searching in any period rather than only when a new opportunity-cost draw arrives. Removing the matching friction in addition lets her move directly into employment whenever she would want to accept a job. Each column reports the share of the baseline gap that closes. The activation and matching columns hold workers' decision rules, wages and market tightness at their baseline values, so only the flows change. The column marked (GE) removes the activation friction and re-solves the model, so that withdrawal decisions, wages and labour market tightness adjust. The final column is the gap that remains when return is frictionless, which is generated by the firm-side. For employment it is close to zero; for earnings it is a gap in wages among the employed.

			Re-entry friction				Residual
Skill	Outcome	Baseline	Activation	(GE)	Matching	Total	(Firm-Side)
Non-college	Employment	27.0 pp	90%	90%	9%	99%	1%
Non-college	Earnings	43.0 %	74%	73%	16%	90%	10%
College	Employment	18.1 pp	91%	91%	8%	99%	1%
College	Earnings	39.5 %	33%	33%	3%	37%	63%

Table 6. Decomposition of the mother–father gap

Withdrawal, the time-out-of-work channel emphasised by the existing literature, accounts for a large fraction of the earnings penalty. Thus mothers withdraw, and they cannot simply walk back in. For both skill groups, the activation fraction accounts for almost all of the employment. Interestingly, for college workers the earnings gap is mostly not the re-entry friction.

5.2 Family Policies

In this section, I implement three counterfactuals. The first two counterfactuals add childcare subsidies (rows 2 and three of Table 7), implemented in the model as making maternal employment cheaper through the opportunity cost shape. I lower the opportunity cost of a mother to that of a childless women by half and fully. The final counterfactual implements guaranteed return for mothers, a proxy for unpaid maternity leave (the final column of Table 7). This removes the matching friction and a mother in unemployment can enter into employment directly.

Table 7. General-Equilibrium Policy Counterfactuals

		Mothers' LFP		Mothers' employment		Earnings	Child penalty
Scenario	Skill	Level	Δ pp	Level	Δ pp	Δ%	Earnings (%)
Baseline							
	Non-college	0.593	—	0.548	—	—	43.0
	College	0.727	—	0.727	—	—	39.5
Childcare subsidy (half)							
	Non-college	0.668	+7.4	0.621	+7.4	+17.5	33.0
	College	0.793	+6.6	0.792	+6.5	+14.0	31.0
Childcare subsidy (full)							
	Non-college	0.760	+16.7	0.713	+16.6	+40.2	20.1
	College	0.926	+20.0	0.924	+19.7	+42.0	14.1
Parental leave (guaranteed return)							
	Non-college	0.638	+4.5	0.605	+5.7	+10.1	36.4
	College	0.763	+3.7	0.765	+3.9	+22.6	26.2

Notes: Changes are measured relative to the baseline equilibrium. Labour force participation and employment are reported as levels and changes in percentage points. Earnings changes are expressed in percent. The child penalty is measured in percent of earnings.

The childcare subsidy has the largest effect. A full subsidy raises mothers' participation rates by around 20 percentage points and increases earnings by around 40%. Under a half subsidy the participation gains are less pronounced, with gains of about 7 percentage points. Guaranteed return has a smaller effect on participation. Since the decomposition finds that the matching friction only accounts for a minority of the employment gap this is in line with the findings in the previous subsection. This points to how crucial it is to remove the barriers to re-entry for women, rather than the barriers to job-finding once participating. Although the childcare subsidy does not directly affect either the activation, nor the matching, fraction it prevents women from experiencing these fractions by reducing the amount of women who move out of employment in the first place.

6 Conclusion

In this paper, I re-evaluate the determinants of the child penalty from the perspective of labour-market flows. Women are almost 2 times more likely than men to exit employment into non-participation instead of unemployment, and 4 times more likely when they have children. This paper has shown that it is key to differentiate how women exit employment from the rates at which they do. The gap between mothers and fathers in employment and earnings is, to a large extent, driven by the frictions that prevent non-participating women from entering into active job search. Mothers withdraw and stay out, non-participation is not unemployment under another name. The return process from non-participation is additionally costly relative to direct return from unemployment as it increases non-employment time. The consequence of this is foregone earnings and a longer period of human capital depreciation, and, in turn, a longer job search process or a lower probability of returning to job search.

The paper presents a three-state-search model with agents who differ by gender, education, human capital, and child state, to separate the activation and matching frictions encountered on the way back to work. The model also allows potential child-related withdrawal to affect equilibrium wages, which generates an endogenous gender wage gap, even though productivity is gender-symmetric. Anticipated fertility transmits this mechanism to those who have not yet had a child.

Estimating the model to individual-level data from the United States shows that frictional re-entry accounts for essentially all of the employment penalty for both college- and non-college-educated women. A childcare subsidy that reduces the time cost of children, thereby reducing the opportunity cost of working, can reduce the gender gap in employment and earnings substantially, raising employment by almost 20 percentage points. On the other hand, the effects of job-protected parental leave are roughly a fifth of that. Guaranteeing returns for mothers is not equivalent to reducing the opportunity costs associated with child care, policymakers must reduce the frictions mothers face upon re-entry into labour force participation.

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A Appendix

B Empirical Appendix

Table A1. Labour Market Attachment by Parenthood, Gender, and Education

		Men		Women	
Education	Children	Employment	LFP	Employment	LFP
Panel A: Levels					
Non-college	No child	80.5	84.6	68.3	71.8
	Young child	89.5	93.2	56.0	59.9
College	No child	91.2	93.3	83.5	85.5
	Young child	95.7	97.0	72.1	73.5
Panel B: Difference associated with having a young child					
Non-college		+9.0	+8.6	-12.3	-11.9
College		+4.5	+3.7	-11.4	-12.0

Notes: Entries in Panel A are percentages. Panel B reports percentage-point differences between individuals with a child under 5 and childless individuals within education and gender groups. The sample consists of individuals aged 25–54 in the 2015–2019 IPUMS-CPS.

Table A2. Full Labour Market Transition Matrix

	Non-college		College	
Transition	Men	Women	Men	Women
Panel A: From employment				
$E \to E$	0.9761	0.9445	0.9912	0.9701
$E \to U$	0.0126	0.0131	0.0037	0.0053
$E \to N$	0.0113	0.0424	0.0051	0.0246
Panel B: From unemployment				
$U \to E$	0.3110	0.2228	0.2918	0.3304
$U \to U$	0.5198	0.4758	0.6151	0.3955
$U \to N$	0.1692	0.3014	0.0931	0.2741
Panel C: From non-participation				
$N \to E$	0.1356	0.0527	0.1569	0.0621
$N \to U$	0.0774	0.0295	0.0383	0.0144
$N \to N$	0.7870	0.9178	0.8048	0.9235

Notes: Entries report transition probabilities across employment (E), unemployment (U), and non-participation (N) for individuals with children present. Columns distinguish gender and college attainment. Within each origin state, transition probabilities sum to one. The sample consists of men and women aged 25–54 in the 2015–2019 IPUMS-CPS.

C Model Details

This appendix presents the recursive formulation of the model in Section 3. It describes the state space and timing, human-capital accumulation, worker decisions, matching and wage determination, and the stationary distribution. The final section outlines the correction for misclassification of labour-market states.

C.1 States, Timing, and Primitives

Child-rearing transitions. Within each gender–education group, child-rearing status follows a two-state Markov chain,

$$\Pr(c' = 1 \mid c = 0, i) = \rho_{\text{enter}}, \tag{18}$$

$$\Pr(c' = 0 \mid c = 1, i) = \rho^i_{\text{exit}}. \tag{19}$$

Thus, the probability of changing child-rearing status is

$$\rho_\omega = \rho_{c,i} = \begin{cases} \rho_{\text{enter}}, & c = 0, \\ \rho^i_{\text{exit}}, & c = 1. \end{cases} \tag{20}$$

A worker retires with probability

$$\Pr(\text{retire}) = \rho_{\text{death}}. \tag{21}$$

Retiring workers are replaced by entrants of the same gender and education, with $c = 0$, unemploymed, and human capital k_{init}. The retirement probability enters the stationary distribution but not the individual Bellman equations.

Opportunity cost of market work. The opportunity cost $x \geq 0$ represents the value of leisure, home production, and other non-market activities. A new draw is distributed according to F_ω, a discretised generalised Pareto distribution with shape K_ω, location zero, and scale one. The numerical support is $[0, \bar{x}]$, with $\bar{x} = 12.313$; for men it is restricted to $[0, \bar{x}_m]$, where $\bar{x}_m = 9.02$. Probability mass beyond the relevant upper bound is distributed uniformly over the corresponding numerical grid. The shape parameter is common across child states for men of a given education and may differ across child states for women. The redraw probability λ_ω can also depend on child-rearing status.

A transition from $\omega = (j, i, c)$ to $\omega' = (j, i, 1 - c)$ preserves the worker's rank in the opportunity-cost distribution. Specifically, the new opportunity cost is

$$\widetilde{x}_{\omega \to \omega'} = F^{-1}_{\omega'}(F_\omega(x)). \tag{22}$$

This mapping preserves persistent heterogeneity in the opportunity cost while allowing its distribution to change with child-rearing status.

Childcare costs. The flow payoff from employment may include a cost ϕ_c for women with a young child. Write $\phi_c^\omega = \phi_c \mathbf{1}\{j = f, c = 1\}$. The estimated specification sets $\phi_c = 0$, so differences in non-market opportunities associated with young children are captured by F_ω.

C.2 Human Capital

Human capital lies on an equally spaced grid $\mathcal{K} = \{k_1, \ldots, k_{n_k}\} \subset [\underline{k}, \bar{k}]$. The estimated model uses $n_k = 11$, $\underline{k} = 0.10$, and $\bar{k} = 2.50$. The target value of next-period human capital depends on the source labour-market state r and education i:

$$\tau_i(k, r) = \begin{cases} e^{g^i} k, & r = E, \\ \max\{(1 - \delta_u^i)k, k_f\}, & r = U,\ k > k_f, \\ \max\{(1 - \delta_n^i)k, k_f\}, & r = N,\ k > k_f, \\ k, & r \in \{U, N\},\ k \le k_f. \end{cases} \tag{23}$$

Here g^i is the education-specific monthly growth rate in employment and δ_u^i and δ_n^i are the depreciation rates in unemployment and non-participation. Targets outside $[\underline{k}, \bar{k}]$ are truncated to the nearest boundary.

For a truncated target $\tau_i(k, r) \in [k_\ell, k_{\ell+1}]$, next-period human capital is drawn from the two adjacent grid points according to

$$\begin{aligned} P_r^i(k, k_{\ell+1}) &= \frac{\tau_i(k, r) - k_\ell}{k_{\ell+1} - k_\ell}, \\ P_r^i(k, k_\ell) &= 1 - P_r^i(k, k_{\ell+1}). \end{aligned} \tag{24}$$

At a grid node or boundary, the transition is degenerate. The resulting row-stochastic matrices P_E^i, P_U^i, and P_N^i preserve the truncated target in expectation. For a function H, let

$$\mathbb{E}_r^i[H(k') \mid k] \equiv \sum_{k' \in \mathcal{K}} P_r^i(k, k') H(k') \tag{25}$$

denote the corresponding expectation.

The estimated specification imposes a lower bound on human-capital depreciation at $k_f = 0.58$, the third grid point. Workers with $k \le k_f$ do not lose further human capital outside employment. Entrants begin at $k_{\text{init}} = 1.06$, so the two points below k_f are not

reached in the stationary distribution. Productivity is

$$y_i(k) = y_i^0 k, \tag{26}$$

where y_i^0 is education-specific output at $k = 1$.

C.3 Worker Value Functions

Let $E_\omega(x, k; w)$, $U_\omega(x, k; w)$, and $N_\omega(x, k; w)$ denote the values of employment, unemployment, and non-participation at wage rate w. The wage rate is a share of output, so the dollar wage of an employed worker with human capital k is $wy_i(k)$. Flow payoffs are

$$e_\omega(x, k; w) = wy_i(k) + (1 - \varepsilon)x - \phi_c^\omega, \tag{27}$$

$$u_\omega(x, k) = b + (1 - s)x, \tag{28}$$

$$n_\omega(x, k) = x. \tag{29}$$

In the calibration, $b = 0.40$, $\varepsilon = 0.625$ is the fraction of time spent working, and $s = 0.125$ is the fraction spent searching.

For notational convenience define, at any (x', k', w),

$$\begin{aligned} T_\omega(x', k'; w) &\equiv \max\{E_\omega(x', k'; w), U_\omega(x', k'; w), N_\omega(x', k'; w)\}, \\ S_\omega(x', k'; w) &\equiv \max\{U_\omega(x', k'; w), N_\omega(x', k'; w)\}, \\ O_\omega(x', k'; w) &\equiv \max\{E_\omega(x', k'; w), U_\omega(x', k'; w)\}. \end{aligned}$$

Let $\omega' = (j, i, 1 - c)$ be the corresponding type in the other child-rearing state and abbreviate $\widetilde{x}_{\omega \to \omega'}$ by $\widetilde{x}$. Expectations below are taken with respect to the human-capital transition of the *source* labour-market state. The child-status transition is resolved before a new opportunity-cost draw; its continuation value is evaluated at the rank-mapped $\widetilde{x}$. The same wage rate w is used across child-status transitions within an existing match.

Employed worker.

$$
\begin{aligned}
E_\omega(x,k;w) = e_\omega(x,k;w) \\
&+ \beta(1-\rho_\omega)\,\mathbb{E}^i_E\Bigg[\lambda_\omega \int \Big\{(1-\delta_\omega)T_\omega(x',k';w) + \delta_\omega S_\omega(x',k';w)\Big\}\,dF_\omega(x') \\
&\qquad + (1-\lambda_\omega)\Big\{(1-\delta_\omega)E_\omega(x,k';w) + \delta_\omega S_\omega(x,k';w)\Big\} \;\Big|\; k\Bigg] \\
&+ \beta\rho_\omega\,\mathbb{E}^i_E\Big[T_{\omega'}(\widetilde{x},k';w) \mid k\Big].
\end{aligned}
\tag{30}
$$

Unemployed worker.

$$
\begin{aligned}
U_\omega(x,k;w) = u_\omega(x,k) \\
&+ \beta(1-\rho_\omega)\,\mathbb{E}^i_U\Bigg[\lambda_\omega \int \Big\{p_i T_\omega(x',k';w) + (1-p_i)S_\omega(x',k';w)\Big\}\,dF_\omega(x') \\
&\qquad + (1-\lambda_\omega)\Big\{p_i O_\omega(x,k';w) + (1-p_i)U_\omega(x,k';w)\Big\} \;\Big|\; k\Bigg] \\
&+ \beta\rho_\omega\,\mathbb{E}^i_U\Big[T_{\omega'}(\widetilde{x},k';w) \mid k\Big].
\end{aligned}
\tag{31}
$$

Non-participating worker.

$$
\begin{aligned}
N_\omega(x,k;w) = n_\omega(x,k) \\
&+ \beta(1-\rho_\omega)\,\mathbb{E}^i_N\Bigg[\lambda_\omega \int S_\omega(x',k';w)\,dF_\omega(x') + (1-\lambda_\omega)N_\omega(x,k';w) \;\Big|\; k\Bigg] \\
&+ \beta\rho_\omega\,\mathbb{E}^i_N\Big[T_{\omega'}(\widetilde{x},k';w) \mid k\Big].
\end{aligned}
\tag{32}
$$

The unemployed job-finding probability p_i is common to all types with education i. The Bellman equations allow workers to anticipate child-rearing transitions, whereas the stationary distribution applies the reduced-form labour-market flow rules described below. Cohort replacement is accounted for only in the stationary distribution.

C.4 Optimal Decision Rules

Under the single-crossing property of the pairwise value differences in x, decisions can be summarised by three thresholds for each (ω, k, w):

$$E_\omega(x_a^*, k; w) = U_\omega(x_a^*, k; w), \tag{33}$$

$$U_\omega(x_n^*, k; w) = N_\omega(x_n^*, k; w), \tag{34}$$

$$E_\omega(x_q^*, k; w) = N_\omega(x_q^*, k; w). \tag{35}$$

The acceptance threshold x_a^* determines whether an unemployed worker accepts an offer; x_n^* governs the decision to participate in active search; and x_q^* is the pairwise employment–non-participation threshold. Each threshold depends on (ω, k, w), which is suppressed below.

When all three pairwise differences cross zero once, x_q^* lies between x_a^* and x_n^*. If $x_a^* \le x_q^* \le x_n^*$, employment is preferred below x_a^*, unemployment between x_a^* and x_n^*, and non-participation above x_n^*. If instead $x_n^* \le x_q^* \le x_a^*$, employment and non-participation dominate unemployment on either side of x_q^*, even though some workers who would accept an offer prefer not to search. In either case, continued employment after an opportunity-cost redraw requires employment to dominate both alternatives. Define

$$\widehat{x}_\omega(k; w) \equiv \min\{x_a^*(\omega, k; w), x_q^*(\omega, k; w)\}, \tag{36}$$

and

$$I_\omega^{\text{ret}}(k; w) \equiv F_\omega(\widehat{x}_\omega(k; w))\,. \tag{37}$$

Thus the probability of retaining an existing match after the opportunity-cost shock, conditional on no exogenous separation, is

$$\sigma_\omega(k; w) = (1 - \lambda_\omega) + \lambda_\omega I_\omega^{\text{ret}}(k; w). \tag{38}$$

On the finite opportunity-cost grid, thresholds are evaluated at the closest point of pairwise indifference and placed at the relevant boundary if the two values never cross. We also use the notation

$$I_a(\omega, k) \equiv F_\omega(x_a^*), \qquad I_n(\omega, k) \equiv F_\omega(x_n^*), \qquad I_q(\omega, k) \equiv F_\omega(x_q^*), \tag{39}$$

with each threshold evaluated at the equilibrium wage. Under single crossing, $I_\omega^{\text{ret}} = \min\{I_a, I_q\}$.

C.5 Matching, Firms, and Wage Determination

Matching and free entry. Following Albanesi and Şahin (2018), firms post vacancies in education-specific markets shared by men and women, with and without young children. The matching function in market i is

$$M_i(u_i, v_i) = \mu_i u_i^{\alpha} v_i^{1-\alpha}. \tag{40}$$

Writing $\theta_i = v_i/u_i$ for market tightness, the job-finding and vacancy-filling probabilities implied by this function are

$$p_i(\theta_i) = \mu_i \theta_i^{1-\alpha}, \qquad q_i(\theta_i) = \mu_i \theta_i^{-\alpha}. \tag{41}$$

In the numerical solution, the job-finding probability is capped at one. Let $\bar{J}_i$ denote the average entry value of a filled match in market i. A vacancy has value

$$V_i = -c_i + \beta q_i(\theta_i)\bar{J}_i. \tag{42}$$

Free entry, $V_i = 0$, implies

$$c_i = \beta \mu_i \theta_i^{-\alpha} \bar{J}_i, \tag{43}$$

and therefore

$$\theta_i^* = \left(\frac{\beta \mu_i \bar{J}_i^*}{c_i}\right)^{1/\alpha}, \qquad \bar{J}_i^* = \frac{1}{4}\sum_{\omega \in \Omega_i} J_\omega^*, \tag{44}$$

where Ω_i contains the four gender–child-status types of education i and J_ω^* denotes the match value at k_{init} and the equilibrium wage. The equal weights are imposed at match formation; they need not coincide with the composition of unemployment or the stationary type shares. Vacancy costs are proportional to baseline productivity, $c_i = \kappa y_i^0$, with $\kappa = 15$ and $\alpha = 0.5$ in the calibration.

Firm values and match retention. A filled job produces $y_i(k)$ and pays the worker the share w of output. For a male match, the value used in wage setting is

$$J_{m,i,c}(k; w) = \frac{y_i(k)(1-w)}{1 - \beta(1-\delta_{m,i,c})\sigma_{m,i,c}(k; w)}. \tag{45}$$

Endogenous separations enter through $\sigma_{m,i,c}$ and exogenous separations through $\delta_{m,i,c}$. This match-value calculation holds human capital fixed over the match and, for men, does not

incorporate future changes in child-rearing status. The corresponding female match values account for transitions between child-rearing states through the coupled two-state firm problem in equation (**??**) of the main text.

Male wages. A wage rate $w_\omega \in [0,1]$ is chosen for each type at entry human capital k_{init}. The dollar wage subsequently varies with human capital as $w_\omega y_i(k)$. Write the expected worker surplus at match formation as

$$S_\omega^W(w) \equiv \int \max\{E_\omega(x, k_{\text{init}}; w) - S_\omega(x, k_{\text{init}}; w), 0\}\, dF_\omega(x). \tag{46}$$

For male types, the equilibrium wage rate solves

$$w_\omega^* = \arg\max_{w\in[0,1]} \Big[S_\omega^W(w)\Big]^\gamma \Big[J_\omega(k_{\text{init}}; w)\Big]^{1-\gamma}, \qquad j = m. \tag{47}$$

The worker's bargaining weight is $\gamma = 0.5$, equal to the matching elasticity α.

Female wages. Following **Albanesi2013**, the female wage rate equates the firm's entry match value for women and men with the same education and current child-rearing status:

$$J_{f,i,c}\Big(k_{\text{init}}; w_{f,i,c}^*\Big) = J_{m,i,c}\Big(k_{\text{init}}; w_{m,i,c}^*\Big). \tag{48}$$

The female match value incorporates anticipated changes in child-rearing status and their implications for attachment to employment. Differences in the expected duration of female and male matches consequently generate differences in wage rates, even though productivity conditional on education and human capital is gender symmetric.

The female wage rate is subject to the floor

$$w_{f,i,c}^* \geq \underline{w}_i \equiv \frac{\max\{b, w_{\min}\}}{y_i^0 k_{\text{init}}}, \qquad w_{\min} = 0.60. \tag{49}$$

If the unconstrained firm-indifference wage lies below $\underline{w}_i$, the floor binds and equation (48) cannot hold with equality. The resulting lower female match value enters $\bar{J}_i$ and reduces market tightness for all workers of the same education. At the calibration values, the floor is 0.566 for non-college women and 0.283 for college women.

Writing $j(\omega)$ for the gender component of type ω, the male-to-female average wage ratio is computed using employment weights and the stationary distribution of human capital,

$$\text{GPG} = \frac{\bar{w}_m}{\bar{w}_f}, \qquad \bar{w}_j = \frac{\sum_{\omega:\, j(\omega)=j} \sum_k \psi_E(\omega, k) w^*_\omega y_i^0 k}{\sum_{\omega:\, j(\omega)=j} \sum_k \psi_E(\omega, k)}. \tag{50}$$

The ratio reflects both differences in wage rates and endogenous differences in the human-capital distribution of employed workers.

C.6 Stationary Equilibrium

[Stationary equilibrium] A stationary equilibrium consists of worker values $\{E_\omega, U_\omega, N_\omega\}_{\omega\in\Omega}$, optimal decision rules, wages $\{w^*_\omega\}_{\omega\in\Omega}$, firm values $\{J^*_\omega\}_{\omega\in\Omega}$, market tightnesses $\{\theta^*_i\}_{i\in\{u,s\}}$, and a distribution $\{\psi^*_r(\omega, k)\}_{r,\omega,k}$ such that:

1. The worker values satisfy equations (30)–(32), and the corresponding decisions are optimal.
2. Male wages solve equation (47), while female wages satisfy equation (48) subject to the wage floor.
3. Market tightness satisfies free entry, equation (44), in each education market, with entry match values consistent with wage setting.
4. Job-finding probabilities are implied by the matching technology, equation (41), subject to the probability bound.
5. The worker distribution is invariant under the transition operator induced by the policy rules, human-capital dynamics, child-rearing transitions, and cohort replacement, as specified in Section C.7.

Computation. The inner value-function problem has a unique solution conditional on the values of the counterpart child-rearing type.

[Inner Bellman operator] Fix w, p_i, and the counterpart continuation value $T_{\omega'}$. On the finite (x, k) grid, the operator defined by equations (30)–(32) is a contraction in the sup

norm with modulus at most $\beta(1-\rho_\omega) < 1$. Flow payoffs are bounded on the finite state space. For fixed $T_{\omega'}$, the continuation terms involving the worker's own value functions are probability-weighted averages of maxima of those values, multiplied by $\beta(1-\rho_\omega)$. The maximum and expectation operators are non-expansive in the sup norm. Consequently, for any two value-function vectors V and $\widetilde{V}$,

$$\|\Gamma V - \Gamma\widetilde{V}\|_\infty \leq \beta(1-\rho_\omega)\|V - \widetilde{V}\|_\infty.$$

The Banach fixed-point theorem establishes the result.

The outer equilibrium problem is solved by iterating on the two education-specific market tightnesses. Given tightness, the Bellman equations are solved on the opportunity-cost, wage, and human-capital grids, with child-state continuation values updated across outer iterations. Optimal cutoffs determine male Nash wages, female firm-indifference wages, and entry match values. Tightness is then updated toward the free-entry values, using damping. Given wages and matching probabilities, the stationary distribution is obtained from the linear flow-balance equations below. The contraction result applies to the inner problem conditional on counterpart continuation values; it does not by itself establish uniqueness of the joint wage–tightness equilibrium.

C.7 Steady-State Flows and Distribution

Labour-market transitions. The stationary distribution is tracked over (r, ω, k), integrating out the opportunity cost x. Write $\pi_{AB}(\omega, k)$ for the probability of moving from origin state A to destination state B, conditional on (ω, k). These transition probabilities use the distribution F_ω for new opportunity-cost draws and the threshold integrals in equation (39).

The reduced-state flow accounting is an approximation to the full individual recursion when opportunity costs are persistent. In particular, it treats the current opportunity cost of an unemployed worker as distributed according to F_ω, and it does not retain the selection of x within labour-market states or changes in thresholds induced by human-capital and child-status transitions. The formulas below use the ordering $x_a^* \leq x_n^*$; when this ordering fails, the transition probabilities must instead be formed using the three-way comparison of E_ω, U_ω, and N_ω.

Conditional on employment at the beginning of the period, the transition probabilities under this ordering are

$$\pi_{EE}(\omega,k) = (1-\delta_\omega)\Big[(1-\lambda_\omega) + \lambda_\omega I_a(\omega,k)\Big], \tag{51}$$

$$\pi_{EU}(\omega,k) = (1-\delta_\omega)\lambda_\omega\Big[I_n(\omega,k) - I_a(\omega,k)\Big] + \delta_\omega\Big[(1-\lambda_\omega) + \lambda_\omega I_n(\omega,k)\Big], \tag{52}$$

$$\pi_{EN}(\omega,k) = \lambda_\omega\Big[1 - I_n(\omega,k)\Big]. \tag{53}$$

The first expression combines survival of the exogenous separation shock with retention following the opportunity-cost shock. The second includes endogenous movements to unemployment and exogenous separations that do not induce non-participation. The last captures transitions to non-participation after a new opportunity-cost draw.

For unemployed workers, the reduced-state transition probabilities are

$$\pi_{UE}(\omega,k) = p_i I_a(\omega,k), \tag{54}$$

$$\pi_{UN}(\omega,k) = 1 - I_n(\omega,k), \tag{55}$$

$$\pi_{UU}(\omega,k) = I_n(\omega,k) - p_i I_a(\omega,k). \tag{56}$$

An unemployed worker finds a job if an offer arrives and it is accepted, and remains out of employment otherwise. The unconditional integration over F_ω in this row is part of the stationary-flow approximation.

For non-participating workers,

$$\pi_{NE}(\omega,k) = 0, \tag{57}$$

$$\pi_{NU}(\omega,k) = \lambda_\omega I_n(\omega,k), \tag{58}$$

$$\pi_{NN}(\omega,k) = 1 - \lambda_\omega I_n(\omega,k). \tag{59}$$

A non-participant returns to active search only after an opportunity-cost redraw induces participation. There is no direct matching from non-participation. Each row sums to one, and its entries are non-negative under $I_a \leq I_n$ and $p_i I_a \leq I_n$. The former condition also makes the employment-retention integral in equation (38) coincide with I_a.

Human-capital and child-status transitions. Let $\psi_r(\omega,k)$ denote the stationary mass of type-ω workers in labour-market state r at human capital k. The one-period push-forward

of mass into destination labour-market state r' and human capital k' is

$$\Phi_{r'}(\omega, k') \equiv \sum_{k \in \mathcal{K}} \sum_{r \in \{E,U,N\}} \psi_r(\omega, k)\, \pi_{rr'}(\omega, k)\, P_r^i(k, k'). \tag{60}$$

Human-capital dynamics therefore depend on the *source* labour-market state. Child-rearing and cohort-replacement transitions then allocate these masses across types.

For a child-present type $\omega = (j, i, 1)$ and its no-child counterpart $\bar{\omega} = (j, i, 0)$, write $s_{\mathrm{v}} = 1 - \rho_{\mathrm{death}}$. The child-present mass satisfies

$$\psi_{r'}(\omega, k') = s_{\mathrm{v}} \Big[(1 - \rho_{\mathrm{exit}}^i) \Phi_{r'}(\omega, k') + \rho_{\mathrm{enter}} \Phi_{r'}(\bar{\omega}, k') \Big]. \tag{61}$$

The corresponding no-child mass is

$$\begin{aligned} \psi_{r'}(\bar{\omega}, k') = s_{\mathrm{v}} \Big[(1 - \rho_{\mathrm{enter}}) \Phi_{r'}(\bar{\omega}, k') + \rho_{\mathrm{exit}}^i \Phi_{r'}(\omega, k') \Big] \\ + \rho_{\mathrm{death}} M_{ji}\, \mathbf{1}\{r' = U,\ k' = k_{\mathrm{init}}\}, \end{aligned} \tag{62}$$

where

$$M_{ji} \equiv \sum_{k} \sum_{r \in \{E,U,N\}} \Big[\psi_r(\omega, k) + \psi_r(\bar{\omega}, k) \Big] \tag{63}$$

is the total mass of gender–education group (j, i). The final term in equation (62) replaces retirees from either child-rearing state with unemployed entrants who have no young child.

Each gender–education group forms a closed population class: gender and education never change, and cohort replacement takes place within the group. Since the π and P_r^i matrices are row stochastic, equations (61)–(62) conserve M_{ji}. The stationary masses of the four gender–education groups are set to $M_{ji} = 1/4$.

Invariant distribution. Stacking the masses $\psi_r(\omega, k)$ yields a vector ψ. The transition rules define a matrix $\mathbf{T}$ whose stationary distribution satisfies

$$\psi = \mathbf{T}\psi, \qquad \mathbf{1}^\top \psi = 1. \tag{64}$$

Equivalently, the row-stochastic representation satisfies

$$\psi^\top = \psi^\top \mathcal{Q}, \qquad \mathcal{Q} = \mathbf{T}^\top. \tag{65}$$

The matrix is block diagonal across the four gender–education groups, so their invariant distributions can be computed separately and normalised to the prescribed group masses. The solution is obtained by a direct linear solve.

Aggregation. The model-implied stocks for each type are

$$E_\omega = \sum_k \psi_E(\omega, k), \qquad U_\omega = \sum_k \psi_U(\omega, k), \qquad N_\omega = \sum_k \psi_N(\omega, k), \tag{66}$$

with normalisation by the type's total mass when expressing stocks as within-type probabilities. Conditional transition rates integrate over the human-capital distribution within each source state:

$$\Pi_{AB}(\omega) = \frac{\sum_k \psi_A(\omega, k)\pi_{AB}(\omega, k)}{\sum_k \psi_A(\omega, k)}, \qquad A, B \in \{E, U, N\}. \tag{67}$$

These stocks and flows are transformed using the misclassification correction below before being compared with CPS moments. Labour-force participation is $\widehat{E}_\omega + \widehat{U}_\omega$, and unemployment conditional on participation is $\widehat{U}_\omega/(\widehat{E}_\omega + \widehat{U}_\omega)$, with the observed stocks normalised within type. The pooled $U \to E$ transition for a gender–education group is constructed as the unweighted average across its two child-rearing states.

D Misclassification Correction

Following **AbowdZellner1985**, the CPS may record a labour-market state different from the worker's true state. Let $q_{AB} = \Pr(\hat{r} = B \mid r = A)$ denote the probability of misclassifying true state A as observed state B. Define the row-stochastic misclassification matrix $\mathbf{Q}$ by

$$Q_{AB} = \begin{cases} q_{AB}, & A \neq B, \\ 1 - \sum_{C \neq A} q_{AC}, & A = B. \end{cases} \tag{68}$$

For a given type ω, let $\mathbf{s}_\omega = (E_\omega, U_\omega, N_\omega)^\top$ be the vector of true stock probabilities and $\widehat{\mathbf{s}}_\omega$ the corresponding vector of observed probabilities. Then

$$\widehat{\mathbf{s}}_\omega = \mathbf{Q}^\top \mathbf{s}_\omega. \tag{69}$$

The observed transition matrix accounts for classification error in both the origin and destination state. Bayes' rule gives

$$[\mathbf{M}_1]_{BA} = \Pr(r = A \mid \widehat{r} = B) = \frac{Q_{AB}\, s_{\omega,A}}{\widehat{s}_{\omega,B}}, \tag{70}$$

while the probability of observing destination state B conditional on true origin state A is

$$[\mathbf{M}_2]_{AB} = \sum_{C \in \{E,U,N\}} \Pi_{AC}(\omega) Q_{CB}, \qquad \mathbf{M}_2 = \mathbf{\Pi}_\omega \mathbf{Q}. \tag{71}$$

The transition matrix in observed states is therefore

$$\widehat{\mathbf{\Pi}}_\omega = \mathbf{M}_1 \mathbf{M}_2 = \operatorname{diag}(\widehat{\mathbf{s}}_\omega)^{-1} \mathbf{Q}^\top \operatorname{diag}(\mathbf{s}_\omega) \mathbf{\Pi}_\omega \mathbf{Q}. \tag{72}$$

For example, the model counterpart of the CPS-measured transition from observed unemployment to observed employment is the (U, E) entry of $\widehat{\mathbf{\Pi}}_\omega$. All probabilities in equation (72) are conditional on the observed origin state.

Table A3. Misclassification Probabilities

	Non-college		College	
	Men	Women	Men	Women
q_{NU}	0.0041	0.0024	0.0041	0.0024
q_{NE}	0.0066	0.0042	0.0066	0.0042
q_{EN}	0.0065	0.0154	0.0065	0.0154
q_{EU}	0.0019	0.0020	0.0019	0.0020
q_{UN}	0.0780	0.1146	0.0780	0.1146
q_{UE}	0.0230	0.0147	0.0230	0.0147

Source: Abowd and Zellner (1985), as used by Albanesi and Şahin (2018). The same probabilities apply to workers with and without a young child within each gender–education group.