Are Working Women Good for Marriage?*

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Abstract

Divorce rates in the U.S. have been falling for the past decade, while female labor force participation rates have been rising. Aggregate data for US states show that in 2000, divorce rates across states are negatively correlated with female labor force participation rates, even after controlling for the variation in the average age of marriage. We connect these two trends in a simple random matching model which starts from the observation that a working woman, because she is paid in cash, has greater flexibility to transfer surplus to her husband than a non-working woman. Under unilateral divorce law, this implies that a marriage with two working partners is more stable with respect to outside offers than a marriage with only one working partner: marriages between working partners break up only if it is efficient to do so, while marriages between a working and nonworking spouse may break up inefficiently. We show that in aggregate there is a predicted inverted U relationship between the divorce rate and fraction of working women.

1. Introduction

From the 1960s through the early 1980s, divorce rates in the US trended upward. So did the fraction of women who work (female labor force participation, or FLFP). A large literature spanning several disciplines has connected these trends. Although the explanations are varied, all suggest that FLFP and divorce rates should covary. Most find causality running from FLFP to divorce rates: working women are more independent, (Nock, 2001); the incomes of husbands and wives are substitutes, making marriage between equals less valuable (Becker et al., 1977); there is increased marital conflict within working couples (Mincer, 1985; Spitz and South, 1985), etc. An important strand finds causality running the other way: in the face of rising divorce rates, even married women have increased incentives to invest in careers, as kind of self insurance (Greene and Quester, 1982; Johnson and Skinner, 1986). Finally, some authors have suggested that the two trends reflect a spurious correlation:

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improvements in home production technology, which both lowers the opportunity cost of working and reduces the value of a marriage, have contributed to increased FLFP and to increases in divorce (Ogburn and Nimkoff, 1955; Greenwood and Gruner, 2004).

In the past two decades though, the trend in divorce rates has begun to reverse itself, palpably, if not overwhelmingly, while FLFP continues to rise.

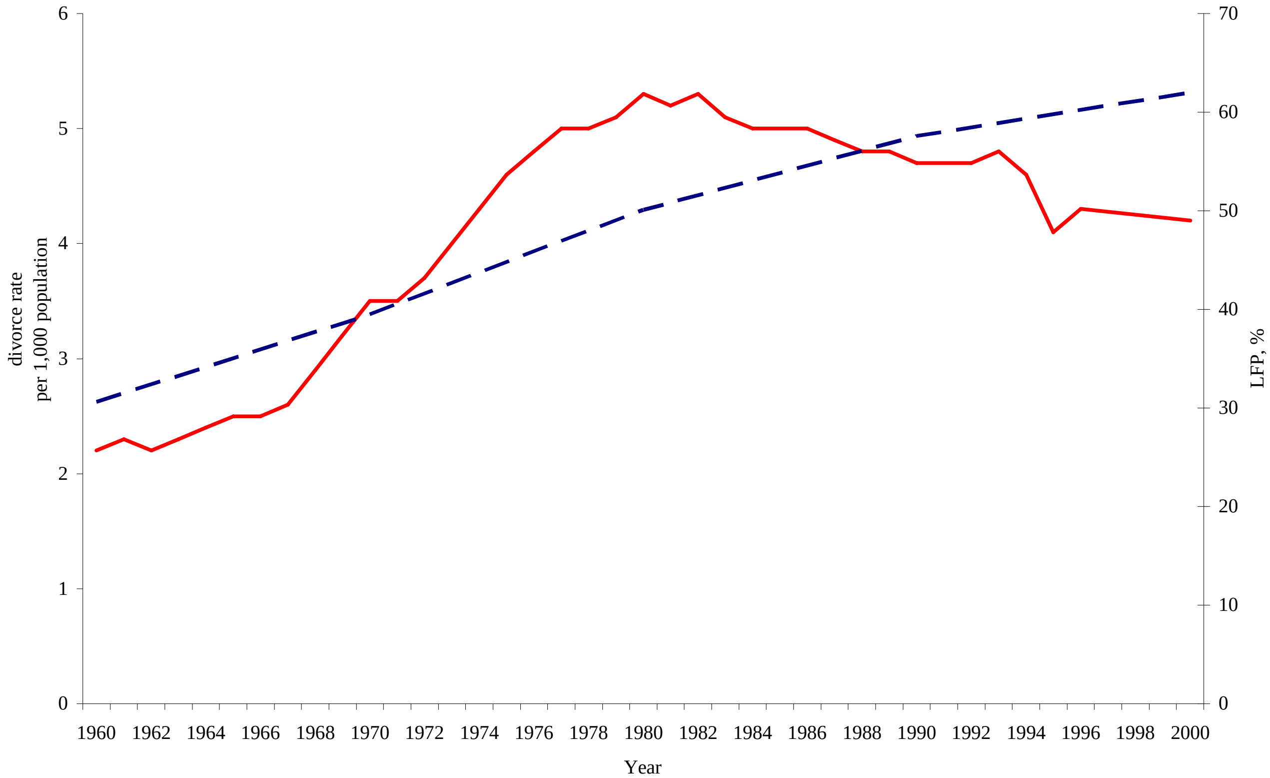

Figure 1: Divorce rate (per 1000 population) and Married Women's LFP: 1960-2000

As shown in Figure 1, from 1980 to 2000, the rate of divorce in the US fell from 5.3 to 4.2 per 1000 people per year, undoing more than a third of the increase of the previous two decades. Meanwhile FLFP continued to rise, from 50% to 62%.

What is more, if one looks at a cross section of US states, one finds a *negative* relationship between the divorce rate and FLFP. Figure 2 shows how the divorce rates, per 1,000 population, and labor force participation rates of married women vary across U.S. states in the year 2000. The divorce rate is high in states like Alabama, Kentucky and West Virginia where married women's labor force participation rates are relatively low - around 60%. Divorce rates tend to be lowest in states like Minnesota, Massachusetts, Vermont and Iowa where more than 70% of married women participate to the labor force. The (population-weighted) correlation coefficient between the two series is sizable, -0.42, and is statistically significant at the 1 percent level.

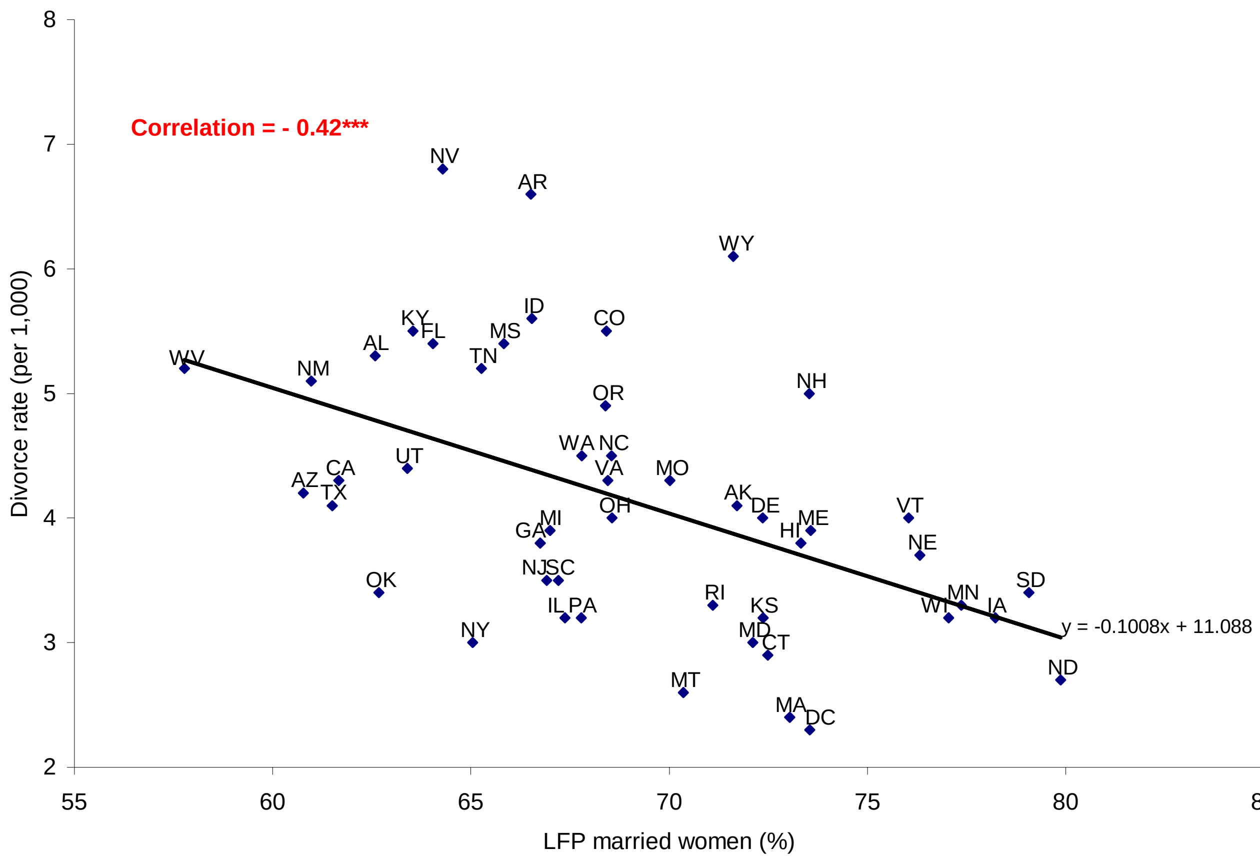

Figure 2: LFP rates of married women and divorce rates by state, 2000

This simple negative correlation, however, could be driven by systematic differences in various characteristics across states. For example, if marriages earlier in the life cycle are less stable and less educated women are more likely to marry earlier and less likely to work, then systematic differences across states in educational attainment and age at first marriage could be the drivers of the observed negative correlation. In Table 1 we present the results of simple state-level regressions of divorce rates on labor force participation of married women where we control for differences in age at first marriage, racial composition, educational attainment, income, age and marriage rates across states.[1]

[1] Data on average labor force participation rates are computed from the one-percent Integrated Public Use Microsample (IPUMS) of the decennial Census, divorce data by state are as reported in the Vital Statistics

Dependent Variable is Divorce Rate, per 1,000 population							
FLFP married	-.083***	-.049**	-0.057**	-.086***	-0.083**	-.095***	-0.076**
	[0.027]	[0.022]	[0.025]	[0.031]	[0.039]	[0.035]	[0.035]
Fmedianagefirst		-.371***	-0.157	-.354***	-.316***	-.407***	-.325***
		[0.088]	[0.309]	[0.095]	[0.108]	[0.098]	[0.104]
Marriage rate		0.041***	0.044***	0.039**	0.042***	0.030**	0.035**
per 1000 pop		[0.015]	[0.015]	[0.015]	[0.015]	[0.014]	[0.014]
white				4.395*	8.418**	5.591	6.503*
				[2.517]	[3.661]	[3.326]	[3.254]
black				3.264	5.977**	2.853	4.453
				[2.256]	[2.941]	[2.739]	[2.780]
asian				6.383	10.593*	8.516*	9.244*
				[4.670]	[5.430]	[4.824]	[4.683]
highschool					-8.139	-6.17	-5.494
					[6.275]	[5.560]	[5.392]
college					-4.041	-1.43	2.172
					[5.463]	[4.873]	[5.079]
nchild						-4.87***	-4.22***
						[1.380]	[1.379]
income							-0.000*
							[0.000]
age							0.381
							[0.300]
Mmedianagefirst			-0.219				
			[0.303]				
Observations	49	49	49	49	49	49	49
Adjusted R-squared	0.15	0.48	0.47	0.48	0.48	0.6	0.63

Robust standard errors in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%.
Missing observations on divorce rate for Indiana and Louisiana. For California and Colorado 1990 divorce rates.
Data Sources: Vital Statistics of the United States (divorce rates), Census IPUMS 2000 (LFP & other variables)
U.S. Census Bureau, American Community Survey 2002-2003, Census Supplementary Survey 2000-2001
(median age at first marriage)

Table 1: Divorce rates and labor force participation of married women

Even after controlling for state level characteristics, such as education, racial composition, marriage rates and especially median age of first marriage that may be driving the negative

of the United States (2004). Data for divorce and marriage rates are from the Vital Statistics of the United States. State level data on female labor force participation, age, education, race and overall income are population-weighted averages computed from Census 2000. The information on median age at first marriage for men and women are from the U.S. Census Bureau's American Community Survey 2002-2003. Indiana and Louisiana are dropped from our sample since we do not have information on divorce rates. For California and Colorado divorce rates.are for 1990 - the latest year for which information is available. Averages are computed over the working-age population (16 to 64 years old).

correlation, divorce rates across states are negatively correlated with labor force participation rates of married women. In the basic regression, column 1, we find that a 10% difference in the full-time labor force participation rates of married women across states translates into a lower divorce rate by 0.83. The estimate is significant at the 1 percent level. Since the average divorce rate is 4.2 per 1000 population this is a sizeable difference. The coefficient on female median age at first marriage is also statistically significant. States characterized by a lower median age at first marriage are also characterized by higher divorce rates. In subsequent columns we progressively control for additional state level characteristics. As shown in the last column of the table, the correlation between divorce rates and labor force participation of married women remains sizeable and significant even after controlling for a string of state-level characteristics.[2]

Both the time-series and the cross-section evidence suggest that something in the above explanations must be incorrect, or at least incomplete. In this and a companion paper we discuss economic forces that could account for the recent trends (as well as the earlier ones) and that seem to have been left out of earlier analyses. The fact that a woman works, thereby deriving monetary income, differentiates her from her nonworking counterpart in two important respects that affect the functioning of the "marriage market." We refer to the first such effect as the *selectivity effect.* This effect pertains to behavior before marriage. The second effect, which is the focus of the present paper, is the *flexibility effect.* This effect has to do with behavior inside the marriage.

Our theory suggests that working women can be both more selective about whom they marry and more flexible with their partners once they are married. Greater selectivity implies that there will be fewer unexpected incompatibilities once the partners are married (perhaps they know each other better, or they know their own preferences better), so they are less likely to have a reason to divorce, all else the same. Greater flexibility implies that once a "crisis" does occur, the working woman will better be able to accommodate her husband, so that he will be less inclined to leave, thereby preserving the marriage.

Before proceeding to our main analysis on the flexibility effect, let us say something about the selectivity effect. One of its implications is that a woman searching for a husband will wait longer to marry if she has her own income than if she does not. This means that she is more likely to make an informed choice of mate than if she marries early because of need (or desire) to be supported by a husband. Thus a society with a high FLFP will have a greater age of first marriage than one with a low FLFP. Greater age of first marriage in turn is positively correlated with the information married people have at the time of their wedding and therefore negatively correlated with divorce. So we should expect societies with higher age of first marriage to have lower divorce rates, and this is indeed borne out in the regressions described in Table 1. (Using the same data, we have regressed age of

[2] We have also run this regressions by using different measures of female labor force participation: full- and part-time participation of married women, labor force participation of white married women, labor force participation of 25-54 year old married women. In all specifications we obtain results that are qualitatively equivalent to the ones reported in the paper.

first marriage on FLFP and found a strong and positive correlation. Note that the FLFP in question is that of *married* women, not all women.) However, the same table also shows that FLFP still has an independent negative effect on divorce rates, so that it is unlikely that the selectivity effect fully explains the trends.

Thus we turn to the flexibility effect, which affects the nature of intrahousehold bargaining. Let's compare a woman who works with one who doesn't. Assume the husband works in both cases and that all characteristics of the woman and man are identical. Then the working woman has more purchasing power, so together a couple where the woman is working can afford more than a couple where the woman is not working with respect to anything where there is increasing returns – a bigger house, better schools for the kids, nicer cars. Obviously a husband is going to be more reluctant to part with that, all else equal.

On the other hand, it is sometimes argued that the woman who doesn't work has more time for "home production," in particular of "local public goods" (children, housecleaning, meal preparation, etc.) that she shares with her husband. These two effects might well wash out.

But there is a more subtle effect as well. Imagine the husband receives an "outside offer" : he meets someone. What will he get from this new mate? Imagine she is slightly more attractive or has slightly greater earning power than his current wife. The working wife has something that the non-working wife doesn't have: money. And money is the instrument *par excellence* for transferring utility from one partner to the other.

If the husband presents this new offer to his wife (one would imagine that it never works itself out this way in practice, but we are interested here in the logic of the forces at work), the working wife can match the offer by transferring some of her earnings to him. He is happier than he was before, and the marriage stays together.

The husband whose wife stays at home has no money to make a counteroffer, only less efficient instruments for transferring utility such as payment in kind. In some cases, she will not be able to compete with the new offer and the marriage dissolves. In short, the essential difference is that working increases the flexibility (in the jargon, the "transferability of utility") of the relationship in a way that actually permits the relationship to last longer. We illustrate the difference in the following figure.

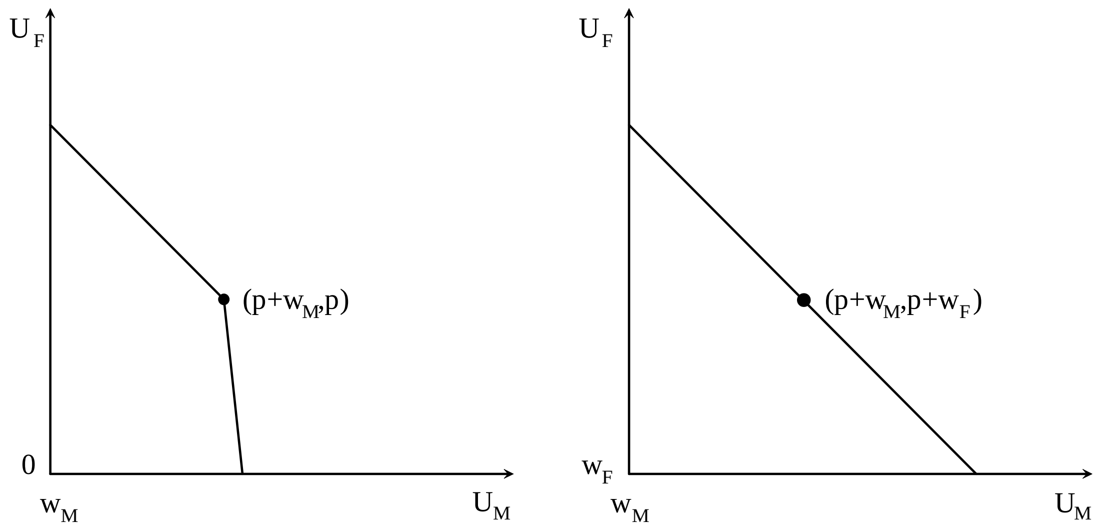

Figure 3: The Flexibility Effect

In both graphs, U_M and U_F denote the utility of the male and female, respectively, w_M and w_F denote the income, or wage, of the male and female, respectively, and p denotes the value that the male and female each derive from their marriage.[3] The left graph describes the utility possibility frontier of a married couple where the woman is not working, and the right graph describes the utility possibility frontier of a married couple where the woman is working. If the husband receives an offer larger than $p + w_M$ (but less than $2p + w_M + w_F$) then the nonworking wife would be unable to match whereas the working wife could match it. Thus the working wife would have an easier time convincing her husband to remain in the relationship.

(Later, the wife might meet someone, and the husband will have to make a transfer to her to keep the marriage together. But that is the same whether or not the wife works. The only difference might be that it's easier to meet people when you work than when you don't – a dubious proposition that is not supported by the data.)

Thus, the greater flexibility offered by the cash instrument actually contributes to the relative stability of the working woman's marriage. And if we are talking about one couple in a sea of couples, then the analysis might stop there. But when we are talking about trends, and whether working women are good for the institution of marriage, we are talking about the whole population, and so the analysis only begins here. All else isn't the same if we compare two populations, one in which few women work and one in which most do. For a man's current wife can retain him more easily against a *given* outside offer than a non working wife, but what if the outside offers are better when there are many working women than if there are not?

We adopt a simple search-and-bargaining framework in the spirit of Becker et al. (1977) to study this question. We suppose that marriages are subject to "shocks" (or quality

[3]It is assumed that p is smaller than w_M and w_F.

realizations) some time after the wedding. We assume that there is no commitment to a particular household allocation of goods or surplus once the marriage begins; rather it can be bargained over at any time. Individuals may encounter potential partners whether or not they are married (offers by such potential partners constitute the "outside options" that affect intrahousehold bargaining). The main departure from the Becker et al. framework is that we do not assume fully transferable utility, but rather make the degree of transferability dependent on the availability to the couple of suitable instruments (such as cash) for surplus transfer. Thus working women can transfer utility easily to the husbands, while non working women cannot. Finally, we take the degree of female labor force participation to be the exogenous parameter.

Using these ingredients, we compute aggregate rates of divorce as a function of FLFP under two forms of divorce law, *unilateral* and *consent*. The former allows a divorce if one partner decides to leave the marriage. The other requires mutual consent of both partners. The model is therefore useful as well for testing some of the conjectures about divorce law that have appeared in the literature.

In the fully transferable world of Becker et al., it doesn't matter which law is in force. Divorce occurs if and only if the spouse who has met someone else generates higher surplus with him/her than s/he does with her/his current partner. Thus when all women work, the divorce law is irrelevant.

Not so when some women don't work: then there is no longer transferable utility, in particular for the couple with a nonworking wife, and the classical Coasian logic breaks down. Under unilateral divorce, there will be both inefficient divorces, as husbands of nonworking women are easily wooed away by working women who can easily outbid the nonworking wife, even if the total surplus of the original marriage is high, and inefficient failures to divorce, as working married women outbid nonworking single women who propose to their husbands, even though the total surplus that would be created if husbands were to leave their working wives and marry nonworking women may be large. Under consent law, there will be *too little* divorce, as working women in low quality marriages can still outbid the offers of single nonworking women who might nevertheless generate higher total surplus with the husbands. The logic of whether or not a divorce occurs is similar to the logic of auctions with liquidity constrained bidders (Che and Gale, 1998). A married and a single or another married woman bid for the right to marry the husband of the former woman. A nonworking woman is financially constrained relative to a working woman and is therefore disadvantaged relative to a working woman. Consequently, a married working woman may be able to inefficiently retain her husband in the face of a proposal from a nonworking woman, and a married nonworking woman may not be able to match the offer made to her husband by a single working woman, which would result in inefficient divorce.

Most important, under either form of law, there is an inverted U relationship between FLFP and the rate of divorce. When initially FLFP is low, increase in FLFP lead to increases in the divorce rate, just as earlier studies have suggested. But there is a turning point, above which further increases in FLFP lead to *declines* in divorce. The model therefore accords well with the evidence presented in Figures 1 and 2.

2. Model

Consider an economy with a measure one of males and a measure one of females. There is one type of male and two types of female: working and non working. The proportion of working females is denoted ω. The (working) male has a per period income of 2. A working female also has a per period income of 2. A non working female has a per period income of 0, but she engages in home production in which she produces one unit of a "local" public good in every period that has a value of 1. If the non working female is single, then she alone consumes this local public good. If, however, the non working female is married, then both she and her husband may each consume this public good.

In addition, every married couple produces one unit of another local public good in every period. If the marriage is good, then the value of this other public good is 2.5 for the husband and wife. If the marriage is bad (mediocre?), then the value of this other public good is 1.5 for the husband and wife. Each marriage is equally likely to be good or bad ex-ante, independently of whether the female is working or not, and of the partners' history. Whether a marriage is good or bad is discovered at the end of the first period after the husband and wife marry.[4]

In every period, each male individual dies with probability δ and is replaced by another male individual.[5] The wife of a male who dies becomes single. Females do not die. The parameter δ may also be interpreted as the probability that the husband and wife "become sick of each other" to such an extent that they prefer to become single than to remain married to each other. Our results do not depend on which interpretation is adopted. However, if the latter interpretation is adopted, then the rate of divorce would be higher by a constant δ.

Importantly, we assume that each married couple can share the *income* generated by the husband and wife any way it likes, but that the *intangible benefits* that are generated by the public goods are non transferrable.

This assumption implies that the utility frontier of a good marriage with a working female is given by

$$\{(6.5 - x, 2.5 + x) : x \in [0, 4]\}$$

for the male and female, respectively. Similarly, the utility frontier of a bad marriage with a working female, of a good marriage with a non working female, and of a bad marriage with a non working female are given by

$$\{(5.5 - x, 1.5 + x) : x \in [0, 4]\}$$

[4]The assumption that wages and the two public goods have specific numerical values greatly simplifes the analysis without qualitatively affecting our conclusions.

[5]The parameter δ is needed in order to ensure the existence of a non trivial steady state.

$$\{(5.5 - x, 3.5 + x) : x \in [0, 2]\}$$

and

$$\{(4.5 - x, 2.5 + x) : x \in [0, 2]\}$$

for the male and female, respectively.

Because an individual would never agree to be married if the utility it gets is lower than the utility it get when it is single, for our purposes, the relevant part of this utility frontier is where the utilities of the male and female are larger than or equal to their utilities as singles. That is, if we put on the axis the additional utility to the male and female relative to being single in a marriage with a working female, we get the following frontier:

$$\{(4.5 - x, .5 + x) : x \in [0, 4]\}$$

for the male and female in a good marriage with a working female, respectively. The relative payoffs in a bad marriage with a working female, in a good marriage with a non working female, and in a bad marriage with a non working female are given by

$$\{(3 - x, x) : x \in [0, 3]\}$$

$$\{(3.5 - x, 2.5 + x) : x \in [0, 2]\}$$

and

$$\{(2.5 - x, 1.5 + x) : x \in [0, 2]\}$$

for the male and female, respectively.

Suppose that every period every male is randomly matched with a female with a small probability $\lambda > 0$. A matched couple might decide to divorce their current spouses, if any, and marry each other. Whether or not they would do it depends on whether or not the female is working, and on the divorce rule as explained below.

Throughout the analysis we assume that ties are resolved in favor of marriage versus being single, and in favor of an existing marriage versus separation and a possibly new marriage.

We describe how the each of the four types of marriage (a good marriage with a working female; a bad marriage with a working female; a good marriage with a nonworking female; a bad marriage with a nonworking female) handles a match between one of the spouses and someone else under a regime of unilateral and consent divorce. Note that single males and females would agree to marry anyone who is matched with them.

2.1. Unilateral Divorce

Under a regime of unilateral divorce, either spouse may initiate a divorce. No cause is required and no compensation needs to be paid to the abandoned spouse. We assume that if a newly matched couple can find a way to share its income in such a way that both the matched male and female prefer to leave their current spouses, if any, and marry each other, *given any redistribution of income that their current spouses may propose in order to sustain* *their marriages*, then the newly matched couple would each divorce its spouse, and marry its matched partner.[6]

2.1.1. A Good Marriage with a Working Female

Our assumptions imply that a good marriage with a working female is stable. The male would not want to leave his wife for another female, because the maximum expected payoff that such a female could offer him is 6,[7] which is smaller than the payoff of 6.5 which his current wife would be willing to offer in order to sustain the marriage. Similarly, the female would not want to leave her husband for another male, because the maximum expected payoff that such a male could offer her is 6,[8] which is smaller than the 6.5 which her current husband would be willing to offer in order to sustain the marriage.

2.1.2. A Bad Marriage with a Working Female

A male in a bad marriage with a working female would divorce his wife if and only if he is matched with a single working female. Such a female would be able to offer him a maximum expected payoff of 6 per period,[9] which is larger than the payoff of 5[10] which is the most that his current wife would be able to offer in order to sustain the marriage. And, a single working female would be happy to pay as much to be able to marry. The analysis above implies that a working female in a good marriage would decline to marry such a male, and so would a working female in a bad marriage, because her husband would be willing to increase her payoff to 5 to keep her from leaving him, which implies that she in turn would be willing to offer the male a maximum payoff of 2, which in turn is smaller than the 5 that his wife would be willing to give him. Such a male would not leave his wife for a single non working female, because the maximum payoff such a female could give him is 5, which, again, is equal to the 5 his wife would be willing to give him to sustain their marriage. It therefore follows that such a male would not leave his wife for married non working females either. They would not be able to offer him a higher payoff, and, moreover, their husbands would be willing to pay to sustain their own marriages.

[6] We thus assume that if both the husband and wife are matched in the same period, then they decide whether to divorce and remarry sequentially, rather than simultanously. That would be the case if, for example, the matches occur throughout the duration of the period, and the husband and wife are matched at different times in the same period.

[7] The expected value of the public good is 2, his own income is 2, and a working female would be willing to pay up to 2 of her own income. The expected payoff from marrying a non working female is lower: the expected value of the public good is 2 and own income is 2 as above, but a non working female generates an additional public good that is only worth 1.

[8] The expected value of the public good is 2, her own income is 2, and a male would be willing to pay up to 2 of his own income.

[9] The expected value of the public good is 2, his own income is 2, and a working female would be willing give up her entire income of 2 to become married.

[10] The value of the public good is 1.5, his own income is 2, and a working female would be willing to pay up to 1.5 of her own income to sustain the marriage.

A working female in a bad marriage would divorce her husband if and only if she is matched with a single male. Such a male would be able to offer her a maximum expected payoff of 6 per period, which is larger than the 5[11] which is the most that her current husband would be able to offer in order to sustain the marriage. And, a single male would be happy to pay as much to be able to marry. The analysis above implies that a male in a good marriage with a working female would decline to marry such a female, and so would a male a bad marriage with a working female, because his wife would be willing to increase his per period payoff up to 5 to keep him from leaving her, which implies that he in turn would be willing to offer the female a maximum payoff of 2, which would be easy for her husband to match. Such a female would not leave her husband for a male who is in a bad marriage with a non working female, because such a male would demand an expected payoff of at least 4.5 per period,[12] which would leave the female with an expected payoff of 3.5 or less, which is less than the payoff of 5 that her husband is willing to give her to sustain their marriage. It follows that such a female would not leave her husband for a male who is in a good marriage with a non working female either, because such a male would require an even higher expected per period payoff to divorce his current wife.

2.1.3. A Good Marriage with a Nonworking Female

A male in a good marriage with a nonworking female would divorce his wife if and only if he is matched with a single working female. Such a female would be able to offer him a maximum expected payoff of 6 per period,[13] which is larger than the payoff of 5.5 per period[14] which is the most that his current wife would be able to offer in order to sustain the marriage. And, a single working female would be happy to pay as much to be able to marry. The analysis above implies that a married working female would decline to marry such a male. And, such a male would not leave his wife for a nonworking female, because the maximum payoff such a female could give him is 5, which is less than the 5.5 that his own wife would be willing to give him to sustain their marriage.

A nonworking female in a good marriage never divorces her husband. The maximum payoff that another male would be able to offer her is 5 per period,[15] which is smaller than the payoff of 5.5[16] which is the most that her current husband would be willing to give her

[11] The value of the public good is 1.5, her own income is 2, and her husband would be willing to pay up to 1.5 of his own income (he would not be willing to pay more because he can get a payoff of 2 as a single male).

[12] His own income is 2, the public good is worth 1.5, and the public good produced by his wife is worth 1.

[13] The expected value of the public good is 2, his own income is 2, and a working female would be willing to pay up to 2 per period to marry him.

[14] The value of the public good is 2.5, his own income is 2, and the public good that is produced by his wife is worth 1 per period.

[15] The expected value of the public good is 2, the value of the public good she produces is 1, and a male would be willing to pay up to 2 to marry her.

[16] The value of the public good is 2.5, the value of the public good she produces is 1, and her husband would be willing to pay up to 2 to sustain their marriage.

in order to sustain the marriage.

2.1.4. A Bad Marriage with a Nonworking Female

A male in a bad marriage with a nonworking female would divorce his wife if and only if he is matched with a single female, working or not. A single nonworking female would be able to offer such a male a maximum expected payoff of 5 per period, which is larger than the payoff of 4.5[17] which is the most that his current wife would be able to offer in order to sustain the marriage. A single working female would be able to such a male a maximum expected payoff of 6 per period, which is even larger.

The analysis above implies that a married working female would not divorce her husband for such a male, and neither would a nonworking married female in a good marriage. The husband of a nonworking female in a bad marriage would be willing to increase his wife's per period payoff to 4.5[18] to sustain his marriage. This implies that the maximum expected payoff the male can get if he marries such a female is 3.5[19], which is less than the maximum payoff of 4.5 which he can get by staying married to his wife.

Finally, a nonworking female in a bad marriage divorces her husband if and only if she is matched with a single male. The maximum payoff that a single male would be able to offer her is 5 per period,[20] which is larger than the maximum payoff that her husband would be willing to give her to sustain the marriage, which is 4.5.[21] The analysis above implies that no other male would want to leave his wife for such a female.

2.1.5. Unilateral Divorce: Summary

We summarize all this information in the following two tables:[22]

marriage\male is matched with female from	WG	WB	WS	NG	NB	NS
good, working	–	–	–	–	–	–
bad, working	–	–	x$^{\checkmark}$	–	–	–$^{\times}$
good, non working	–	–	x$^{\times}$	–	–	–
bad, non working	–	–	x^{-}	–	–	x$^{\checkmark}$

[17] The value of the public good is 1.5, the value of the public good that is produced by his wife is 1, and his own income is 2. His wife has no income she can transfer to him to sustain the marriage.

[18] Such a wife gets 1.5 from the public good, an additional 1 from the public good she produces, and her husband is willing and able to pay 2 more to sustain the marriage.

[19] The expected value of the public good is 2, the public good produced by the wife is worth 1, and his income is 2. But he would need to pay 1.5 of his income to his new wife to ensure she has a payoff of 4.5, which would leave him with 3.5.

[20] The expected value of the public good is 2, the value of the public good she produces is 1, and a male would be willing to pay up to 2 of his own income to marry her.

[21] The value of the public good is 1.5, the value of the public good she produces is another 1, and her husband would be able to pay up to 2 to sustain his marriage.

[22] Observe that the single "x" in the table for females is consistent with the fact that "working females expect more of their husbands" or "are quicker to leave their husbands" which is consistent with the date reported by sociologists.

Table 1: likelihood of divorce when a married male is matched with another female under unilateral divorce

marriage\female is matched with male from	WG	WB	NG	NB	S
good, working	–	–	–	–	–
bad, working	–	–	–	–	x$^{\checkmark}$
good, non working	–	–	–	–	–
bad, non working	–	–	–	–	x$^{\checkmark}$

Table 2: likelihood of divorce when a married female is matched with another male under unilateral divorce

Observe that a match between two married people never leads to a divorce, only matches with single males or females do.

Another important observation is that, with one exception, unilateral divorce generates more divorces relative to what is efficient: If a match implies that divorce is efficient, then it always occurs. And, in addition, sometimes inefficient divorces may also occur. In particular, in the two tables above, the divorces that are marked by a check mark are efficient, those that are marked by a cross are inefficient, and those that are marked by a hyphen are neutral. For example, the divorce that occurs when a male who has a good marriage with a non working female leaves his wife for a single working female is inefficient because the expected total value of the marriage decreases by 1, and the male is barred from consuming the public good that is produced by his former wife, which reduces efficiency by one unit more. The divorce that occurs when a male who has a bad marriage with a non working female leaves his wife for a single working female is neutral because the total expected value of the marriage increases by 1, but the male is barred from consuming the public good that is produced by his former wife, which reduces efficiency by one unit.

The exception to the rule above is that a male in a bad marriage to a working female who is matched with a single non working female should divorce his wife to increase total surplus but does not. The reason for that is that his working wife's income gives her enough financial flexibility to sustain her marriage against what is an efficiency enhancing separation.

Observe also that divorce is always efficient when the female is working. It may be inefficient when the female is not working because in this case, the female's ability to compensate her husband is compromised, and so the logic of the Coase Theorem fails. As we show below, this observation holds true also under consent divorce.

3. Steady-State Analysis

Before we proceed, we point out that inspection of the divorce tables under unilateral and consent divorce reveals that:

1. when $\omega = 0$ (no female is working) the rate of divorce under consent divorce is lower than under unilateral divorce.

2. when $\omega = 1$ (all females are working) the rate of divorce is equal under consent and unilateral divorce.

3. for $\omega \in (0, 1)$ (the proportion of working females is strictly between 0 and 1) the rate of divorce is strictly lower under consent compared to unilateral divorce, but the two rates of divorce converge to each other as ω tends to 1.

In the Appendix we demonstrate that in steady state there is in fact an inverted-U relation between the FLFP ω and the divorce rate. The intuition is that at low levels of FLFP, introducing a small number of working women destabilizes the nonworking women's marriages (the working women are unlikely to meet men already married to working women, so the fact their marriages are more stable has little effect), thereby raising the divorce rate. At high levels of FLFP, adding more working women increases the average stability of marriages, while the destabilizing effect on nonworking women's marriages is second order, and the divorce rate falls.

The model therefore delivers a causal relation from FLFP to divorce rate – but a non-monotonic one. According to the model, in the early years of womens' entry into the labor force, one could expect to see a rising divorce rate. Eventually, as FLFP rises enough – and evidently in the US at least, that point has been passed in recent years – divorce rates decline.

4. Discussion

Similar conclusions can be reached if instead we assume that the law is consent divorce. When all women are working, the Coasian conclusion that the divorce law doesn't matter holds true, simply because the Coasian assumption of universal transferable utility is satisfied. For levels of ω below 1, however, the divorce rate is indeed lower than it would be under unilateral divorce. The reason is that the marriages in general are harder to destabilize, simply because non working women cannot offer enough to make it worthwhile to compensate their wives in case of divorce. The difference in divorce rate is largest at $\omega = 0$, and declines as ω approaches 1.

This suggests a possible efficiency explanation for the nearly universal switch in US state divorce laws from consent to unilateral that began in the early 1970s. The point has been made that consent divorce is transactionally very costly, while unilateral divorce is much less so. The analysis above implies that when FLFP rises enough, divorce rates are little affected by which form of divorce law is in place, and it become efficient to avoid the transaction costs of consent divorce and impose unilateral divorce law instead.

5. Appendix

5.1. Steady State Analysis under Unilateral Divorce

Denote the measure or fraction of working females in good marriages in period t, working females in bad marriages in period t, single working females in period t, non working females in good marriages in period t, non working females in bad marriages in period t, and single non working females in period t, by μ_t^{WG}, μ_t^{WB}, μ_t^{WS}, μ_t^{NG}, μ_t^{NB} and μ_t^{NS}, respectively. Observe that the measure or fraction of males in good marriages with working females in period t, males in bad marriages with working females in period t, males in good marriages with non working females in period t, males in bad marriages with non working females in period t, and single males in period t, is given by μ_t^{WG}, μ_t^{WB}, μ_t^{NG}, μ_t^{NB} and $\mu_t^{WS} + \mu_t^{NS}$, respectively.

We are interested in economies that are in a steady-state, where the fractions $\left(\mu_t^{WG}, \mu_t^{WB}, \mu_t^{WS}, \mu_t^{NG}, \mu_t^{NB}, \mu_t^{NS}\right)$ do not change over time. As will become clear from our calculation below, for an economy that is characterized by the parameters δ, λ, and a proportion of working females ω, there exists a unique steady-state distribution $\left(\mu^{WG}, \mu^{WB}, \mu^{WS}, \mu^{NG}, \mu^{NB}, \mu^{NS}\right)$. Let $\mu^S \equiv \mu^{WS} + \mu^{NS}$ denote the proportion of single females or single males in steady state, and let $\mu^{MW} \equiv \mu^{WG} + \mu^{WB}$ and $\mu^{MN} \equiv \mu^{NG} + \mu^{NB}$ denote the proportion of married working and married nonworking females, respectively.

Given a steady-state distribution $\left(\mu^{WG}, \mu^{WB}, \mu^{WS}, \mu^{NG}, \mu^{NB}, \mu^{NS}\right)$, and the likelihood of divorce described in Tables 1 and 2, the rate of divorce is given by[23]

$$\begin{aligned}\rho_D &= \frac{\lambda(1-\delta)\left(\mu^{WB}+\mu^{NM}\right)\mu^{WS}+\lambda(1-\delta)\mu^{NB}\mu^{NS}+\lambda(1-\delta)\left(\mu^{WB}+\mu^{NB}\right)\mu^{S}}{\mu^{MW}+\mu^{MN}} \\ &\quad -\frac{\lambda^2(1-\delta)^2\left(\mu^{WB}\right)^2\mu^{WS}\mu^{S}+\lambda^2(1-\delta)^2\left(\mu^{NB}\right)^2\left(\mu^{S}\right)^2}{\mu^{MW}+\mu^{MN}}\end{aligned}$$

The first three terms describe the rates of divorce that follow from a match with a single working female, a single non working female, and a single male, respectively. The fourth and fifth terms are there to avoid the double counting of couples who divorce because *both* the husband and wife leave their spouses for a new one.

We solve for the steady-state distribution $\left(\mu^{WG}, \mu^{WB}, \mu^{WS}, \mu^{NG}, \mu^{NB}, \mu^{NS}\right)$ by solving the "flow equations" into and out of the steady-state as follows. In a steady-state, the "rate of entry" into being a single working and a single nonworking female has to be equal to the "rate of exit," respectively, Tables 1 and 2 therefore imply that the following two equations

[23] Couples with males who would have divorced their wives but have died or with females who would have divorced their husbands if they didn't die are not counted as divorced couples.

If δ is interpreted as a probability that the marriage becomes so bad that it lead to immediate divorce, then the rate of divorce is higher by δ.

have to be satisfied:

$$\begin{aligned} \delta\mu^{MW} &= \lambda(1-\delta)\mu^{MN}\mu^{WS}+\lambda(1-\delta)\left(\mu^{WS}+\mu^{NS}\right)\mu^{WS} && (1) \\ \delta\mu^{MN}+\lambda(1-\delta)\mu^{MN}\mu^{WS} &= \lambda(1-\delta)\left(\mu^{WS}+\mu^{NS}\right)\mu^{NS} && (2) \end{aligned}$$

where

$$\begin{aligned} \mu^{MW}+\mu^{WS} &= \omega && (3) \\ \mu^{MN}+\mu^{NS} &= 1-\omega && (4) \end{aligned}$$

Together, equations (1) and (2) imply

$$\delta\left(\mu^{MW}+\mu^{MN}\right)=\lambda(1-\delta)\left(\mu^{WS}+\mu^{NS}\right)^2. \quad (5)$$

Because

$$\mu^{MW}+\mu^{MN}+\mu^{WS}+\mu^{NS}=1,$$

$\mu^{MW}+\mu^{MN}=1-\mu^S$, and so we can solve (5) for the the value of μ^S as follows:[24]

$$\mu^S(\lambda,\delta)=\frac{\sqrt{\delta^2+4\lambda\delta(1-\delta)}-\delta}{2\lambda(1-\delta)}$$

Observe that $\mu^S(\lambda,\delta)$ does not depend on ω.

>From (2), we can express μ^{WS} in terms of μ^S, μ^{NS}, and μ^{MN} as follows:

$$\mu^{WS}=\frac{\lambda(1-\delta)\mu^S\mu^{NS}-\delta\mu^{MN}}{\lambda(1-\delta)\mu^{MN}} \quad (6)$$

Plug (3) into (1) and rearrange to express μ^{WS} in terms μ^S, μ^{MN}, and ω as follows:

$$\mu^{WS}=\frac{\delta\omega}{\delta+\lambda(1-\delta)\mu^{MN}+\lambda(1-\delta)\mu^S} \quad (7)$$

[24] The quadratic equation has two solutions, one of which is irrelevant. Observe that

$$\begin{aligned} \mu^S(\lambda,0) &= 0 \\ \mu^S(\lambda,1) &= 1 \\ \mu^S(\lambda,\delta) &\geq \delta \quad \forall\delta,\lambda\in[0,1] \end{aligned}$$

because

$$\begin{aligned} \frac{\sqrt{\delta^2+4\lambda\delta(1-\delta)}-\delta}{2\lambda(1-\delta)} &\geq \delta \\ \sqrt{\delta^2+4\lambda\delta(1-\delta)} &\geq \delta(1+2\lambda(1-\delta)) \\ \delta^2+4\lambda\delta(1-\delta) &\geq \delta^2(1+2\lambda(1-\delta))^2 \\ \delta^2+4\lambda\delta(1-\delta) &\geq \delta^2\left(1+4\lambda^2(1-\delta)^2+4\lambda(1-\delta)\right) \\ 4\lambda\delta(1-\delta)(1-\delta-\lambda(1-\delta)\delta) &\geq 0 \end{aligned}$$

which holds because $1\geq\delta+(1-\delta)\lambda\delta$.

By plugging (4) into (6) and (7), we can combine equations (6) and (7) into equation (8) that relates μ^{MN} to ω as follows:

$$\frac{\delta\omega}{\delta+\lambda(1-\delta)\mu^{MN}+\lambda(1-\delta)\mu^{S}}=\frac{\lambda(1-\delta)\mu^{S}\left(1-\omega-\mu^{MN}\right)-\delta\mu^{MN}}{\lambda(1-\delta)\mu^{MN}} \tag{8}$$

Letting $K\equiv\delta+\lambda(1-\delta)\mu^{S}$, equation (8) can be rewritten as:

$$\delta\omega\lambda(1-\delta)\mu^{MN}-\left(\lambda(1-\delta)\mu^{S}(1-\omega)-K\mu^{MN}\right)\left(K+\lambda(1-\delta)\mu^{MN}\right)=0$$

or

$$K\lambda(1-\delta)\left(\mu^{MN}\right)^{2}+\left(K^{2}+\delta\omega\lambda(1-\delta)-\lambda^{2}(1-\delta)^{2}\mu^{S}(1-\omega)\right)\mu^{MN}-\lambda(1-\delta)\mu^{S}K(1-\omega)=0$$

It therefore follows that:

$$\begin{aligned}\mu^{MN} &= \frac{-K^{2}-\delta\omega\lambda(1-\delta)+\lambda^{2}(1-\delta)^{2}\mu^{S}(1-\omega)}{2K\lambda(1-\delta)} \\ &\quad+\frac{\sqrt{\left(K^{2}+\delta\omega\lambda(1-\delta)-\lambda^{2}(1-\delta)^{2}\mu^{S}(1-\omega)\right)^{2}+4K^{2}\lambda^{2}(1-\delta)^{2}\mu^{S}(1-\omega)}}{2K\lambda(1-\delta)}\end{aligned} \tag{9}$$

Once we solve for μ^{MN} in terms of ω, λ, and δ, we can use (4) to solve for μ^{NS} in terms of ω, λ, and δ, and use the fact that $\mu^{MW}=1-\mu^{S}-\mu^{MN}$ together with (3) to solve for both μ^{MW} and μ^{WS} in terms of ω, λ, and δ.

In a steady-state, the "rate of entry" into being a working female in a good marriage has to be equal to the "rate of exit," which implies that the following equation has to be satisfied:

$$\delta\mu^{WG}=\frac{\lambda(1-\delta)}{2}\left(\mu^{WB}+\mu^{MN}\right)\mu^{WS}+\frac{\lambda(1-\delta)}{2}\mu^{WB}\mu^{S}+\frac{\lambda(1-\delta)}{2}\mu^{S}\mu^{WS} \tag{10}$$

Exits are by death only, entrants are a consequence of (i) matches between males in bad marriages with working females or males who are married to nonworking females and single working females, (ii) working females in bad marriages and single males, and (iii) matches between single males and single working females.

Since we already solved for μ^{MN}, μ^{NS}, μ^{MW}, and μ^{WS} in terms of ω, λ, and δ, by plugging $\mu^{WG}=\omega-\mu^{WS}-\mu^{WB}$ from (3) into (10), we can solve for μ^{WB} as a function of ω, λ, and δ as follows:

$$\delta\left(\omega-\mu^{WS}-\mu^{WB}\right)=\frac{\lambda(1-\delta)}{2}\left(\mu^{WB}+\mu^{MN}\right)\mu^{WS}+\frac{\lambda(1-\delta)}{2}\mu^{WB}\mu^{S}+\frac{\lambda(1-\delta)}{2}\mu^{S}\mu^{WS} \tag{11}$$

Finally, in a steady-state, the "rate of entry" into being a nonworking female in a good marriage has to be equal to the "rate of exit," which implies that the following equation has to be satisfied:

$$\delta\mu^{NG}+\lambda(1-\delta)\mu^{NG}\mu^{WS}=\frac{\lambda(1-\delta)}{2}\mu^{NB}\mu^{NS}+\frac{\lambda(1-\delta)}{2}\mu^{NB}\left(\mu^{WS}+\mu^{NS}\right)+\frac{\lambda(1-\delta)}{2}\mu^{S}\mu^{NS} \tag{12}$$

Exits are by death and by a match with a single working female, entrants are a consequence of (i) matches between males in bad marriages with nonworking females and single nonworking females, (ii) nonworking females in bad marriages and single males.

Since we already solved for μ^{MN}, μ^{NS}, μ^{MW}, and μ^{WS} in terms of ω, λ, and δ, by plugging $\mu^{NG} = 1 - \omega - \mu^{NS} - \mu^{NB}$ from (4) into (12) we can solve for μ^{NB} as a function of ω, λ, and δ as follows:

$$\begin{aligned}&\left(\delta + \lambda\left(1-\delta\right)\mu^{WS}\right)\left(1-\omega-\mu^{NS}-\mu^{NB}\right)\\&\quad = \frac{\lambda\left(1-\delta\right)}{2}\mu^{NB}\mu^{NS} + \frac{\lambda\left(1-\delta\right)}{2}\mu^{NB}\left(\mu^{WS}+\mu^{NS}\right) + \frac{\lambda\left(1-\delta\right)}{2}\mu^{S}\mu^{NS}\end{aligned} \tag{13}$$

We are now done – we can express the steady-state $\left(\mu^{WG}, \mu^{WB}, \mu^{WS}, \mu^{NG}, \mu^{NB}, \mu^{NS}\right)$ and therefore also the rate of divorce as a function of ω, λ, and δ. Plotting the rate of divorce as a function of the proportion of working females reveals that it has an inverse-U shape: initially, the rate of divorce increases with ω, but from a certain point onwards, it decreases with ω. Furthermore, careful inspection of Tables 1 and 2 reveals that the rate of divorce when no female is working ($\omega = 0$) is equal to the rate of divorce when all females are working ($\omega = 1$).

Lemma 5.1. *The rates of divorce when all females work ($\omega = 1$) and when none do ($\omega = 0$) are identical.*

Proof. If all females work, then a match leads to a divorce if and only if it is between a married male in a bad marriage and a single female, or between a married female in a bad marriage and a single male. If all females are nonworking, then a match leads to a divorce if and only if it is between a married male in a bad marriage and a single female, or between a married female in a bad marriage and a single male. Thus, the type of matches that lead to divorce when females are working and not working is the same, which implies that the rate of divorce should be the same too. ■

Given the calculation above, we can plot the rate of divorce as a function of ω or FLFP for any values of λ and δ. It is readily verified that the relationship has an inverse U shape, albeit numerically rather than analytically.

5.2. Consent Divorce

Under consent divorce, divorce may occur only if both the husband and wife agree to it. This implies that the party that wants the divorce may need to compensate the other party in order to obtain its agreement for divorce. To simplify the discussion, and to make it analytically tractable, we assume that a married male or female would consent to divorce if it is paid enough so that its payoff after the divorce is the same as its payoff if it remains married.

We describe how the each of the four types of marriage handles a match between one of the spouses and someone else under a regime of consent divorce below.

5.2.1. A Good Marriage with a Working Female

Because a good marriage with a working female is the type of marriage that maximizes the joint surplus of the married couple over all four types of marriages, such a married is stable.

5.2.2. A Bad Marriage with a Working Female

Such a marriage ends in divorce if and only if the male is matched with a single working female. Observe that because divorce and marriage of the male with a single working female increases total surplus, a single working female is able to offer the male in a bad marriage with a working female a distribution of payoff that Pareto dominates the current distribution of payoffs. A married working female cannot do it because it decreases total surplus.

Denote the payoff to the male in a bad marriage with a working female by $x \in [1.5, 5.5]$. The payoff of the female is $7 - x$. In order to be able to lure the male out of his marriage, a single non working female has to offer him a payoff that is larger than $x + (7 - x - 2) = 5$.[25] However, although the expected joint surplus that would be generated if a single non working female marries the male is $8 > 5$, because the non working single female cannot transfer any income to the male, his expected payoff upon marriage to such a female would be at most only 5. Because of this, a match with a married non working female would not dissolve the marriage either since they would be able to pay even less to attract the male to marry them (or alternatively, the male would have to pay them to induce them to leave their husbands for him).

A working female in a bad marriage divorces her husband if and only if she is matched with a single male. Because divorce and marriage of the female with a single male increases total surplus, the male is able to offer the working female in a bad marriage a distribution of payoffs that Pareto dominates the current distribution of payoffs. A married male cannot do it because it has to compensate his wife to be able to divorce her.

5.2.3. A Good Marriage with a Nonworking Female

Denote the payoff to the male in a good marriage to a non working female by $x \in [3.5, 5.5]$, and the payoff to the female by $9 - x$. For the male to agree to leave his wife, he has to be offered more than $x + (9 - x - 1) = 8$.[26] No female, not even a single working female would offer so much.

For the female to agree to leave her husband, she has to be offered more than $(9 - x) + x - 2 = 7$. The maximum that any male would be willing to offer is $8 - 2 = 6$.

[25] It is $x + (7 - x - 2)$ because the payoff to the male is x, and the compensation to the female has to be at least $7 - x - 2$. The -2 is due to the fact that the working female earns an income of 2 on her own.

[26] It is $x + (9 - x - 1)$ because the payoff to the male is x, and the compensation to the female has to be at least $9 - x - 1$. The -1 is due to the fact that the non working female produces a public good that is worth 1 on her own.

5.2.4. A Bad Marriage with a Nonworking Female

Denote the payoff to the male in a bad marriage to a non working female by $x \in [2.5, 4.5]$, and the payoff to the female by $7 - x$. For the male to agree to leave his wife, he has to be offered more than $x + (7 - x - 1) = 6$. Although the expected joint surplus that would be generated if a single female marries the male is $8 > 6$, because the maximum payoff that a working single female would be willing to give the male is 6, the marriage would not be dissolved. A non working female, and married females would be willing to offer the male even less.

For the female to agree to leave her husband, she has to be offered more than $(7 - x) + x - 2 = 5$. The maximum that any male would be willing to offer is $8 - 2 = 6$. It therefore follows that a match of the female with a single male would dissolve the marriage. A match with a married male would not because such a male would be willing to offer less than 5 because it need to compensate his wife to be able to leave her.

5.2.5. Consent Divorce: Summary

We summarize all this information in the following two tables:[27]

marriage\male is matched with female from	WG	WB	WS	NG	NB	NS
good, working	–	–	–	–	–	–
bad, working	–	–	$\text{x}^{\checkmark}$	–	–	$–^{\times}$
good, non working	–	–	–	–	–	–
bad, non working	–	–	x^{-}	–	–	$\text{x}^{\checkmark}$

Table 3: likelihood of divorce when a married male is matched with another female under consent divorce

marriage\female is matched with male from	WG	WB	NG	NB	S
good, working	–	–	–	–	–
bad, working	–	–	–	–	$\text{x}^{\checkmark}$
good, non working	–	–	–	–	–
bad, non working	–	–	–	–	$\text{x}^{\checkmark}$

Table 4: likelihood of divorce when a married female is matched with another male under consent divorce

[27] Observe that the single "x" in the table for females is consistent with the fact that "working females expect more of their husbands" or "are quicker to leave their husbands" which is consistent with the date reported by sociologists.

Not surprisingly, inspection of the tables reveals that divorce is less prevalent under consent divorce compared to unilateral divorce. As shown in the table, divorce, when it happens, is efficient in the sense that it increases social surplus. However, sometimes a marriage that should be dissolved to increases social surplus does not end in divorce.

Proposition 1. *Consent divorce generates less divorces relative to what is efficient.*

Proof. The need to pay compensation ensures that a marriage cannot be dissolved unless this increases social surplus. Sometimes, the inability of the male or female to transfer enough resources to their intended wife or husband prevents efficient divorces from materializing. ■

5.3. Steady States under Consent Divorce

Steady-state analysis for the case of consent divorce is similar to the analysis for the case of unilateral divorce. Inspection of the differences between Tables 1 and 2 and 3 and 4 reveals that divorce is less prevalent under consent divorce than under unilateral divorce. Nevertheless, the rate of divorce under consent divorce when no female is working ($\omega = 0$) is equal to the rate of divorce under consent divorce when all females are working ($\omega = 1$), and to the rates of divorce under unilateral divorce when $\omega = 0$ and $\omega = 1$.

The rate of divorce as a function of ω or FLFP has an inverse U shape, for any values of λ and δ, as in the case of unilateral divorce.

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