E C O N O M I C S B U L L E T I N

Why are there singles: Being single in equilibrium as a partner discipline device

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Abstract

Although people constantly search for partners, there are always some ones who are left as singles. This paper provides a simple model to demonstrate that this can happen even in the environment most conducive to partnership, when monitoring infidelity is not perfect. The intuition is that, when having a partner is preferred to being single, being single can be used as a discipline device to prevent infidelity.

I am grateful to Adrian Masters, the associate editor, and an anonymous referee for helpful comments.
Citation: Sohn, Kitae, (2008) "Why are there singles: Being single in equilibrium as a partner discipline device." *Economics Bulletin*, Vol. 10, No. 10 pp. 1-6
Submitted: April 25, 2008. **Accepted:** July 3, 2008.
URL: http://economicsbulletin.vanderbilt.edu/2008/volume10/EB-08J60004A.pdf

Nothing in the world is single,
All things by a law divine
In one another's being mingle--
Why not I with thine?

From Love's Philosophy by Percy B. Shelley (1792-1822)

1. Introduction

People search for partners. Whether the intention is for one night stand, dating, cohabitation, or marriage, they search. They go to pubs, clubs, or churches, participate in social gatherings, browse on-line dating websites, or even attend speed dating. Although people are eager to find "the" ones, it is an ineluctable fact that there are always people who do not have partners ("singles"), not to mention "the" ones. It is puzzling why this happens.

In the Beckerian world, people positively assortatively sort themselves, get married, and divide labor according to their comparative advantage (Becker 1973). This is possible in his world, because information is perfect. Everyone knows everything about their potential partners including their location. Apparently information is not perfect in reality, and it is costly to search and find partners. Burdett and Coles (1997) theorize that, even with imperfect information, people still positively sort into distinctive classes, and get married within the classes. And yet, it is possible that some are left without partners, when there is only one sex in certain classes. Even if sorted in such a way, when one sex has sufficiently weak bargaining power in the partnership, the weakly empowered sex would avoid partnership (Lundberg and Pollak 1993). Beyond the theories, one common sense states that an unbalanced sex ratio mechanically generates singles.

Is it possible that there can still be singles, even when information is "almost" perfect, everyone is same so there is no class and no weakly empowered sex, and there are exactly same number of men and women? This paper attempts to demonstrate that this is possible not because of something before the formation of partnership but because of something *after* the formation: infidelity or cheating. The intuition comes from Shapiro and Stiglitz (1984). They argue that unemployment is used as a device to discipline workers. The analogy is obvious. Being single can be used as a device to discipline partners, if being single is worse than having partners, which seems to be the case considering the endless search.

2. Model

2.1. Basic Set-up

The following model is similar to the model built by Shapiro and Stiglitz (1984) with different interpretations. Suppose there are one man and one woman, called Adam and Eve, respectively. They are identical in every way but sex, and prefer forming a partnership to being single. But they are concerned with infidelity. Although they know all about each other, they cannot monitor infidelity perfectly.

Suppose, by God's command, a sufficiently large number, N -1, of clones of Adam are generated instantaneously, and the same happens to Eve. The world is heterosexual and monogamous, so only one Adam and one Eve can form a partnership. Adam and Eve are risk neutral and maximize the expected present discounted value of

utility at a rate of $r(>0)$. Time is infinite and continuous. When they are singles, they enjoy b unit of utility ("basic utility"). When they become partners, Adam hires Eve for his love factory at wage $w(>0)$, and she decides how much "love," $l(>0)$, she will produce. Symmetrically, in the same partnership, Eve hires Adam at wage w, and he decides how much love, l, he will produce. Hence Adam and Eve are employees as well as employers, but Eve does not own Adam's love factory, and vice versa for Adam. Although one is hired by the other to produce love, Adam and Eve firmly believe that money (wage) cannot buy love. So, wage and love are distinctive to them. The partnership dissolves at a probability of δ per unit of time, which is exogenously given.

2.2. Cheating

Unfortunately, life is not so peaceful. Partners cheat, and the prevalence of cheating seems to be a real threat. A conservative rate of infidelity in marriage ranges 20 to 25 percent in the United States (Greeley 1994; Wiederman 1997). In a less formal partnership, about 70 percent of college students report extradyadic involvement during a serious dating relationship (Wiederman and Hurd 1999). Neither Adam nor Eve is God. They are only the image of God. So, they also succumb to the temptation in spite of himself, i.e. at a exogenous rate. Because the situations for Adam and Eve are symmetrical, Adam will be focused from now on.

Although Eve in the partnership is same as Eve outside of the partnership, there is a sense of excitement in cheating, which yields $u(>0)$ unit of utility. When Adam is in the state of cheating, he produces no love for Eve but pays the wage of w to her. Although love is missing in the partnership, Eve never doubts his fidelity, as long as Adam pays what is due to her, i.e. w. Adam unremorsefully takes advantage of her naïveté. He falls into an affair with another Eve at an exogenous rate of ς per unit of time. When Adam is caught at an exogenous probability of ρ per unit of time, the partnership immediately dissolves, and they become singles again. V_S, V_{MN}, and V_{MC} are defined as the expected lifetime utility of single Adam, non-cheating Adam, and cheating Adam, respectively.

The fundamental equation for each state is given by

$$rV_S = b + \alpha(V_{MN} - V_S), \tag{1}$$

$$rV_{MN} = (1-\varsigma)(l+w) - w + \delta(V_S - V_{MN}) + \varsigma(V_{MC} - V_{MN}), \text{ and} \tag{2}$$

$$rV_{MC} = (1-\varsigma)(l+w) - w + u + (\delta+\rho)(V_S - V_{MC}). \tag{3}$$

$(1-\varsigma)(l+w)$ is the expected love and wage that Adam enjoys, as long as he is in the partnership regardless of his cheating state. $-w$ is the wage that Adam needs to pay to Eve in the partnership. And, ς in $(1-\varsigma)(l+w)$ reflects the cheating rate of Eve, whereas ς in $\varsigma(V_{MC} - V_{MN})$ indicates Adam's rate of cheating.

Analogous to Shapiro and Stiglitz (1984), if $V_{MN} \geq V_{MC}$, Adam does not cheat on Eve.[1] From (1), (2), and (3), the no-cheating condition (NCC) can be written as

$$l \geq \frac{1}{1-\varsigma}\left[b + \varsigma w + \frac{u}{\rho}(\alpha + \delta + r) \right] \equiv \underline{l}, \tag{4}$$

[1] The active form of the expression does not mean that cheating is endogenously chosen.

where $\underline{l}$ is the critical level of love that Eve has to produce for Adam to ensure that he does not cheat.

The NCC implies that the critical level of love, $\underline{l}$, is higher

(a) the more likely Adam and Eve cheat on each other (ς)
(b) the better the basic utility Adam enjoys as single (b)
(c) the more Adam needs to pay Eve (w)
(d) the less likely Adam is caught on cheating (ρ)
(e) the more enjoyable cheating is (u)
(f) the easier forming a partnership is (α)
(g) the more likely Adam and Eve break up (δ)
(h) the less patient Adam is (r).

All the results intuitively make sense. In the case of (b), (d), (e), and (f), Adam has better outside options. Eve needs to offer better options in parallel with Adam's outside options, if she does not want to see Adam cheating. When the partnership is shaky, as in (a) and (g), Eve has to love Adam more. (c) means nothing but quid pro quo. As Adam pays more, Eve also needs to pay more. Finally, in the case of (h), when Adam does not see much value in the future, Eve has to bribe Adam with more love now.

2.3. Equilibrium

Since there are a sufficiently large number of clones of Adam and Eve, Adam and Eve take the decision of the clones as given. Given the decision, Adam and Eve offer the going level of love. Eve does not need to offer more love than the going level of love, because she can still prevent Adam from cheating at the going level. If her offer is lower than the going level, she cannot form a partnership, because Adam can always find another Eve at the going level. The same argument applies to the level of love that Adam has to offer Eve.

In steady state, the population in each state flows in and out as depicted in Figure 1. When the total population of Adams is normalized to 1, α is solved to

$$\alpha = \frac{(\delta+\varsigma)(\delta+\rho)(1-n_S)}{(\delta+\rho+\varsigma)n_S}.$$

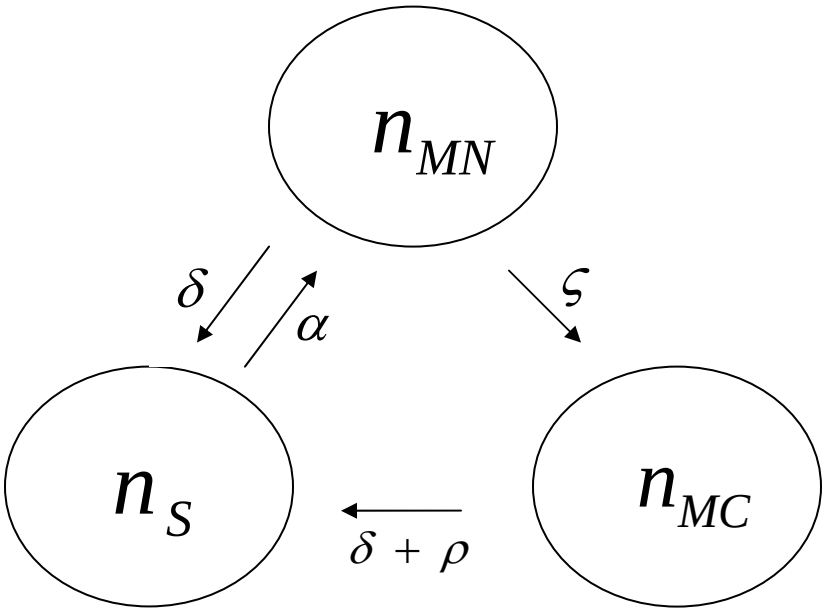
By substituting this term into (4), the NCC condition becomes

$$l \geq \frac{1}{1-\varsigma}\left[b+\varsigma w+\frac{u}{\rho}\left(\frac{(\delta+\varsigma)(\delta+\rho)(1-n_S)}{(\delta+\rho+\varsigma)n_S}+\delta+r\right)\right] \equiv \underline{l},$$

where n_S represents the population of single Adams.

Hence, as the population of single Adams approaches to zero ($n_S \to 0$), Eve needs to produce unlimited love for Adam to prevent cheating ($\underline{l} \to \infty$). Unless love is freely produced in this world, it is inevitable that there are lonely Adams and Eves haplessly searching for partners. Even if Adam demands less than $\underline{l}$ for a partnership, Eve does not accept the proposal. His proposal is simply not credible, i.e. the NCC is not satisfied.

Figure 1. Steady State Flow Rates in the Three States: Single, Non-Cheating, and Cheating



NOTE: δ : an exogenous rate of partnership destruction; α : an exogenous rate of partnership arrival; ς : an exogenous rate of cheating; ρ : an exogenous rate of being caught; n_S : the population of single Adams; n_{MN} : the population of non-cheating Adams; n_{MC} : the population of cheating Adams. $n_S + n_{MN} + n_{MC} = 1$.

3. Concluding Remarks

This paper attempts to explain why there are singles in spite of the endless search for partners. I borrow the concept from the model of Shapiro and Stiglitz (1984) to suggest one possible reason: being single as a partner discipline device, namely preventing partners from cheating. If it is not perfect to monitor infidelity, singles exist, even if information is perfect except the monitoring, people are identical, the bargaining power is same for both sexes, and the sex ratio is exactly balanced.

The reason introduced in this paper may not be the only or even crucial reason for the existence of singles. It may be true that they exist, because information is not perfect, there are not compatible partners, or simply, there are not enough warm bodies to go around. However, the possibility that there can be singles even in the environment most conducive to partnership presents a small modicum of thought to ruminate.

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