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The welfare effects of mobility restrictions

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Abstract

Mobility restrictions (e.g., severance payment, lifelong tenure, and divorce ban) are widely observed. I present a partnership model that highlights the 'break-up externality' (i.e., the negative effect of a person's break-up decision on his current partner). Under this externality, there is too much searching for new partners and too much breaking-up of existing partnerships. Restrictions such as a break-up payment and break-up ban can reduce the levels of searching and breaking-up and improve welfare. Thus the paper rationalizes mobility restrictions as welfare-improving arrangements.

JEL classification: D62; J41; J60

Keywords: Mobility restriction; Partnership; Search; Break-up

1. Introduction

Mobility restrictions are commonly observed in the labor market. The Southern European countries are noted for high severance payment, and the East Asian countries for life-long tenure. Mobility restrictions are also widely found in the marriage market. Alimony (i.e., divorce payment) is a common practice and direct divorce bans are widely observed in developing countries and in the recent history of developed countries. A normative question is what are the welfare effects of mobility restrictions. One common view is that these restrictions lead to inefficient matching and thus reduce welfare. For example, this is the case in the models of firing costs in Hopenhayn and Rogerson (1993) and Alvarez and Veracierto (1999). However, at least some of the mobility restrictions are contractual arrangements between two parties, whose purpose is presumably to improve

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welfare. In this paper, I adopt this alternative view and explore the situations under which the mobility restriction emerges as a welfare-improving arrangement.

The basic story is as follows. Imagine two people in a partnership. Suppose one of them meets an alternative partner. If he breaks up with his current partner and forms a new partnership with the alternative partner, this deserted partner suffers a welfare loss. However, without any restrictions on the break-up, the welfare loss of the deserted partner is external to the decision problem of the deserting partner. Due to this externality, the partnership breaks up too easily and further there is too much searching for an alternative partner since meeting an alternative partner is over-valued. In this situation, restriction on breaking-up can improve the welfare of the partners by internalizing (some of) the externality.

This story can be cast in the framework of the search and matching theory. In this theory, previous related work includes Burdett and Coles (1998) whose model features the endogenous break-up of partnerships and focuses on the 'sorting externality' (i.e., the effect of a person's break-up decision on the type of people in the matching market).[1] On the other hand, this paper focuses on the 'break-up externality,' that is, the negative effect of a person's break-up decision on his partner. After finishing the earlier version of this paper, I came to know of the work of Burdett et al. (1999), which also focuses on break-up externality. The equilibrium in their paper is similar to the equilibrium in this paper under no mobility restrictions. The main difference is that their paper features multiple equilibria and explores search and matching behavior under various parameter values, whereas this paper features a unique equilibrium due to a strong convexity assumption on search cost and explores arrangements that reduce inefficiency.

In Section 2, I present a basic model of a symmetric partnership where the above-mentioned break-up externality is present. I show that mobility restriction can serve as a welfare-improving contractual arrangement between partners. Depending on the contractual environment, the restriction may be a break-up payment that requires the deserting partner to compensate the deserted partner, or a break-up ban that forbids breaking-up altogether. In Section 3, I explore variations of the basic model. First, I present a model of an asymmetric partnership, and show that the results from the symmetric partnership can carry over depending on the contractual environment. Second, I present a general equilibrium version of the basic model, and show that mobility restriction can improve the social welfare (i.e., the welfare of any and all people in the economy). In Section 4, I conclude by summarizing the results and discussing future research.

2. The basic model

Consider a two-people partnership. At each date, partners produce output together but separately search for alternative partners. Their joint output is $2y$. The partners divide the output equally so that each takes y. The equal division may be due to the nature of the

[1] The other studies with endogenous break-up include Burdett and Wright (1998) and Aiyagari et al. (2000). The interests of these studies are, however, the equilibrium search and matching behavior and not the issue of externality and efficiency.

output, e.g., intrinsic utility from marriage or friendship. For the basic model, partners are assumed to be identical in their searching and matching prospects. They would then divide output equally even if the output is non-equally divisible. Let m be the probability of meeting an alternative partner. To obtain matching probability m, a partner has to spend $x(m)$ units of output. Assume that $x'(m) > 0$ and $x''(m) > 0$. To simplify the analysis, further assume that at most only one of the two partners meet an alternative partner: either one of the two members meets an alternative partner or neither does.[2] To be consistent with this assumption, assume that as $m \to 1/2$, $x(m) \to \infty$. If a partner meets an alternative partner, the partner can break up with his current partner and form a new partnership with the alternative partner. The new partnership would then be in effect from the next date, while the deserted partner would be without a partner. The utility from starting the next date in a new partnership is given by V_h and that from starting the next date without a partner is given by V_l.

2.1. No break-up restriction

Let us first consider an environment where: (i) contracts are not enforceable and (ii) there are no means for payment. The first assumption implies that the current partners cannot sign any (binding) contracts restricting a break-up. The second assumption implies that the current partners cannot negotiate with each other when break-up decisions are made. This environment is meant to capture the extreme case for the narrative purpose. Let V denote the expected utility of a partner. The Bellman's equation is

$$V = \max_m \bigl\{ y - x(m) + \beta\bigl[V + m(V_h - V) - \phi(V - V_l)\bigr]\bigr\}. \tag{1}$$

In this equation, $\beta \in (0, 1)$ is a discount rate and ϕ is the probability of being deserted by the current partner. Since the two partners' decision problems are identical, in equilibrium the probability of being deserted is the same as the probability of meeting an alternative partner:[3]

$$\phi = m. \tag{2}$$

An equilibrium is the utility V, the matching probability m, and the desertion probability ϕ such that V and m solve (1) given ϕ, and (2) holds.

In making the search and break-up decision, a partner ignores the negative effect of his searching and breaking-up on his current partner, which is captured by the last term in (1). Let us call this 'break-up externality.' This externality makes multiple equilibria likely: if my partner searches more, I search more. Burdett et al. (1999) show this in their analysis of search and matching behavior under the presence of break-up externality. This paper,

[2] This will be approximately the case if the length of a period is short, even if the search outcomes of the two current partners are independent of each other: the probability of the two current partners both meeting potential partners can be assumed away. This assumption is implicit in continuous-time models, which are obtained in the limit of shortening the length of period. See Burdett and Coles (1999).

[3] This implicitly restricts the equilibrium to be a symmetric one, where two partners' search levels are the same. However, this restriction is not binding: there is no asymmetric equilibrium under the strong convexity assumption on $x(m)$, i.e., Eq. (3).

however, focuses on the welfare effects of mobility restrictions. For this purpose, working with unique equilibrium is technically, but not substantively, simpler than working with multiple equilibria. One way to have a unique equilibrium is to assume strong convexity on $x(m)$: for all m,

$$x''(m) > \frac{\beta^2(V_h - V_l)}{1-\beta}. \tag{3}$$

Proposition 1. *There is a unique equilibrium. There are y_l and y_h such that $V \leqslant V_l$ if $y \leqslant y_l$; $V_l < V < V_h$ if $y_l < y < y_h$; and $V \geqslant V_h$ if $y \geqslant y_h$. For $y \in (y_l, y_h)$, $\mathrm{d}V/\mathrm{d}y > 0$ and $\mathrm{d}m/\mathrm{d}y < 0$.*

Proof. Given ϕ, there is a unique set of V and m that solve (1). We can derive that $\mathrm{d}m/\mathrm{d}\phi < 1$ under (3). Thus there is a unique ϕ under which (2) is satisfied. Further, we can derive that $\mathrm{d}\phi/\mathrm{d}y < 0$ under (3) (if ϕ is interior), leading to the remainder of the proposition. □

The intuition is that under the strong convexity on $x(m)$, in equilibrium a partner's reaction to the increase in his partner's search level is not strong enough to support another equilibrium with mutually higher levels of search. For the simplicity of analysis, assume that (3) holds from now on. To insure that partners gain from forming a new partnership and suffer from being deserted by each other, also assume that $y_l < y < y_h$. Due to the break-up externality, partners break-up too easily: they break-up even if the welfare gain of a partner is less than the welfare loss of the other. Further, partners search too much since meeting an alternative partner is over-valued. Partners would be better off if they could restrict their search and break-up behavior.

2.2. Break-up payment

Let us now consider an environment where: (i) contracts are enforceable and (ii) there are means for payment. This is the completely opposite environment from the previous one. In this environment, an obvious contract to consider is one that requires the deserting partner to pay to the deserted partner the amount equal to the welfare loss of the deserted partner. Let $\widehat{V}$ denote the expected utility of a partner under the break-up payment contract. The Bellman's equation is

$$\widehat{V} = \max_m \bigl\{y - x(m) + \beta\bigl[\widehat{V} + m\bigl(V_h - \widehat{V} - z\bigr) - \phi\bigl(\widehat{V} - V_l - z\bigr)\bigr]\bigr\}. \tag{4}$$

Here z is the break-up payment and satisfies

$$z = \widehat{V} - V_l. \tag{5}$$

This break-up payment would make a partner internalize the welfare loss of his current partner when making break-up decisions, and this would effectively eliminate the break-up externality. Thus the break-up decision will be optimal. Further, we can see that under (5) any $\widehat{V}$ and m that solve (4) also solve

$$\widehat{V} = \max_m \bigl\{y - x(m) + \beta\bigl[\widehat{V} + m\bigl(V_h + V_l - 2\widehat{V}\bigr)\bigr]\bigr\}, \tag{6}$$

but this is what the partners would solve if they could fully commit to a search level. Thus under the break-up payment the search level will be optimal as well.

2.3. Break-up ban

Let us now consider an environment where: (i) contracts are enforceable but (ii) there are no means for payment. This environment is in-between the two previous environments. In this environment, an obvious contract to consider is one that bans breaking-up directly. If there is a break-up ban, there would be no searching and the Bellman's equation is simply $\widetilde{V} = y - \beta \widetilde{V}$, or

$$\widetilde{V} = \frac{y}{1-\beta}. \tag{7}$$

Comparing (2) and (7), partners would choose to ban a break-up if $\widetilde{V} > V$ and not to ban if $\widetilde{V} < V$. This choice depends on how high current output is relative to outputs resulting from alternative matching.

Proposition 2. *There is $\bar{y} \in (y_l, y_h)$ such that $\widetilde{V} > V$ if $\bar{y} < y < y_h$. Conversely, there is $\underline{y} \in (y_l, y_h)$ such that $\widetilde{V} < V$ if $y_l < y < \underline{y}$. Further, $\bar{y} = \underline{y}$ if $x'''(m) \geqslant 0$ for all m.*

Proof. From (7), if y is close enough to y_h, $\widetilde{V} > (V_h + V_l)/2$. From (1), (2), and (7), if $V > (V_h + V_l)/2$, $V < \widetilde{V}$. Thus there is $\bar{y}$ with the stated property. From (1) and (7), $V > \widetilde{V}$ if y is close enough to y_l. Thus there is $\underline{y}$ with the stated property. We can derive $\mathrm{d}^2 V/\mathrm{d}y^2 > 0$ if $x'''(m) \geqslant 0$ for all m. Since $\mathrm{d}^2 \widetilde{V}/\mathrm{d}y^2 = 0$, there is a unique y where $V = \widetilde{V}$, leading to the remainder of the proposition. □

Thus the partners would ban a break-up if their current output is sufficiently high while they would not if their current output is sufficiently low. Intuitively, with a high enough current output the benefit of searching for a better partner is outweighed by the loss of being deserted by the current partner, while the converse is true with a low enough current output.

3. Extensions

In this section, I characterize the welfare effects of mobility restrictions in variations of the basic model. First, I consider the asymmetric partnership and second, the general equilibrium.

3.1. Asymmetric partnership: Non-equal division of output

Consider a partnership that is the same as in the basic model but in that the partners are different ex-ante. Let $i = 1, 2$ denote the two partners and assume that

$$V_h^1 - V_h^2 = V_l^1 - V_l^2 > 0. \tag{8}$$

Thus Partner 1 has a better search and matching prospect than Partner 2. The equality is not essential, but simplifies the analysis. The two partners' joint output is the same as in the basic model (i.e., $y^1 + y^2 = 2y$), but the output is non-equally divisible. Given y_i (more on this shortly) and under no restrictions on a break-up, the Bellman's equation for partner i is

$$V^i = \max_m \bigl\{y^i - x(m) + \beta\bigl[V^i + m\bigl(V_h^i - V^i\bigr) - \phi^i\bigl(V^i - V_l^i\bigr)\bigr]\bigr\} \tag{9}$$

and in equilibrium the desertion probability ϕ^i satisfies

$$\phi^i = m^j, \tag{10}$$

where $i = 1$ if $j = 2$ and vice-versa. We can show that given $(V_h^i, V_l^i, y^i)_i$, there is a unique equilibrium $(V^i, m^i, \phi^i)_i$ that solves (9) and (10), using a variation of the proof for Proposition 1 and assuming the strong convexity condition on x: for all m and for $i = 1, 2$,

$$x''(m) > \frac{\beta^2(V_h^i - V_l^i)}{1 - \beta}. \tag{11}$$

The output shares of the partners are determined through bargaining. Since the alternatives to partnership is being alone, we could impose

$$V^1 - V_l^1 = V^2 - V_l^2. \tag{12}$$

Thus y^1 and y^2 are chosen such that (12) prevails in equilibrium. From (8), (9), and (12), we can show that in equilibrium

$$m^1 = m^2. \tag{13}$$

From (9) and (13), we can show that[4]

$$y^1 - y^2 = (1 - \beta)\bigl(V^1 - V^2\bigr). \tag{14}$$

Thus the output share of Partner 1 is greater than that of Partner 2 by the amount proportional to the degree of their asymmetry. Note from (13) that the search and matching behavior of partner i is *as if* he is in a symmetric partnership with the joint output equal to $2y^i$. Intuitively, through the non-equal division of output, the *net* benefit of searching and the *net* loss from being deserted are endogenously equalized between the partners (i.e., $V_h^1 - V^1 = V_h^2 - V^2$ and $V^1 - V_l^1 = V^2 - V_l^2$), which in turn equalizes the incentives for searching between partners.

Given the symmetry in the search and matching behavior between partners, we can repeat the reasoning in the basic model and show that if partners can sign a break-up payment contract, they would choose the break-up payment that is equal to the welfare loss of the deserted partner, and partners would benefit equally from this restriction. The break-up payment is

$$z = \widehat{V}^1 - V_l^1 = \widehat{V}^2 - V_l^2, \tag{15}$$

[4] As in the basic model, given (14), there are y_l and y_h such that $V_l^i < V < V_h^i$, $i = 1, 2$, if and only if $y_l < y < y_h$. Assume that $y_l < y < y_h$ to insure that partners gain from forming a new partnership and suffer from being deserted by each other.

analogous to (5). This break-up payment restriction would induce the optimal levels of searching and breaking-up. Now, if partners can only sign a break-up ban contract, they would compare utilities under no restrictions with those under the break-up ban:

$$\widetilde{V}^i = \frac{y^i}{1-\beta}, \tag{16}$$

which is analogous to (7). Again, given the symmetry in the search and matching behavior between partners, we can repeat the reasoning in the basic model and show that partners would choose the break-up ban if their joint output is sufficiently high while they would not if their joint output is sufficiently low, and they would benefit equally from the break-up ban. In summary, despite their ex-ante asymmetry, partners' search and matching behavior is symmetric due to the non-equal division of their joint output and consequently their preference for restrictions is symmetric as well. Thus partners choose to have break-up payment or ban restriction just as they would if their partnership were symmetric.

3.2. Asymmetric partnership: Equal division of output

Now consider a partnership that is the same as in the previous subsection except in that the joint output can only be divided equally (i.e., $y^1 = y^2 = y$), and further the partners cannot make the payment to each other.[5] Under no restrictions on a break-up, the search and matching behavior is no longer symmetric between them: Partner 1 has more incentive to search than Partner 2. Nevertheless, there is still, albeit non-symmetric, break-up externality.

To characterize the partners' preference for the break-up ban, consider a symmetric partnership with joint output $2y$ and utilities (V, V_h, V_l), and compare it with an asymmetric partnership *with the same joint output* $2y$ and utilities $(V^i, V_h^i, V_l^i)_i$. Further, assume that $V_h^1 - V_h = V_l^1 - V_l = V_h - V_h^2 = V_l - V_l^2 > 0$. Thus Partner 1 in the asymmetric partnership has a better search and matching prospect than a partner in the symmetric partnership by a certain degree, while Partner 2 in the asymmetric partnership has a worse prospect than a partner in the symmetric partnership by the same degree.

Proposition 3. *Under no restrictions,* $V^1 > V > V^2$.

Proof. From (8) and (9), we can derive

$$\mathrm{d}V^i \left[1 - \frac{\beta^4(V^1 - V_l^1)(V^2 - V_l^2)}{x''(m^1)x''(m^2)(1 - \beta(1 - m^1 - m^2))}\right]$$

[5] If the partners can make the payment to each other (through means other than the non-equal division of joint output), the equal division constraint is effectively non-binding, and we would end up with the same no-restriction equilibrium as in the previous subsection. Further, if the partners are able to sign a break-up payment contract, the partners would choose to have the same break-up payment restriction as in (12) and this would lead to the optimal levels of searching and breaking-up.

$$= \mathrm{d}V_h^i\left[\frac{\beta m^i}{1-\beta(1-m^1-m^2)} - \frac{\beta^4(V^1-V_l^1)(V^2-V_l^2)}{x''(m^1)x''(m^2)(1-\beta(1-m^1-m^2))}\right]$$
$$+ \mathrm{d}V_l^i \frac{\beta m^j}{1-\beta(1-m^1-m^2)}$$
$$+ \mathrm{d}V_h^j\left[\frac{\beta m^j}{1-\beta(1-m^1-m^2)} - 1\right]\frac{\beta^2(V^i-V_l^i)}{x''(m^2)(1-\beta(1-m^1-m^2))}$$
$$+ \mathrm{d}V_l^2 \frac{\beta m^i}{1-\beta(1-m^1-m^2)}\frac{\beta^2(V^i-V_l^i)}{x''(m^2)(1-\beta(1-m^1-m^2))}.$$

Setting $\mathrm{d}V_h^1 = \mathrm{d}V_l^1 = -\mathrm{d}V_h^2 = -\mathrm{d}V_l^2 > 0$ and assuming (10), we have $\mathrm{d}V^1 > 0$ and $\mathrm{d}V^2 < 0$, which implies the proposition. □

Thus the asymmetry benefits Partner 1 and harms Partner 2. If there were to be break-up ban, each partner's utility in the symmetric partnership would be given by (7), which would be equal to each partner's utility in the asymmetric partnership:

$$\widetilde{V}^1 = \widetilde{V}^2 = \frac{y}{1-\beta}. \tag{17}$$

Thus, Partner 1 in the asymmetric partnership would be less willing to ban a break-up than a partner in the symmetric partnership, while Partner 2 in the asymmetric partnership would be more willing to ban a break-up than a partner in the symmetric partnership. If one partner can refuse to sign the break-up ban contract, this implies that the asymmetric partnership is less likely to have a break-up ban than the symmetric partnership. Indeed we can show that under any level of joint output, there would be no break-up ban if the asymmetry is large enough.

3.3. General equilibrium

Now consider an economy that builds on the basic model. There are many people. At any date, a person is alone, in a partnership with joint output equal to $2y$, or in a partnership with joint output equal to $2y_h$, where $y_l < y < y_h$. People search in a matching market for partners. I make three simplifying assumptions on matching. First, I assume that the pair-wise match quality is idiosyncratic: for any new match, its joint output is $2y_h$ with probability μ and $2y$ with probability $1-\mu$. Second, the matching market is segmented so that a lone person is matched only with another lone person, and a partner with joint output $2y$ is matched only with another partner with join output $2y$. (Partners with joint output $2y_h$ do not search.) If there were no segmentation, searching by a person with current joint output $2y$ entails either greater break-up externality or a lower matching prospect of a lone person, depending on the tie-breaking break-up rule when the new joint output is $2y$. In either case, the segmentation assumption only reduces the negative externality of searching, which is a safe bias in showing the positive welfare effects of mobility restrictions.[6,7] Third, in each segment of the market, the aggregate matching technology is constant returns to scale when the input is measured as the sum of *effective* search effort across searchers, so that a person's matching probability is a constant multiple of his effective search effort. Without the loss of generality, m denotes both the individual matching probability and effective search effort. Under these three assumptions, there is no effect of a person's search effort on the matching prospect of the other searchers.[8] At the end of each date, σ fraction of all (new and old) partnerships are randomly broken-up. The exogenous break-up is to generate the non-diminishing searching and breaking-up in the long run.

Under no restrictions, the Bellman's equation of a partner with joint output $2y$ is basically the same as in the basic model:

$$V = \max_m \bigl\{y - x(m) + \beta\bigl[V + m\mu(1-\delta)(V_h - V) - (\delta + \phi)(V - V_l)\bigr]\bigr\}, \tag{18}$$

analogous to (1). In equilibrium the probability of being deserted is the same as the probability of meeting an alternative partner:

$$\phi = m\mu(1-\delta). \tag{19}$$

The Bellman's equation for a lone person is

$$V_l = \max_n \bigl\{y_l - x(n) + \beta\bigl[V_l + n(1-\delta)\bigl(\mu(V_h - V_l) + (1-\mu)(V - V_l)\bigr)\bigr]\bigr\}, \tag{20}$$

and that for a partner with joint output $2y_h$ is[9]

$$V_h = y_h + \beta\bigl[V_h - \delta(V_h - V_l)\bigr]. \tag{21}$$

An equilibrium is value functions V, V_l, and V_h that solve (18) to (21), and the associated matching and desertion probabilities m, n, and ϕ. As in the basic model, we can show the existence of unique equilibrium under a strong convexity assumption on $x(m)$: for all m,

$$\frac{x''(m)}{y_h - y_l} > \left(\frac{\beta(1-\delta)\mu}{1-\beta(1-\delta)}\right)^2. \tag{22}$$

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[6] I assume the tie-breaking break-up rule that a person with current joint output $2y$ does *not* break up with his current partner if the new joint output is $2y$ (see Eqs. (18) and (19)), which minimizes the negative externality of searching. Again, this is a safe bias in showing the positive welfare effects of restrictions. Under this tie-breaking rule, segmentation could endogenously arise if the partnership-status is public information: lone people would exclude people with partners from their matching places since they provide a lower matching prospect.

[7] Burdett et al. (1999) adopts an alternative simplifying assumption that a partner leaves his current partner before finding out the new match quality. *Applied here*, this is equivalent to assuming no market segmentation and the tie-breaking rule that a person with current joint output $2y$ breaks up with his current partner if the new joint output is $2y$, the opposite of the assumptions in this paper. Again, the assumptions adopted here are safer in showing the positive welfare effects of restrictions.

[8] This is not to deny that in general there could be externality that operates among searchers. In fact a host of previous work studied this type of externality. For example, a worker's search effort may benefit firms in the matching market (Mortenson, 1982; Pissarides, 1984). This type of externality may provide the rationale for an employment tax/subsidy or the other active labor market policies, but it seems somewhat removed from the context of mobility restrictions, which this paper focuses on.

[9] This implicitly restricts the equilibrium to be one with no searching by partners with current joint output $2y_h$. However, this restriction is not binding: under the strong convexity assumption on $x(m)$ (i.e., Eq. (22)), there is no equilibrium with a positive level of searching by partners with current joint output $2y_h$.

Proposition 4. *There is a unique equilibrium.*

Proof. Let $\Gamma_1 \equiv V - V_l$, $\Gamma_2 \equiv V_h - V$, and $\Delta \equiv \beta\phi\Gamma_1$. We can derive

$$\Gamma_1 = \min_n \bigl\{ y_h - y_l + x(n) + \beta(1-\delta)(1-n)\Gamma_1 - \bigl[1 - \beta(1-\delta)(1-\mu n)\bigr]\Gamma_2 \bigr\} \tag{P1}$$

and

$$\Gamma_2 = \min_m \bigl\{ y_h - y + x(m) + \beta(1-\delta)(1-\mu m)\Gamma_2 + \Delta \bigr\}. \tag{P2}$$

Given Δ, there is a unique set of Γ_2 and m that solves (P2). Given Γ_2, there is a unique set of Γ_1 and n that solves (P1). Given Γ_1 and m, we can calculate a new Δ. Thus this algorithm maps Δ to a new Δ. Let $\xi(\Delta)$ denote this mapping. We can show that $0 < \Delta < y - y_l$ in equilibrium. To characterize ξ in this range, we can show that $\xi(0) > 0$ and $\xi(y - y_l) = 0$. Further, $\mathrm{d}\Gamma_1/\mathrm{d}\Delta < 0$ and $\Gamma_1 < (y - y_l)/[1 - \beta(1-\delta)]$ such that

$$\frac{\mathrm{d}\xi}{\mathrm{d}\Delta} < \beta\Gamma_1 \frac{\mathrm{d}\phi}{\mathrm{d}\Delta} < \left[\frac{\beta(1-\delta)\mu}{1 - \beta(1-\delta)}\right]^2 \frac{(y - y_l)}{x''(m)} < 1.$$

Thus ξ has a unique fixed point in $(0, y - y_l)$, leading to the proposition. □

Partners with joint output equal to $2y$ essentially face the same search and matching environment as in the basic model: there is a break-up externality, which leads to excessive searching and breaking-up. If they can, partners would sign a break-up payment contract whereby the deserting partner pays to the deserted partner the amount given by (5). Recall that given the assumptions on matching, there is no externality in the economy other than the break-up externality. Thus the break-up payment restriction leads to the economy-wide optimal search and matching behavior. If partners can only sign a break-up ban contract, they would do so if the ban delivers a greater utility. Under the ban, the Bellman's equations are the same as before except that (18) is replaced by

$$\widetilde{V} = y + \beta\bigl[\widetilde{V} - \delta\bigl(\widetilde{V} - \widetilde{V}_l\bigr)\bigr]. \tag{25}$$

Proposition 5. *Given y_l and y_h, there is $\bar{y} \in (y_l, y_h)$ such that $\widetilde{V}_l > V_l$, $\widetilde{V} > V$, and $\widetilde{V}_h > V_h$ if $\bar{y} < y < y_h$. Conversely, there is $\underline{y} \in (y_l, y_h)$ such that $\widetilde{V}_l < V_l$, $\widetilde{V} < V$, and $\widetilde{V}_h < V_h$ if $y_l < y < \underline{y}$. Further, $\bar{y} = \underline{y}$ if $x'''(m) \geqslant 0$ for all m.*

Proof. Define Γ_1 and Γ_2 as in the proof for Proposition 4. Analogously, let $\widetilde{\Gamma}_1 \equiv \widetilde{V} - \widetilde{V}_l$ and $\widetilde{\Gamma}_2 \equiv \widetilde{V}_h - \widetilde{V}$. If y is close enough to y_h, $\Gamma_1 > \Gamma_2$. Then $\Gamma_2 > \widetilde{\Gamma}_2$. Then $\Gamma_1 + \Gamma_2 > \widetilde{\Gamma}_1 + \widetilde{\Gamma}_2$ since $\mathrm{d}\Gamma_1/\mathrm{d}\Gamma_2 = \mathrm{d}\widetilde{\Gamma}_1/\mathrm{d}\widetilde{\Gamma}_2 > -1$. Then $V_h < \widetilde{V}_h$ so that $V < \widetilde{V}$ and $V_l < \widetilde{V}_l$. Thus there is $\bar{y}$ with the stated property. If y is close enough to y_l, Γ_1 is small enough so that $\Gamma_2 < \widetilde{\Gamma}_2$. Repeating the above steps, we have $V_h > \widetilde{V}_h$, $V > \widetilde{V}$, and $V_l > \widetilde{V}_l$. Thus there is $\underline{y}$ with the stated property. We can show that if $V = \widetilde{V}$ at y_1 and y_2 where $y_1 < y_2$, $(\mathrm{d}V/\mathrm{d}y)/(\mathrm{d}\widetilde{V}/\mathrm{d}y)$ is greater at y_2 than at y_1 assuming $x'''(m) \geqslant 0$ for all m. Further we can show that if $V = \widetilde{V}$ and $\mathrm{d}V/\mathrm{d}y = \mathrm{d}\widetilde{V}/\mathrm{d}y$ for some y, $\mathrm{d}^2V/\mathrm{d}y^2 > \mathrm{d}^2\widetilde{V}/\mathrm{d}y^2$. These properties imply that there is a unique y where $V = \widetilde{V}$, leading to the remainder of the proposition. □

Thus, as in the basic model, partners would ban a break-up if their current output is sufficiently high while they would not if their current output is sufficiently low. It is worth emphasizing that even though the break-up payment or ban is a contractual arrangement made in each partnership, its collective practice can improve the welfare of *all people* in the economy.

4. Conclusion

The results can be summarized as follows. In a symmetric partnership, if there are means for payment, a break-up payment restriction achieves the optimal levels of searching and breaking-up. If there are no means for payment, a break-up ban restriction improves welfare if the joint output of the partnership is high enough. In a non-symmetric partnership, if the joint output is non-equally divisible, the partner with a better matching prospect, through bargaining, takes a greater share of output than the other partner so that the *net* benefit of searching becomes equal between the partners. Then the welfare effects of the break-up payment or ban restriction are the same as in the symmetric partnership. If the joint output is only equally divisible and there are no means for payment, the net-benefit equalization does not hold and the break-up ban restriction is less likely to prevail than in the symmetric partnership. In an aggregate economy with symmetric partnerships and a stylized matching market, the break-up payment or ban restriction can only improve the social welfare: its practice in individual partnerships can collectively improve the welfare of all people in the economy.

In all, this paper is an attempt to model (some of) the observed mobility restrictions as welfare-improving arrangements between two parties. The validity of this view of mobility restrictions would depend on particular examples. My immediate future research is to adapt this model explicitly for the European labor market and assess the balance of welfare-improving and welfare-reducing effects of firing restrictions. Another direction of future research is to explore why there are differences in the degree of mobility restriction across countries and time periods (e.g., the greater severance payments in Europe than in the USA, the abandonment of the divorce ban in the 70's in Italy and Brazil).

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