On the Effect of Parental Leave Duration on Unemployment and Wages

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Abstract

We introduce parental leave policies in a labour search and matching model and study the effect of leave duration on unemployment and wages. We show that the effects are ambiguous and depend on whether the net benefit of the leave for the worker relative to her bargaining power is larger than the net benefit of the leave for the firm relative to its bargaining power. Our results suggest that simulated labour market outcomes in search and matching models may be sensitive to the calibration of these key parameters of the model.

Keywords: parental leave, search and matching

JEL Classification: E24, J38
1 Introduction

Maternal and parental leaves are a fundamental component of family policy in most OECD countries (Thévenon and Solaz, 2013). However, leave policies differ significantly across OECD countries. Leave duration is one of the aspects that is found to differ the most, with an average length of 55.2 weeks and a standard deviation of 46.1 weeks of total paid leave available to mothers. In this paper we explore the effect of parental leave duration on wages and unemployment.

We propose a labour search and matching model in which an individual can be unemployed, working or on parental leave. While the worker is on leave the firm incurs a productivity loss but also saves the cost of opening a vacancy as the worker is expected to return to the job. Similarly, the worker enjoys a benefit (e.g. the value of leisure and payment, if any) that needs to be compared with the benefit of the best alternative to the leave if not working (i.e. unemployment). Firms decide whether to open a vacancy under a free entry condition and, when firms and workers are matched, wages are determined through Nash bargaining.

We show that the effects of leave duration on wages and unemployment can be ambiguous and identify the mechanisms underlying this ambiguity. On the one hand, an increase in the duration of the leave has a negative direct effect on job creation, as the benefit of opening a vacancy decreases, thereby raising unemployment. On the other hand, the direct effect on wages can be negative or positive. It will be negative when the net benefit of the leave relative to the bargaining power is higher for the worker than for the firm, as she will be willing to accept a lower wage if parental leave is available. It will be positive if the net benefit of the leave relative to the bargaining power is higher for the firm than for the worker, since it will then be willing to pay a higher wage when parental leave is available.

Our paper is related to Erosa et al. (2010). They were the first to develop a general equilibrium model of fertility and labor market decisions within a search and matching framework. They consider three types of workers - males, non-fertile women and fertile women - who decide whether to have children and take leave. Parental leave policies affect equilibrium allocations through three channels: (i) a bargaining channel in which females have the option of taking a parental leave; (ii) a redistributive channel where paid parental leaves redistribute resources

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1 See Table PF2.1.A in OECD Family Database (http://www.oecd.org/els/soc/PF2_1_Parental_leave_systems.pdf) for a summary of paid leave entitlements available to mothers for 35 OECD countries.
from taxpayers to mothers on leave and; (iii) a job creation channel that reduces the value of posting vacancies which, in turn, reduces the job finding rate and increases the unemployment rate. Their model is comprehensive, but also relatively complex, and they resort to calibrations to evaluate the welfare effects of leave policies on fertility, leave take-up and employment.

Our simpler model focuses on the job creation channel and provides empirically testable theoretical results. In addition, our results suggest that simulated labour market outcomes in search and matching models are sensitive to the calibration of key parameters that we identify.

2 The model

This economy consists of a measure 1 of risk-neutral, infinitely-lived workers and risk-neutral, infinitely-lived firms. Workers and firms discount future payoffs at a common rate $r$ and capital markets are perfect. Time is continuous.

The unemployment rate is denoted by $u$ and the number of vacant jobs is $v$. There is a time-consuming and costly process of matching unemployed workers and job vacancies, which is captured by a matching function $m = m(u, v)$ increasing in both of its arguments, concave, and homogeneous of degree 1. Thus, the aggregate rate at which unemployed workers find jobs is $p(\theta) = \frac{m(u, v)}{u}$, or $p(\theta) = m(1, \frac{v}{u})$, and the aggregate rate at which vacancies are filled is $q(\theta) = m(\frac{u}{v}, 1)$. Then, the vacancy-unemployment ratio $\theta$, also known as market tightness, satisfies $p(\theta) = \theta q(\theta)$ and $p'(\theta) > 0$, $q'(\theta) < 0$.

A job can be either filled or not. If the position is not filled, the firm incurs a flow cost $c$. A vacancy is filled at the endogenous rate $q(\theta)$, yielding a positive value $J - V$, where $J$ and $V$ stand for the value that the firm attributes to a filled and vacant position, respectively.

Each firm has a constant-returns-to-scale production technology with labor as the unique production factor, which generates an instantaneous profit equal to the difference between the constant labor productivity $A$ and the labor cost $w$. Filled positions can be either destroyed at hazard rate $s$ or interrupted at hazard rate $\sigma$ if the worker moves to the status of parental leave. The capital loss is represented by $J - V$ when the position is destroyed and $J - X$ when the worker is on parental leave, where $X$ stands for the value that the firm attributes to the parental leave. While the worker is on leave the firm incurs a net productivity loss $\psi$ per period until the individual returns to his job at hazard rate $\gamma$. The values $V$, $J$ and $X$ are given by the
following expressions:

\[ rV = -c + q(\theta)(J - V), \] 
\[ rJ = A - w - \sigma(J - X) - s(J - V), \] 
\[ rX = -\psi + \gamma(J - X). \] 

An unemployed individual gets value \( b \) and with probability \( p(\theta) \) finds a job that yields net value \( W - U \), where \( W \) and \( U \) stand for the value that the worker attributes to employment and unemployment, respectively. Employed workers earn the endogenous wage \( w \), and can either lose their jobs at rate \( s \) or move to the status of parental leave at rate \( \sigma \). A worker on parental leave enjoys value \( z \) and returns to the job position at rate \( \gamma \). This generates a net gain \( W - L \), where \( L \) stands for the value that the worker attributes to being on parental leave.\(^2\) The inverse of \( \gamma \) represents the average duration of the parental leave. The values associated with the different worker status - unemployed \( (U) \), employed \( (W) \) and on parental leave \( (L) \) - are given by the following expressions:

\[ rU = b + p(\theta)(W - U), \] 
\[ rW = w - s(W - U) - \sigma(W - L), \] 
\[ rL = z + \gamma(W - L). \] 

To close the model, we invoke two standard assumptions: free entry condition for vacancies and bilateral Nash bargaining over wages. The free entry condition for vacancies, whereby firms open vacancies until the expected value of doing so becomes zero, implies

\[ V = 0. \] 

Since neither workers nor employers can instantaneously find an alternative match partner in the labor market, and since hiring decisions are costly, a match surplus exists: \( S = J + W - U \). To divide this surplus between the firm and the worker, we assume wages are the result of bilateral Nash bargaining. The Nash solution is the wage that maximizes the weighted product of the worker’s and the firm’s net return from the job match. The first-order condition yields the following equation:

\[ (1 - \beta)(W - U) = \beta J, \]

\(^2\)Both \( b \) and \( z \) may include income transfers when unemployed or on leave, respectively.
where $\beta$ and $1 - \beta$ represent the bargaining power of the worker and the firm, respectively.

3 The equilibrium

Dynamics of unemployment

Given the state-contingent ratio of vacancies to unemployment $\theta$, unemployment $u$ and employment $e$ evolve according to the following backward-looking differential equations:

$$\dot{u} = se - p(\theta)u, \quad (9)$$
$$\dot{e} = -se + p(\theta)u. \quad (10)$$

At equilibrium, $\dot{u} = 0$. Then, using (9) and the fact that individuals are either employed (working or on leave) or unemployed:

$$1 = e + u, \quad (11)$$

we get the equilibrium unemployment level:

$$u = \frac{s}{s + p(\theta)}. \quad (12)$$

The unemployment rate is $u = s/ (s + p(\theta))$.

Job creation by firms

Equations (1) and (7) imply that the expected value to the firm of filling a position must equal at equilibrium the cost of opening the vacancy:

$$J = \frac{c}{q(\theta)}. \quad (13)$$

A second condition for $J$ can be derived using (2) and (3):

$$J = \frac{(r + \gamma)(A - w) - \sigma \psi}{r(r + \sigma + s) + \gamma (s + r)}. \quad (14)$$

Equilibrium wage

To find the equilibrium wage, we first calculate $W - U$, using (4) to (6), and then substitute the result, together with (14), in (8). After some manipulation, we get:

$$w = (1 - \beta) b + \beta A + \beta c \theta + \frac{\sigma}{(r + \gamma)} \left( \beta \left( \frac{c (p(\theta) + r)}{q(\theta)} - \psi \right) - (1 - \beta) (z - b) \right). \quad (15)$$
The first three terms on the right hand side of (15) are the elements of the standard wage equation in the search and matching model. The last term shows that the determination of wages is affected by costs and benefits of parental leaves to both firms and workers. On the one hand, even though the firm incurs a productivity loss $\psi$ while the worker is on leave, it saves the cost of opening a vacancy for a regular position, represented by $B = c\left(p(\theta) + r\right)/q(\theta)$. If $B - \psi > 0$, the firm will be willing to pay a higher wage than in the absence of leave. In contrast, if $B - \psi < 0$, the firm will be passing some of the cost of the parental leave to the worker through a reduction of the wage. On the other hand, the worker’s benefit when on leave $z$ needs to be compared with the benefit of the best alternative to the leave if not working, i.e. benefit when unemployed $b$. If $z - b > 0$, she will be willing to accept a lower wage. If $z - b < 0$, she will need to be compensated for the utility loss associated to the leave.

4 Effect of leave duration on unemployment and wages

In this section we analyze the effect of leave duration on unemployment and wages. To do that we use the system of two equations that determines market tightness $\theta$ and wages $w$ at equilibrium:

$$\frac{(r + \gamma)(A - w) - \sigma \psi}{r(r + \sigma + s) + \gamma(s + r)} - \frac{c}{q(\theta)} = 0 \text{ and } w - (1 - \beta) b - \beta A - \beta c \theta - \frac{\sigma}{(r + \gamma)} (\beta (B - \psi) - (1 - \beta) (z - b)) = 0,$$

and apply Cramer’s rule. It can be shown that the effect of $\gamma$ on $\theta$ and $w$ hinges on whether the benefit of the leave to the worker relative to her bargaining power $(z - b)/\beta$ is higher than the benefit of the leave to the firm relative to its bargaining power $(B - \psi)/(1 - \beta)$.

**Proposition 1.** Let $\delta = 1/\gamma$ be the duration of the leave:

1. If $z - b/\beta > (B - \psi)/1 - \beta$, then $\frac{dw}{d\delta} < 0$: An increase in leave duration reduces the equilibrium wage but has an ambiguous effect on market tightness and unemployment.

2. If $z - b/\beta < (B - \psi)/1 - \beta$, then $\frac{d\theta}{d\delta} < 0$ and $\frac{du}{d\delta} > 0$. An increase in leave duration decreases

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3See e.g. Pissarides (2000).
4Detailed calculations are available upon request.
5Note that $\frac{du}{d\gamma} = \frac{-sp'(\theta)d\theta}{s + p(\theta)} < 0$. 

market tightness and increases unemployment but has an ambiguous effect on the equilibrium wage.

3. If \( \frac{z - b}{\beta} = \frac{B - \psi}{1 - \beta} \) then \( \frac{d\theta}{d\delta} < 0 \), \( \frac{du}{d\delta} > 0 \) and \( \frac{dw}{d\delta} < 0 \): An increase in leave duration decreases market tightness, increases unemployment and reduces the equilibrium wage.

In order to understand the intuition underlying these results consider Figure 1.

Figure 1: The effect of an increase in parental leave duration

On the one hand, increasing the duration of the leave \( \delta \) has a negative direct effect on job creation: the benefit of opening a vacancy decreases, shifting the job creation equation downwards in both cases. On the other hand, the direct effect on wages can be negative or positive. It will be negative, thus shifting the wage equation downwards, when the net benefit of the leave relative to the bargaining power is higher for the worker (case 1 in Figure 1). It will be positive, thus shifting the wage equation upwards, when the net benefit of the leave relative to the bargaining power is higher for the firm (case 2 in Figure 1). Finally, when the net benefit of the leave relative to bargaining power is equal for both, the direct effect on the wage is nil and only the direct effect on job creation operates, yielding higher unemployment and lower wages.

Recent evidence emphasizes gender differences in wage bargaining. In particular, the literature points out that women are less likely both to bargain on starting wages and to ask for pay raises than men. This implies that they have relatively lower wage bargaining power \( \beta \) and helps
to explain part of the gender wage gap (Card et al., 2015). Interestingly, note that if $\beta = 0$, the effect of the increase in leave duration $\delta$ depends only on whether $z > b$ (case 1) or $z < b$ (case 2).

5 Discussion

We have shown that to determine the effect of parental leave duration on unemployment and wages it is important to evaluate the net benefit of the policy for both workers and firms relative to their respective bargaining powers. Even though there is some empirical evidence on the relative generosity of parental leave versus unemployment, estimating the magnitude of the net benefit for the firm is more difficult. Our conjecture is that sectors/countries with large replacement costs are likely to enjoy a larger benefit from parental leave, but we think that more empirical research is required.

We have considered a single type of worker. This could correspond to a benchmark situation in which all workers - men and women - are treated the same, or alternatively to a situation with segmented markets in which only women are entitled to take leave. In reality, men and women often compete for the same jobs. Firms will take this into consideration when assessing the value of posting a vacancy. Then, although leave entitlements are mainly enjoyed by females in OECD countries (from 54.4% in Iceland to 99.5% in Australia of total users of paid parental leave - see OECD, 2016), they can also affect male outcomes. We plan to extend the model to two types of workers to be able to analyze the effects of type-specific parental leave policies on both males and females.

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6See Table A.1 in the Appendix. Parents can take care of their children while on leave or unemployed, hence the relative income transfer received (if any) in each case is what matters to determine the net benefit.

References


Appendix
Table A1: Components of net benefits of leave for the workers

<table>
<thead>
<tr>
<th>Country</th>
<th>Paid maternity leave: Average payment rate (z)</th>
<th>Net replacement for two earners married couple (b)</th>
<th>Net benefits of leave for workers (z - b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>42.3</td>
<td>55.6</td>
<td>-13.3</td>
</tr>
<tr>
<td>Austria</td>
<td>100</td>
<td>80.3</td>
<td>19.7</td>
</tr>
<tr>
<td>Belgium</td>
<td>64.1</td>
<td>73.8</td>
<td>-9.8</td>
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<tr>
<td>Canada</td>
<td>48.4</td>
<td>80.9</td>
<td>-32.4</td>
</tr>
<tr>
<td>Chile</td>
<td>100</td>
<td>73.5</td>
<td>26.5</td>
</tr>
<tr>
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<td>62.6</td>
<td>88.6</td>
<td>-25.9</td>
</tr>
<tr>
<td>Denmark</td>
<td>53.6</td>
<td>76.6</td>
<td>-23.1</td>
</tr>
<tr>
<td>Estonia</td>
<td>100</td>
<td>73.9</td>
<td>26.1</td>
</tr>
<tr>
<td>Finland</td>
<td>78.5</td>
<td>86.3</td>
<td>-7.9</td>
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<td>France</td>
<td>94.2</td>
<td>82.2</td>
<td>12</td>
</tr>
<tr>
<td>Germany</td>
<td>100</td>
<td>87.6</td>
<td>12.4</td>
</tr>
<tr>
<td>Greece</td>
<td>54.2</td>
<td>61.3</td>
<td>-7.1</td>
</tr>
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<td>71.8</td>
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<tr>
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<td>74.8</td>
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<td>Korea</td>
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<td>13.1</td>
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<td>-6.9</td>
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<td>30.9</td>
<td>56.1</td>
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<tr>
<td>United States</td>
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<td>69.3</td>
<td>-69.3</td>
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<tr>
<td><strong>Average OECD</strong></td>
<td><strong>74.6</strong></td>
<td><strong>6.8</strong></td>
<td><strong>-2.3</strong></td>
</tr>
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</table>

Sources: OECD Family Database (Table PF2.1.A) and OECD Benefits and Wage Statistics during the initial phase of unemployment, 2014.