Female Employment and Divorce: Taking Into Account a Social Multiplier

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Abstract

A model of interactions of marriage and labor markets, taking into account a feedback process from aggregate divorce rates on individuals' decisions, explains why small changes in men's attitudes towards sharing the breadwinner role with their wives may change female labor force participation rates and divorce rates considerably.

Keywords: female labor force participation, divorce rates, social multiplier

JEL-Classification: J12, J16, J21

1 Introduction

Female employment rates and divorce rates vary much over time and countries (United Nations, 2007; World Bank Group, 2009). I argue that small changes in men's attitudes towards sharing the breadwinner role with their wives may explain an increase in higher divorce rates and employment rates if there is a social multiplier effect from macro-variables on individuals' decisions.

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I consider a couple where each spouse takes a single decision. The wife decides on how much effort to devote into job search while her husband decides on how much he supports his wife's job search. The husband's decision depends on the aggregate divorce rate, according to Chiappori and Weiss (2006, 2007), who argue that more divorces around increase the possibility of a husband to find a new woman if he asks for divorce. This would reduce the value of marriage in the eyes of husbands. Thus, aggregate outcomes would feedback on men's behavior. This mechanism is subsumed under the name of social multiplier (Glaeser and Scheinkman, 2003).

Becker (1981) claimed that the benefits of marriage stem from the specialization of men in market and of women in household work. This statement implies that women who have other sources of income are also more likely to divorce. The independence hypothesis is that divorce increases with women's higher labor market participation (Cherlin, 1979). I build on both the independence hypothesis and the social multiplier.

2 The model

Consider a wife j who decides on her job search effort while her husband i chooses on how much to support his wife's job search. The timing of events is shown in Figure 1: the husband chooses the level of support h_i to his wife. The wife devotes the effort s_j on searching for a job. These two decisions are taken simultaneously. Afterwards the wife finds a job or does not. Finally, the quality of the marriage is revealed, and husband and wife decide whether to get divorced or not.

Figure 1: Timing of events

2.1 The wife

The wife's payoff for employment is $v_e = 1$ and for unemployment $v_e = 0$. Her employment is given by $e_j(h_i, s_j)$ with $e_{jh_i} > 0$ and $e_{js_j} > 0$. For the second-order partial derivatives I assume $e_{jh_ih_i} < 0$, $e_{js_js_j} < 0$, and $e_{js_jh_i}$ may be of either sign.

Support by her husband may encourage the wife; it can also take the form of opening his network of colleagues. Campbell (1988) finds that many women's successes in the job search depends on using men's networks.

A wife j's expected utility is:

$$U_{w,j} = e_j(h_i, s_j) - S(s_j), \tag{1}$$

where the first term on the right hand side is the expected utility from job search and the second term are the job search costs. I impose $S_{s_j} \geq 0$, $S_{s_js_j} > 0$, and $S_{s_j}(0) = 0$. The wife maximizes $U_{w,j}$ with respect to her job search effort s_j given h_i.

2.2 The husband

The husband has a divorce option denoted by $v_O(D)$, should his marriage fail. This option is higher as the aggregate divorce rate D is higher. It captures the idea that the returns from a failed marriage are higher to a husband when divorced women are more numerous. This relies on the idea that the probability of remarriage increases with the total number of singles. According to Chiappori and Weiss (2006), "wasted" meetings are lower. Someone is less likely to meet somebody else who is already married or not willing to divorce if the proportion of divorced agents in the population is higher. These authors also argue that channels where singles meet other singles might be costly to establish and only profitably introduced if the market for singles or divorced agents is sufficiently large. Search efforts might also decrease with the non-availability of other divorced or single agents in the population. This would lower the returns for searching for a mate (Mortensen, 1988).

An exogenous shock θ reveals the quality of the marriage to both spouses. The probability that a divorce follows is denoted with $p_{i,j}$. The marriage will continue with probability $1 - p_{i,j}$.

It is costly to the husband to support his wife's job search as time is spent on searching or supporting the search. The cost function $H(h_i)$ is such that $H_{h_i} \geq 0$, $H_{h_i h_i} > 0$, and $H_{h_i}(0) = 0$.

I let the husband's well-being be positively influenced when his wife finds a job. I assume that in the case in which the wife is employed, the husband derives additional utility from the wife's income. Voydanoff (1990) showed that a husband's well-being may improve with the wife's income when this income lessens (potential) economic hardship. Men sharing the breadwinner role appreciate additional income and depart from traditional gender role attitudes (Hochschild, 1989). A man who has a higher $\gamma > 0$ values additional income more. Variation in this parameter will allow me to look into various men's attitudes. I will derive comparative static results with respect to aggregate female employment and divorce as γ is changed. Given how women's and men's utility functions are set-up, a higher valuation by the husband of the income generated by the wife increases the husband's utility and consequently their overall well-being. Formally, this result follows from the envelope theorem applied on optimal choices.

As the focus is on the nexus between women's employment and divorce, men's success on the labor market is kept exogenous: men earn a fixed income which is shared in the family. The income is independent of the choices made in the model and is not explicit.

A husband's i expected utility is:

$$U_{h,i} = p_{i,j} v_O(D) + (1 - p_{i,j}) E(\theta) - H(h_i) + \gamma e_j(h_i, s_j). \tag{2}$$

The husband maximizes his utility with respect to the level of support h_i that he gives to his wife, given s_j and the aggregate divorce rate D.

2.3 Shock to the marriage

A marriage affected by an exogenous shock θ reveals the value which husband and wife attach to this marriage. Chiappori and Weiss (2006) relate such a random event to the emotional feelings that partners have for each other and which may turn bad. I assume that θ is distributed uniformly with support $[\underline{U}_m, \overline{U}_m]$ and $\overline{U}_m > 1 > \underline{U}_m = 0$. Figure 2 shows the density function with the shaded area marking all events of θ compared to an arbitrarily chosen divorce option for which divorce is preferred. The wife decides on whether to continue or not with her marriage, in comparing with the situation of divorced woman. The husband decides by comparing with his current value of v_O. Divorce occurs if both partners agree. Then, the probability of a divorce becomes:

$$p_{i,j} = (e_j(h_i, s_j)F(1) + (1 - e_j(h_i, s_j))F(0))F(v_O(D)), \tag{3}$$

where F denotes the cumulative distribution for the event θ. As the wife finds employment with probability e_j, in which case she has a single option, divorce occurs with $F(1)$. As the wife is unemployed with probability $(1-e_j)$, her probability of divorce becomes $(1 - e_j)F(0) = 0$, because $F(0) = 0$. The husband wants a divorce as his option for divorce $v_O(D)$ is higher than his option for remaining married. This happens with probability $F(v_O(D))$. With consent divorce the marriage is split if both want divorce.

Figure 2: Divorce decision: shaded area marks all events for which divorce is preferred.

3 Results

I first derive individual choices h_i and s_j. The aggregate divorce rate D is treated as exogenous because an individual's decision has a small influence on the aggregate outcome. Aggregate outcomes will then be analyzed in taking the social multiplier effect into account.

The wife's optimal search behavior, given the husband's support h_i, follows from maximizing Eq. (1) with respect to s_j as:

$$e_{js_j} - S_{s_j} = 0. \tag{4}$$

Given that the second order condition fulfills $e_{js_js_j} - S_{s_js_j} < 0$, Eq. (4) implicitly determines a maximum. As usual, the wife's response describes all combinations of search s_j and support h_i where the expected marginal increase in the payoffs of employment equals the marginal costs of searching.

The husband decides on h_i, taking his wife's behavior, the distribution of the shock to the marriage, and the divorce rate D as given. I get the first order condition:

$$e_{jh_i}F(1)F(v_O(D))v_O(D) - e_{jh_i}F(1)F(v_O(D))E(\theta) - H_{h_i} + \gamma e_{jh_i} = 0. \quad (5)$$

Throughout assume that $v_O(D) - E(\theta) > 0$, so that the husband's choice constitutes a maximum. More costly support by the husband increases the likelihood of a consent divorce, as shown by Eq. (3), and it increases the wife's chances to find a job. The husband trades off the marginal well-being from sharing the breadwinner role reflected in the expected change of the divorce option, the expected valuation of marriage, the increase of valuation of the income when the wife finds a job, and the marginal cost for supporting his wife. Eq. (4) and (5) determine the optimal choices s_j^* and h_i^*. In the Appendix I show that these choices constitute locally stable Nash equilibria.

As all individuals and couples are alike, I have identical choices implying $s_j = s$ and $h_i = h$ at equilibrium. The female employment rate is determined by $e = e(h, s)$, and I get for the aggregate divorce rate from Eq. (3): $D =$

$eF(1)F(v_O(D))$. The system

$$e_h F(1)F(v_O(D))(v_O(D) - E[\theta]) + e_h\gamma - H_h = 0 \tag{6}$$

$$e_s - S_s = 0 \tag{7}$$

$$e - e(h, s) = 0 \tag{8}$$

$$D - eF(1)F(v_O(D)) = 0 \tag{9}$$

involves the endogenous variables h^*, s^*, e^*, and D^*.

Proposition 1:

1. *If $v'_O = 0$ and $|e_{hs}| < \overline{e}_{hs}$, an increase in husbands' valuation for sharing the breadwinner role with their wives leads to higher female employment and divorce rates ($de^*/d\gamma > 0$ and $dD^*/d\gamma > 0$).*

2. *Allowing for $v'_O > 0$ aggravates the effect of husbands' higher valuation for sharing the breadwinner role on employment and divorce, constituting the social multiplier effect.*

A proof is in the Appendix. Intuitively, as γ increases, the husband's valuation of sharing the breadwinner role with his wife increases. He supports his wife more. As all husbands act alike, aggregate employment and the divorce rate rise. The higher aggregate divorce rate increases an individual husband's valuation of divorce. This aggravates his job search support. Through this mechanism, a small change in husbands' attitudes may result in relatively large changes in female employment and divorce.

The magnitude and importance of a social multiplier effect can be investigated with a numerical example. I chose functional forms and parameters such that the female employment rate is approximately 54% and the divorce rate 27%. With these choices the employment rate increases by roughly four percents as the valuation of the wife's contribution to the household income by the husband is increased by 10%. The elasticity corresponding to that change amounts to about 0.7. This elasticity halves when I shut off the social multiplier, and increase the valuation as parameterized by γ again by 10% starting off from the same female employment. Results vary with the numerous possibilities for functional and parameter choices. Overall, however, the results suggest a robust effect. For example, I recalculated the elasticities for $\gamma = 0.8$ and $\gamma = 1.2$. Shutting off the social multiplier leads again to a reduction of the elasticities in the order of 50%.

4 Conclusion

I argue that even small changes in husbands' attitudes towards sharing the breadwinner role with their wives can bring about considerable variation in female employment and divorce rates. The underlying mechanism is a social multiplier arising from the aggregate divorce rate on a husband's individual decision to support his wife's job search, and consequently the probability that she finds a job and the probability for consent divorce.

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Appendix

Local stability: Eq. (4) and (5) constitute the optimal choices of wife and husband in s_j^* and h_i^*, given the aggregate divorce rate D, and expectations over the shock θ to the quality of the marriage. If an equilibrium exists, local stability can be proved by examining the best responses of the two players for small deviations from the Nash equilibrium (Cornes and Sandler, 1991). From Eq. (4) and (5) I get:

$$h_{i,t} = h_i^* - \frac{e_{jh_is_j}F(1)F(v_O(D))(v_O(D) - E(\theta)) + e_{jh_is_j}\gamma}{e_{jh_ih_i}F(1)F(v_O(D))(v_O(D) - E(\theta)) + e_{jh_ih_i}\gamma - H_{h_ih_i}}(s_{j,t-1} - s_j^*) \tag{10}$$

$$s_{j,t} = s_j^* - \frac{e_{js_jh_i}}{e_{js_js_j} - S_{s_js_j}}(h_{i,t-1} - h_i^*). \tag{11}$$

The Jacobian is

$$J = \begin{pmatrix} 0 & j_{12} \\ j_{21} & 0 \end{pmatrix} \tag{12}$$

with

$$j_{12} = -\frac{e_{jh_is_j}F(1)F(v_O(D))(v_O(D) - E(\theta)) + e_{jh_is_j}\gamma}{e_{jh_ih_i}F(1)F(v_O(D))(v_O(D) - E(\theta)) + e_{jh_ih_i}\gamma - H_{h_ih_i}} \tag{13}$$

$$j_{21} = -\frac{e_{js_jh_i}}{e_{js_js_j} - S_{s_js_j}}. \tag{14}$$

The eigenvalues satisfy:

$$(0 - \lambda)(0 - \lambda) - j_{12}j_{21} = 0 \tag{15}$$

or

$$\lambda_{1,2} = \pm(j_{12}j_{21})^{1/2}. \tag{16}$$

The equilibrium is locally stable if the eigenvalues lie within the unit circle:

$$|j_{12}j_{21}| < 1, \tag{17}$$

which requires:

$$\begin{aligned} &|e^2_{js_jh_i}(F(1)F(v_O(D))(v_O(D) - E(\theta)) + \gamma)| \\ &< |(e_{js_js_j} - S_{s_js_j})(e_{jh_ih_i}F(1)F(v_O(D))(v_O(D) - E(\theta)) + e_{jh_ih_i}\gamma - H_{h_ih_i})|. \end{aligned} \tag{18}$$

As by assumption $v_O(D) - E(\theta) > 0$:

$$\begin{aligned} &e^2_{js_jh_i}(F(1)F(v_O(D))(v_O(D) - E(\theta)) + \gamma) \\ &< (e_{js_js_j} - S_{s_js_j})(e_{jh_ih_i}F(1)F(v_O(D))(v_O(D) - E(\theta)) + e_{jh_ih_i}\gamma - H_{h_ih_i}). \end{aligned} \tag{19}$$

A sufficient condition for stability is that the second-order partial derivative for the women's employment function is small enough in absolute term $|e_{js_jh_i}| < \overline{e}_{js_jh_i}$ with $\overline{e}_{js_jh_i}$ determined by Eq. (19).

Proof of proposition 1: I first establish the existence of an equilibrium and then prove the social multiplier effect.

Equilibrium: Assume that $v'_O(D) = 0$. Eq. (9) becomes $D = eF(1)\widehat{F}$ with $\widehat{F} = F(\widehat{v}_O)$ and $\widehat{v}_O$ denoting a fixed divorce option for the husband should his marriage fail. Eq. (20) and (21) determine s^* and h^*:

$$G := e_h F(1)\widehat{F}(\widehat{v}_O - E[\theta]) + e_h\gamma - H_h = 0 \tag{20}$$

$$K := e_s - S_s = 0. \tag{21}$$

Differentiating G and K gives the slopes of the equilibrium conditions in the (h, s) space as:

$$\frac{dh}{ds}|_G = -\frac{\frac{\partial G}{\partial s}}{\frac{\partial G}{\partial h}} = -\frac{e_{hs}F(1)\widehat{F}(\widehat{v}_O - E(\theta)) + e_{hs}\gamma}{e_{hh}F(1)\widehat{F}(\widehat{v}_O - E(\theta)) + e_{hh}\gamma - H_{hh}} \tag{22}$$

$$\frac{dh}{ds}|_K = -\frac{\frac{\partial K}{\partial s}}{\frac{\partial K}{\partial h}} = -\frac{e_{ss} - S_{ss}}{e_{sh}}. \tag{23}$$

Three cases are distinguished:

1. when $e_{hs} \to 0$, $\frac{dh}{ds}|_G \to 0$ and $\frac{dh}{ds}|_K \to \infty$.

2. when $e_{hs} > 0$, $\frac{dh}{ds}|_G > 0$ and $\frac{dh}{ds}|_K > 0$.

3. when $e_{hs} < 0$, $\frac{dh}{ds}|_G < 0$ and $\frac{dh}{ds}|_K < 0$.

From Eq. (23), at $h = 0$ the optimal response is $s^* > 0$, given that $e_s(0, s) > 0$. From Eq. (22), at $s = 0$ the optimal response is $h^* > 0$, given that $e_h(h, 0) > 0$. There then exists a range for the second-order partial derivatives $|e_{hs}| < \widehat{e}_{hs}$ for which an equilibrium with (s^*, h^*) is implicitly defined by Eq. (6) to (9). Such an equilibrium also exists for small deviations from $v'_O = 0$.

Social multiplier: The proof of the social multiplier effect makes use of the implicit function theorem. Consider a single equilibrium h^*, s^*, e^*, and D^* associated with the parameter γ^*. The linearized system of Eq. (6) to (9) around that particular point yields:

$$A \begin{pmatrix} de \\ dh \\ ds \\ dD \end{pmatrix} + \begin{pmatrix} e_h \\ 0 \\ 0 \\ 0 \end{pmatrix} d\gamma = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \tag{24}$$

with

$$A = \begin{pmatrix} 0 & a_{12} & a_{13} & a_{14} \\ 0 & e_{sh} & e_{ss} - S_{ss} & 0 \\ 1 & -e_h & -e_s & 0 \\ a_{41} & 0 & 0 & a_{44} \end{pmatrix} \tag{25}$$

and

$$a_{12} = e_{hh}F(1)F(v_O(D))(v_O(D) - E(\theta)) + e_{hh}\gamma - H_{hh} \tag{26}$$

$$a_{13} = e_{hs}F(1)F(v_O(D))(v_O(D) - E(\theta)) + e_{hs}\gamma \tag{27}$$

$$a_{14} = e_h F(1)F'(v_O(D))v'_O(D)(v_O(D) - E(\theta)) + e_h F(1)F(v_O(D))v'_O(D) \tag{28}$$

$$a_{41} = -F(1)F(v_O(D)) \tag{29}$$

$$a_{44} = 1 - eF(1)F'(v_O(D))v'_O(D). \tag{30}$$

By applying Cramer's rule,

$$\frac{de^*}{d\gamma^*} = -\frac{\det\ B}{\det\ A} \tag{31}$$

with

$$B = \begin{pmatrix} e_h & a_{12} & a_{13} & a_{14} \\ 0 & e_{sh} & e_{ss} - S_{ss} & 0 \\ 0 & -e_h & -e_s & 0 \\ 0 & 0 & 0 & a_{44} \end{pmatrix}. \tag{32}$$

I examine $de^*/d\gamma^*$.

- No feedback from aggregate divorce rate. Postulating that $v'_O(D) = 0$:

$$A = \begin{pmatrix} 0 & a_{12} & a_{13} & 0 \\ 0 & e_{sh} & e_{ss} - S_{ss} & 0 \\ 1 & -e_h & -e_s & 0 \\ a_{41} & 0 & 0 & 1 \end{pmatrix}. \tag{33}$$

  and

$$B = \begin{pmatrix} e_h & a_{12} & a_{13} & 0 \\ 0 & e_{sh} & e_{ss} - S_{ss} & 0 \\ 0 & -e_h & -e_s & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, \tag{34}$$

and for the effect of a change of γ on the female employment rate:

$$\frac{de^*}{d\gamma^*} = -\frac{e_h \begin{vmatrix} e_{sh} & e_{ss} - S_{ss} \\ -e_h & -e_s \end{vmatrix}}{\begin{vmatrix} a_{12} & a_{13} \\ e_{sh} & e_{ss} - S_{ss} \end{vmatrix}}. \tag{35}$$

For sufficiently small $|e_{sh}| < \widetilde{e}_{sh}$, the numerator is negative and the denominator is positive which results in $de^*/d\gamma^* > 0$.

- Allowing for feedback from aggregate divorce rate. Postulating that $v'_O(D) > 0$ yields:

$$\frac{de^*}{d\gamma^*} = -\frac{a_{44}e_h \begin{vmatrix} e_{sh} & e_{ss} - S_{ss} \\ -e_h & -e_s \end{vmatrix}}{\begin{vmatrix} 0 & a_{12} & a_{13} & a_{14} \\ 0 & e_{sh} & e_{ss} - S_{ss} & 0 \\ 1 & -e_h & -e_s & 0 \\ a_{41} & 0 & 0 & a_{44} \end{vmatrix}} \tag{36}$$

or

$$\frac{de^*}{d\gamma^*} = -\frac{e_h \begin{vmatrix} e_{sh} & e_{ss} - S_{ss} \\ -e_h & -e_s \end{vmatrix}}{-\frac{a_{14}a_{41}}{a_{44}} \begin{vmatrix} e_{sh} & e_{ss} - S_{ss} \\ -e_h & -e_s \end{vmatrix} + \begin{vmatrix} a_{12} & a_{13} \\ e_{sh} & e_{ss} - S_{ss} \end{vmatrix}} \tag{37}$$

The comparison with Eq. (35) requires that

$$-\frac{a_{14}a_{41}}{a_{44}}\begin{vmatrix} e_{sh} & e_{ss}-S_{ss} \\ -e_h & -e_s \end{vmatrix} < 0. \tag{38}$$

As $\begin{vmatrix} e_{sh} & e_{ss}-S_{ss} \\ -e_h & -e_s \end{vmatrix} < 0$ for sufficiently small $|e_{sh}| < \widetilde{e}_{sh}$, I need to verify that

$$-\frac{a_{14}a_{41}}{a_{44}} > 0. \tag{39}$$

For small $v'_O(D)$ the denominator of Eq. (39) is positive. Furthermore $a_{41} < 0$ and $a_{14} > 0$. Thus, at equilibrium, $\frac{de^*}{d\gamma^*}$ increases when $v'_O(D) > 0$.

Similarly $\frac{dD^*}{d\gamma^* > 0}$, which increases when $v'_O(D) > 0$.