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Bargaining on your Spouse: Coasean and non-Coasean Behaviour within Marriage

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***Bargaining on your Spouse:
Coasean and non-Coasean Behaviour within Marriage.***

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Abstract

Legal structures of divorce settlements are important in how marital division of labour impacts on divorce. They affect not only divorce welfare but also Coasean within-marriage allocations. We offer a new theoretical framework to empirically identify Coasean and non-Coasean behaviour. Whilst an increase in the spouse's wage always reduces (increases) non-Coasean labour supply (home production), observing an increase in both types of production indicates Coasean bargaining. Observing labour supply falls after a divorce will again indicate Coasean bargaining. We give a possible explanation for why males' preferences for stereotypical work division and the females emphasise on non-monetary work aspects persist.

Keywords: Marriage, Divorce, Coasean Bargains, non-Coasean behaviour.

JEL classifications: J12, J22, K3

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1. Introduction.

In the economics of marriage and divorce, a simple question has been asked: Do married couples engage in Coasean bargains that ensure efficiency, or are marriages characterised by non-Coasean behaviour where inefficient divorces may ensue? This matter stems from the substantial empirical literature investigating the effects of the change in divorce laws on divorce rates, that emerges from Becker (1973, 1974) and Becker et al. (1977) seminal discussion where it is argued the move to unilateral divorces should have no impact on divorce rates as long as there is Coasean bargaining between the marital partners. It is a line of research that has not resulted in a strict consensus, for whereas some papers argue the trend in divorce rates has remained unchanged others have taken the contrary stand.

Our paper will not directly seek to join either side of the divide over the impact of the introduction of unilateral divorce laws, but will instead contribute by opening a new front. An agnostic approach is adopted by investigating the Coasean and the non-Coasean cases in turn. Thus rather than presupposing either of the two regimes we investigate both cases to compare and contrast the case specific labour market and home production outcomes. As such new insight is gained providing testable predictions that has the potential to shed more light on the issue.

Whilst we find some similarities across the regimes there are also notable differences. So though in both cases divorce rates fall with increases in marital production abilities we also find major dissimilarities. Coasean married employment exceeds the non-Coasean equivalent employment. Under Coasean behaviour we find an increase in the spouse's wage encourages own labour supply and that it is sometimes possible for employment to be higher in marriage than divorce. Contrast this to our non-Coasean finding where increases in the spouse wage reduces own labour supply, and where non-Coasean divorced employment unambiguously exceeds married employment.

Legal frameworks, with their rules that characterise property rights within and out of marriage, play an important role in the time allocated to labour market and marital production activities. This is a largely under-exploited avenue of research. Thus this paper will also seek to add to our understanding of how the courts' division of marital income and assets in the event of a divorce interacts with a marital couple's behaviour within marriage and the potential decision to seek a divorce. We demonstrate how different sharing regimes produce different effects. With an increasing trend towards more equitable sharing of income in the event of a divorce we pay special attention to this regime without explicitly restricting other sharing arrangements.

We include a discussion on some related literature in the following section. Section 3 then includes a discussion on some of the legal framework underlying the post marital divorce division of wealth and why such considerations are important here. We proceed to outline the main aspects of the model in Section 4. We then solve the model in Section 5, whereas Section 6 offers a concluding statement.

2. The Paper in the Context of Related Literature.

The literature that investigates the effect of changes in divorce law can, as mentioned above, be subdivided into those papers that support Coasean behaviour and those who do not. Though Peters (1986, 1992) argues that the introduction of unilateral divorce laws in the US had no effect on the overall divorce rate, Allen (1992) and Friedberg (1998) for instance claim the opposite. Wolfers (2006) offers the view that the effect is only transitory. González and Viitanen (2009) conduct a European cross country study that reports significant effects of changes in divorce laws on divorce rates.

From theory it follows that marriages are governed by efficient Coasean bargains when marriage transactions are costless and without frictions. Non-Coasean behaviour and inefficient separations, on the other hand, can only occur when these frictionless conditions are violated.¹ Some papers in the non-Coasean tradition do not explicitly model the frictions. Such papers include Rasul (2005) who, by simply assuming the absence of Coasean bargains, argues that the change to unilateral divorce laws can cause those married to be better matched than those previously married under mutual consent divorce laws, and Matouschek and Rasul (2008) who argue marriage contracts are most typically drawn up for commitment reasons. Papers that explicitly model the process include Peters (1986), who argues that the frictionless assumptions of Coasean bargaining are violated when the individual shocks are privately observed. They also include Rainer (2007) who provides a contracting reason as well as Geddes and Lueck (2002) who argue the violation of Coase happens through the generation of transaction costs arising from hold-up associated with human capital investment.

One strand of ensuing literature from the seminal work of Becker, whose focus includes the division of labour and human capital acquisition and where gender differences arise for comparative advantage reasons, examines the incentives to partake

¹Though inefficiencies arise from the lack of Coasean trade within the marriage, sub-optimal outcomes can arise for at least two other reasons, pertaining to hold up and the externalities of getting married/divorced have on individuals other than the married couple. The first of these types of inefficiencies yields under-investments to the joint detriment of the couple later on, whereas the second type concerns either externalities affecting other family members or trading externalities imposed on the mating market should a couple decide to marry or divorce.

in investment within the marriage. This strand can for our purposes broadly be subdivided into two. On the one hand are the papers who do not consider divorce at all. Lundberg and Pollack (1993), for instance, present a convincing argument that the valid threat point in the marital bargain is not contained in divorce, but is instead found in the non-cooperative outcome within the marriage. Thus the outside option of divorce is of little interest in their model. On the other hand are the papers allowing divorces that arise when a common unavoidable exogenous shock to the marriage is sufficiently severe, but where it is critically assumed that no action is undertaken to soften the blow. This therefore implies that the divorce rates are characterised solely by the size of the exogenous shock. Such exogeneity issues arise for instance in Rainer (2007), who investigates the incentives of prenuptial agreements and includes a discussion of how the outcome is affected by different levels of divorce, but not how the choices made affect divorce rates. Another example is Lommerud (1989) who discusses how the risk of divorce may affect the division of labour within the marriage, but not vice versa. This paper will not investigate investments and differs further from this literature in another important respect: The Coasean part of our model also investigates the individuals' evading actions that may affect divorce rates. Thus the focus in the Coasean analysis is wider than the above literature where divorce rates are purely exogenous.

In addition, to our paper's comparative analysis of Coasean and non-Coasean behaviour, it distinguishes itself from the existing literature in at least two further respects. First it differs in its treatment of private and public goods. Most of the literature assumes that some goods are private, usually those derived in the labour market, whereas others are public, usually those derived in home/marriage production. We instead follow the assumption of Peters and Siow (2002) that goods whether produced at home or in the market are public,² though we also assume that leisure is private. Second, our paper is unique and novel in its division of time. We know of no other paper on marriage and divorce that splits time between market work, marriage work and leisure. In contrast to our approach, the literature invariably assumes that time spent in home/marriage production and leisure is one and the same. Not only is this a gross simplification, it is also a feature that may force a perfectly negative correlated co-movement between market work and home production. For, if time can only be spent by supplying labour to market or home production, it follows that time in marriage production must inevitably fall when there is a rise in the time spent in the labour market. Thus the tri-partition of time introduced in this paper is more than a trivial extension of the model, as it provides the means to which a positive correlation

² For a further discussion on public goods within families see Bergstrom (1997).

between production in the home and market sector is not automatically excluded. It is therefore quite possible not always to arrive at the conclusion, common in the comparative advantage literature, that marital survival is helped by a division of labour that specifies specialisation. Nor is a more equal division of labour where females have a great degree of financial independence necessarily detrimental to marital success. Without yielding definite answers, the paper sheds further light on the question of whether it is better for spouses to separate their tasks, so that one stays at home and the other works in the labour market, or whether the couple could improve their prospects by sharing the responsibility of home and market production more equally.

Finally, this paper is also linked to Browning and Chiappori (1998), and Chiappori, Fortin and Lacroix (2002), who have developed a “collective” framework for intrahousehold bilateral decision processes, that encompasses a range of collective bargaining and contracting models. Whereas the non-Coasean part of the model is less cooperative than that literature, the analysis offered in this paper can be viewed as more cooperative than the (non-cooperative) models of Chen and Wolley (2001), Konrad and Lommerud (2000), Lundberg and Pollak (1993, 1994), Vagstad (2001), who typically assume that some goods are private goods.³ Instead our paper assumes that all goods (apart from leisure) are public to the extent that they are shared equally amongst the spouses.

3. The Division of Income and Legal Rules.

Since property rights within marriage and divorce depend on the legal framework we include a brief discussion of some judicial traditions and recent prevailing trends in this section.

If s^i (s^{-i}) denotes the share of aggregate wealth an individual (her/his spouse) receives after a divorce, then an equitable division rule would imply; $s^i = s^{-i} = \frac{1}{2}$. Whilst this may seem a restrictive case it may in many instances be close to reality. Indeed in many judicial districts this legal practice is well established. Such legal jurisdictions include those that are governed by “Community of acquests” laws present in the US community property states,⁴ and European legislative authorities such as Scotland,⁵ see

³ Early work in that tradition includes Manser and Brown (1980), McElroy and Horney (1981).

⁴ The community property states in the US include Arizona, California, Idaho, New Mexico, Louisiana, Washington, Nevada, Texas, Wisconsin, and Alaska, where property acquired by either spouse while married automatically becomes joint property. All other US states other than the “Community of acquest” states (apart from Mississippi) are “equitable distribution states” and could at a push said to be close to the assumption of $s = \frac{1}{2}$ in that division in these states should at the least be fair, if not necessarily equal.

⁵ Note that law varies across the UK and therefore that Scotland’s legal system differs from that in England and Wales.

Smith (2000),⁶ where property accumulation during marriage is divided equally. Furthermore, it is equally germane in countries with “Universal Community” laws such as the Scandinavian countries where all property is assumed to be available for equal division. We also argue, with the support of Smith (2007), that limiting the study to this rule, $s^i = s^{-i} = 1/2$, is becoming less restrictive with time as such an application of family law is becoming increasingly widespread with changing social norms.

Common law countries with “Judicial discretion,” such as England, for instance, who traditionally awarded financial assistance fairly on account of future needs of spouses have seen recent moves toward equality in the division of marital surplus, see the House of Lord (2000) judgment. This ruling, which concerns the case *White vs. White*, made legal precedence for divorcing couples, deeming the contributions of the breadwinner and home maker equally valid and effectively deciding that equal sharing should become the default position: It states: “As a general guide, equality should be departed from only if, and to the extent that, there is good reason for doing so.”⁷ This was followed by a series of high profile cases in England, suggesting the preceding court ruling has had a marked effect. These include *Morgan vs. Morgan*, 2000 where the ex-wife became a member of the Sunday Times Rich List when she won a settlement of £100m after the couple divorced. In *Miller vs. Miller*, 2006 Alan, former husband of Melissa, unsuccessfully appealed against a £5m divorce settlement, saying his wife of three years had been given a “meal ticket for life”. In *Mcfarlane vs. Mcfarlane*, 2006 Julia, was awarded £250,000 a year and half of her ex-husband's £3m estate.

All these cases and several more indicate a move to more equitable sharing rules within divorce. How many more couples may practice equal sharing irrespective of legal structure is likely to be a reflection of social norms and is ultimately a matter for empirical verification. Though we do not restrict our model solely to the case of equitable sharing, we note equity of partners within and out of marriage seems ever more realistic and we will therefore in the following afford it special attention.

It is, despite the previous paragraphs, important to note that it may not be the share of wealth the parties receive within wedlock and in divorce that by itself is important, but rather how the share changes should the parties make the transition from marriage to divorce. In other words, our model, that has chosen a benchmark of

⁶ For an economic model which links divorce and legal structure see Clark (1999)

⁷ It should be noted that the legal matters in England surrounding the principle of equal sharing are considerably more complicated than a blanket equal sharing of marital assets and income. Indeed it is possible for the courts to award, on the grounds of several factors, the lower earning party in a divorce settlement less and also more than their equal share of property. These factors include wealth and age at the time of marriage, the accumulation during marriage, the length of marriage and needs based considerations. Nevertheless the principle of equal sharing following *White vs. White* prevails as the predominant principle.

equal within a marriage, could without loss of generality be extended to situations where the married spouses are attributed different shares when married. The driver of the results in that augmented model would then be whether or not the spouses receive the same share when divorced. It can therefore be argued that the special case in the model below of an equitable divorce division, $s^i=s^{-i}=1/2$, can effortlessly be extended to situations and legal regimes where the couple are given the same proportion of funds in divorce as in marriage, as seems to be the basis of more ‘traditional’ needs based divisions, such as in equitable distribution states.

4. The model.

We present a one period model of marriage where two married individuals i and $-i$ consider the pros and cons of staying in wedlock. We assume that marriages have previously been entered into voluntarily so that the ex ante expected value of marriage, EV_m^i , exceeds the value of a divorce V_d^i . However at the beginning of the period each individual receives marriage specific information, through the experience of a marriage specific independently distributed random idiosyncratic shock ϕ^i with an expected value of zero and an upper and a lower bound of ϕ^H and ϕ^L . Individual i 's ex post value of marriage, V_m^i , is therefore $V_m^i = EV_m^i + \phi^i$ and no longer guaranteed to exceed the value of a divorce. Thus when the shock has been revealed the individuals either separately or together consider whether they should continue the marriage or go down the divorce route. If the shocks are favourable the marriage survives, whereas if the shocks are bad enough they will result in a split, immediately triggering a divorce. The individual shock, whether good or bad, has a lasting effect on the individual if the couple remains married but is not felt if divorced. We assume individuals optimise either separately (non-Coasean) or jointly (Coasean) to maximise the value of marriage, whereas they individually maximise their individual values of divorce. Thus they trade off the (maximum) value of the marriage against the (maximum) value of a divorce.

A married individual divides her/his time between 1) time l_m^i spent in the labour market, 2) marital time m^i that might either be spent on physical marriage specific goods and services production or on intangibles such as attention and love,⁸ and

⁸ This is in the spirit of Parkman (2004), who discusses marital gifts that benefit a spouse. Such gifts may be physical in nature, manifested for instance through physical presents but also of a more psychological kind and include attention given, empathy, affection and communication in time spent together. Parkman shows that such gift exchanges are important factors that ensure a successful marriage and that divorcees report lower levels of such gift exchanges in their failed marriages than do those who continue to be married.

3) leisure time r_m^i , which is the only pure private good in this model. Total time is normalised to unity so that; $l_m^i + m^i + r_m^i = 1$. An additional hour spent in labour returns the wage rate, w^i , implying a take-home pay of: $w^i l_m^i$. The value of an additional hour of marriage specific production is reflected by the parameter A^i , which is a technological production factor that enhances marital production $A^i m^i$.⁹

Goods, whether produced in the market or at home, are common, public and divided equally amongst the spouses. Thus the individual specific monetary values within marriage derived from the labour market and marital specific production are given by $\frac{w^i l_m^i + w^{-i} l_m^{-i}}{2}$ and $\frac{A^i m^i + A^{-i} m^{-i}}{2}$ respectively. The spouses share identical, strictly concave utility functions, separable across market production, marital specific production and leisure, where the utility derived from market goods is u , the utility from marital specific production goods is υ and the utility from leisure is v . To reflect the disutility of work and marital production, the spouses each face costs associated with the two productive activities which are solely a function of their own time spent in that activity. We impose strict convexity of the cost functions $c_l^i(l_m^i)$ and $c_m^i(m^i)$ for market and marriage specific production respectively.

It follows that the net value, V_m^i within the marriage can be characterised by:

$$V_m^i = u\left(\frac{w^i l_m^i + w^{-i} l_m^{-i}}{2}\right) + \upsilon\left(\frac{A^i m^i + A^{-i} m^{-i}}{2}\right) + v(1 - l_m^i - m^i) - c_l^i(l_m^i) - c_m^i(m^i) + \varphi^i \quad (1)$$

In order to pin down the survival/divorce probabilities further, we need to consider each individual's outside divorce opportunity, V_d^i . No marriage specific production takes place after a divorce and the benefits from being productive in marriage are forever zero in the event of a marital breakdown.¹⁰ The same is not the case for labour market production. Marital production stems in other words from (marriage) specific human capital, whereas an individual's labour market income is derived from general (between marital states) human capital, which is perfectly transferable from marriage to divorce.

⁹ Though A_1 and w_1 are exogenous to the model and taken to reflect innate ability in performing the respective tasks, they may nevertheless be affected by pre-marriage investments; that is past human capital investments in both markets, accumulated through 1) the educational system, 2) past labour market experience and 3) past household/relationship activities.

¹⁰ We are therefore for example excluding the analysis of the impact of children, from whom in practice the divorcee of course may derive utility well beyond marriage.

In the event of a divorce, a court sets the exogenously determined share, s^i of the aggregate labour income a single individual receives, whilst the spouse's share is $s^{-i}=1-s^i$. With labour market income depending on how much is worked, we assume the courts can deduce the expected marital labour supply of both parties and therefore the expected income generated had the relationship lasted. In this way all assets and income streams can be valued and verified perfectly. Though this is a simplification, it can nevertheless be noted that divorce proceedings are often associated with significant court resources spent on the verification of the size of the assets held by the respective parties in a divorce.¹¹ We allow the divorcees' work to vary across marital states, so that individual i 's married and divorced labour supply are not necessarily the same. Finally, though the divorced individuals lose the consumption of the marriage specific good, they will in exchange gain some outside additional value H^i of being single. Thus the value, V_d^i , of the outside opportunity is given by:

$$V_d^i = u\left(s^i(w^i l_m^i + w^{-i} l_m^{-i}) + w^i(l_d^i - l_m^i)\right) + v(1 - l_d^i) - c_i^i(l_d^i) + H^i \quad (2)$$

The net value to a divorcee consists therefore of the utility of consumption and leisure less the cost of labour market work and plus the additional value of the outside option. Note labour market income (consumption) is now comprised of two main elements; $s^i(w^i l_m^i + w^{-i} l_m^{-i}) + w^i(l_d^i - l_m^i)$, the share of joint income allocated to the divorcee and the change in income resulting from a change in labour supply after marriage. The latter part; $w^i(l_d^i - l_m^i)$ is equal to zero in the case where labour supply does not depend on marital status, is positive if labour supply increases after divorce and is negative if the opposite is true.

5. Coasean bargains versus non-Coasean decisions.

If bargaining is costless the Coase (1960) theorem applies, as noted by Becker et al. (1977) and Becker (1991). Divorces are efficient under such circumstances, in the sense that they will never occur as long as the couple's joint surplus is greater within as opposed to outside marriage. Should the joint surplus satisfy such a criterion, then "side payments" can be used to allow them to "work it out". In the context of our model, for the case when $V_m^i < V_d^i$, but where $V_m^i + V_m^{-i} \geq V_d^i + V_d^{-i}$ there now exist a transfer, T , from individual $-i$, to the spouse i such that: $V_m^i + T \geq V_d^i$ and $V_m^{-i} - T \geq V_d^{-i}$, ensuring

¹¹ In some cases this is fairly straightforward whereas in others such as for example the case of *McFarland v McFarland* (see the House of Lord(2006) ruling) the determination of assets were far from straightforward, as reflected by the initial judge's ruling that in relation to the assets stated that the "present value was inestimable and their future value unfathomable".

marital survival, as it leaves neither worse off and may render one or both better off as compared to a divorce.

Coasean transfers are not modelled as 'strict' monetary exchanges. Instead they take the form of changes in the time spent in the labour market and marriage specific production. With leisure being a private good, it can be foregone to effectively facilitate a transfer from the individual to her/his spouse, who may consume more market and/or marital goods. Thus an individual with a discontented spouse could seek to placate the partner with higher exertions in the marriage either by working more to increase labour income or by increasing efforts at home to enhance marriage specific production.

In contrast, in the absence of Coasean bargains and transfers $V_m^i < V_d^i$ will always invoke a unilaterally initiated divorce. Divorces will in that case occur even when it is not efficient, that is even when $V_m^i + V_m^{-i} \geq V_d^i + V_d^{-i}$.

Consider first the absence of Coasean bargains. Here the individuals will seek a unilateral divorce as long as $V_m^i < V_d^i$ implying a person specific critical shock, φ_*^i , (such that $V_m^i = V_d^i$ implying $\varphi_*^i = V_d^i - EV_m^i$) for each individual, such that any realisation of a shock smaller than this triggers a divorce. The critical shock is therefore governed by:

$$\begin{aligned} \varphi_*^i = & \left[u(s^i(w^i l_m^i + w^{-i} l_m^{-i}) + w^i(l_d^i - l_m^i)) - u\left(\frac{w^i l_m^i + w^{-i} l_m^{-i}}{2}\right) \right] - (c_i^i(l_d^i) - c_i^i(l_m^i)) \\ & + H^i + v(1 - l_d^i) \\ & - v(1 - l_m^i - m^i) - \left[v\left(\frac{A^i m^i + A^{-i} m^{-i}}{2}\right) - c_m^i(m^i) \right] \end{aligned} \quad (3)$$

Further understanding of expression (3) can be gained by considering a specific case. Assume working time is independent of marital status, as occurs when jobs are associated with fixed hours that cannot be altered. Assume in addition an equal post-divorce split of labour income, so that $s^i = 1/2$, leading the expression within the bracket of the first line of the right hand side of expression (3) to cancel out. If non-labour derived net benefits within marriage, as represented by the third line exceeds the non-labour benefits outside marriage, represented by the second line, it follows that the shock will have to be negative for the individual to desire a marital exit. Such an individual will on average want the marriage to survive.

It can be noted that the critical shock will typically differ between the two individuals in a married couple, even with identical utility and cost functions, since the natural abilities, as reflected by w^i and A^i , and the preference, H^i , for the outside option will in general vary between partners. Because in addition the shocks are idiosyncratic, it is therefore quite possible for inefficient divorces to occur.

It follows from (3) that a smaller shock is required to dissolve the marriage with a higher outside option, H^i . We will abstract away from two issues in this respect. First, the choice of how to allocate time between work and home may impact on the probability of meeting an alternative mate. This is not considered here, but is studied by McKinnish (2007) where those who work with a larger fraction of co-workers of the opposite sex are more likely to divorce in the future. Second, and yet again beyond this paper is the possibility that individuals may seek to improve their outside option when divorce becomes more likely, as is studied by Johnston and Skinner (1986) who find the anticipation of future divorce is coupled with greater female labour force participation.

With a similar expression as (3) for the spouse, the overall probability of a divorce/marital survival in the non-Coasean case is represented in Figure 1.

Figure 1 here

Here the incidence of marital survival is given by the top right rectangular area. With symmetric agents the marital survival probability is given by $1-p = \frac{(\varphi^H - \varphi_*^i)(\varphi^H - \varphi_*^{-i})}{(\varphi^H - \varphi^L)^2}$.

Thus the divorce probability is $p = 1 - \frac{(\varphi^H - \varphi_*^i)(\varphi^H - \varphi_*^{-i})}{(\varphi^H - \varphi^L)^2}$. It follows that the probability of divorce is rising with the critical shock, since $\frac{dp}{d\varphi_*^i} = \frac{(\varphi^L - \varphi_*^{-i})}{(\varphi^H - \varphi^L)^2} > 0$. Any variable that reduces the critical shock will therefore have a positive effect on marital survival.

Now consider the Coasean bargain case where all divorces are efficient, that is $V_m^i + V_m^{-i} < V_d^i + V_d^{-i}$. Here the critical joint shock is given by $\varphi^* = \varphi_*^i + \varphi_*^{-i}$, that is the sum of shocks below which divorces are unavoidable and above which marriages should to the joint benefit of the couple survive. This joint critical shock is simply determined by, $V_m^i + V_m^{-i} = V_d^i + V_d^{-i}$, that is $EV_m^i + EV_m^{-i} + \varphi_*^i + \varphi_*^{-i} = V_d^i + V_d^{-i}$, implying, whilst omitting to substitute in expressions (1) and (2):

$$\varphi^* = \varphi_*^i + \varphi_*^{-i} = V_d^i + V_d^{-i} - EV_m^i - EV_m^{-i}. \quad (4)$$

This is presented diagrammatically in Figure 2. The downward sloping line represents the combination of ex post shocks such that the individual shocks sum up to the critical one. The shaded area represents the incidence of efficient divorces which occur when the realisation of shocks are too adverse for the marriage to remain viable.

Figure 2 here.

Given the joint critical shock, the probability, p , of divorce follows by a simple geometric consideration of figure 2 so that $p = \frac{\frac{1}{2}(\varphi^* - \varphi^L)^2}{(\varphi^H - \varphi^L)^2}$. Note that an increased intolerance of bad ex post realisations, that is an increase in the critical shock, will in

effect increase the probability of a divorce since $\frac{dp}{d\varphi^*} = \frac{(\varphi^* - \varphi^L)}{(\varphi^H - \varphi^L)^2} > 0$. As expected, a simple comparison of Figures 1 and 2 illustrates that divorces occur more often in the absence of Coasean bargains and transfers.

Not wanting to restrict our analysis to either of the two cases depicted in Figure 1 and 2, we will instead analyse the cases in turn starting with the non-Coasean case and for then to proceed to the Coasean case next. This will enable us to compare and contrast the two frameworks. The following proposition demonstrates that though there are undoubtedly some differences, one must not overegg the argument for there are also a lot of similarities. We note that any factors that ceteris paribus decrease (increase) the individual's critical shock φ_*^i in the non-Coasean case will also ceteris paribus decrease (increase) the critical shock φ^* in the Coasean case.

Proposition 1.

The critical shocks φ_*^i , in the non-Coasean, and φ^* , in the Coasean case, and therefore also the respective divorce rates, are declining with both own and spouse's innate ability in producing marriage specific products.

The proof is in the Appendix.

Proposition 1 shows the effect of a higher ability in marriage specific production is to increase marital survival rates in both the non-Coasean and the Coasean case. This implies that high marriage specific production ability, high innate love couples are less likely to seek a divorce. Marital ability has both a direct effect; that makes the individual less likely to seek a divorce, and an indirect externality effect; reducing the spouse's divorce propensity. It should be noted, with ability being exogenously given, that investment in marital production has not been modelled in our study that concentrates on the ex post separation decision. Several previous studies suggest nevertheless an under-investment in marriage specific capital, see for instance Baker and Jacobsen (2007) and Vagstad (2001). This would in the light of Proposition 1 translate into higher divorce rates.

The non-Coasean individual spouse's choice of time spent in the labour market and marriage production in a continuing marriage is given by:¹²

$$\frac{\partial V_m^i}{\partial l_m^i} = \frac{w^i}{2} u' \left(\frac{w^i l_m^i + w^{-i} l_m^{-i}}{2} \right) - v'(1 - l_m^i - m^i) - c_l^{i'}(l_m^i) = 0 \quad (5a)$$

$$\frac{\partial V_m^i}{\partial m^i} = \frac{A^i}{2} v' \left(\frac{A^i m^i + A^{-i} m^{-i}}{2} \right) - v'(1 - l_m^i - m^i) - c_m^{i'}(m^i) = 0 \quad (5b)$$

¹² The leisure choice follows trivially from conditions (5a), (5b) and the time constraint.

These two first order conditions then reduce to:

$$\frac{w^i}{2} u' \left(\frac{w^i l_m^i + w^{-i} l_m^{-i}}{2} \right) - c_l^i(l_m^i) = \frac{A^i}{2} v' \left(\frac{A^i m^i + A^{-i} m^{-i}}{2} \right) - c_m^i(m^i) \quad (6)$$

The private optimum requires, according to expression (6), the individual to equate private net marginal benefits, derived from labour market activity, with those derived from marriage specific production. Note that this private optimum does not necessarily maximise the joint marital surplus, which in the absence of any trading externalities we deem to be equivalent to the social surplus. Indeed in order to investigate whether the privately optimal coincides with the jointly (social) efficient, we will seek to maximise the social value of marriage survival, SV , which is merely given by the sum of the individual spouses' values of marriage, that is $SV = V_m^i + V_m^{-i}$. By recalling that spouses have identical utility functions, the conditions relating to individual i 's socially optimal choices of market and marriage specific production follow:

$$\frac{\partial SV}{\partial l_m^i} = w^i u' \left(\frac{w^i l_m^i + w^{-i} l_m^{-i}}{2} \right) - v'(1 - l_m^i - m^i) - c_l^i(l_m^i) = 0 \quad (7a)$$

$$\frac{\partial SV}{\partial m^i} = A^i v' \left(\frac{A^i m^i + A^{-i} m^{-i}}{2} \right) - v'(1 - l_m^i - m^i) - c_m^i(m^i) = 0 \quad (7b)$$

Which implies:

$$w^i u' \left(\frac{w^i l_m^i + w^{-i} l_m^{-i}}{2} \right) - c_l^i(l_m^i) = A^i v' \left(\frac{A^i m^i + A^{-i} m^{-i}}{2} \right) - c_m^i(m^i) \quad (8)$$

Thus expression (8) states that the social optimum occurs where the social net marginal benefit in labour market production is equated to the social net marginal benefit in marriage specific production. From expressions (5a), (5b), (7a) and (7b) we can directly note that the private levels of effort in both sectors, as reflected by l_m^i and m^i , when the marriage survives are lower than the socially optimal levels. This is the standard free riding under-provision result that arises in the public goods literature. In this case each partner in the marriage fails to take into account the positive externality their production has on their partner's utility. It reflects a tendency in marriages to work too little both in the market and at home. Though it is well known from the marriage literature that joint increases in contributions to the public good yield Pareto improvements, see Konrad and Lommerud (2000), our model illustrates that this may also apply simultaneously to labour market and marital production contributions.

Proposition 2.

An increase in the spouse's wage will reduce (increase) one's own labour supply (home production) in the non-Coasean case.

The proof is in the Appendix.

Proposition 2 suggests quite intuitively that a married individual will substitute away from labour supply and into marital production when the wage of the spouse increases in the non-Coasean case. This provides a useful contrast to the spouse's wage effect in the Coasean case that will later be deduced from Proposition 4 below.

We now turn to the Coasean case, where the parties bargain over employment and marital production. With γ_i and $(1 - \gamma_i)$ representing the relative bargaining strengths of individual i and individual $-i$ respectively, the Coasean Nash bargain is given by:

$$\text{Max}_{l_m^i, m^i, l_m^{-i}, m^{-i}} B = (V_m^i - V_d^i)^{\gamma_i} (V_m^{-i} - V_d^{-i})^{(1-\gamma_i)} \quad (9)$$

The Nash bargain outcome is now characterised by the first order conditions:

$$\frac{\partial B}{\partial l_m^i} = \gamma_i (V_m^i - V_d^i)^{\gamma_i - 1} (V_m^{-i} - V_d^{-i})^{1-\gamma_i} \left(\frac{\partial V_m^i}{\partial l_m^i} \right) + (1 - \gamma_i) (V_m^i - V_d^i)^{\gamma_i} (V_m^{-i} - V_d^{-i})^{-\gamma_i} \left(\frac{\partial V_m^{-i}}{\partial l_m^i} \right) = 0 \quad (10a)$$

$$\frac{\partial B}{\partial m^i} = \gamma_i (V_m^i - V_d^i)^{\gamma_i - 1} (V_m^{-i} - V_d^{-i})^{1-\gamma_i} \frac{\partial V_m^i}{\partial m^i} + (1 - \gamma_i) (V_m^i - V_d^i)^{\gamma_i} (V_m^{-i} - V_d^{-i})^{-\gamma_i} \frac{\partial V_m^{-i}}{\partial m^i} = 0 \quad (10b)$$

$$\frac{\partial B}{\partial l_m^{-i}} = \gamma_i (V_m^i - V_d^i)^{\gamma_i - 1} (V_m^{-i} - V_d^{-i})^{1-\gamma_i} \left(\frac{\partial V_m^i}{\partial l_m^{-i}} \right) + (1 - \gamma_i) (V_m^i - V_d^i)^{\gamma_i} (V_m^{-i} - V_d^{-i})^{-\gamma_i} \left(\frac{\partial V_m^{-i}}{\partial l_m^{-i}} \right) = 0 \quad (10c)$$

$$\frac{\partial B}{\partial m^{-i}} = \gamma_i (V_m^i - V_d^i)^{\gamma_i - 1} (V_m^{-i} - V_d^{-i})^{1-\gamma_i} \frac{\partial V_m^i}{\partial m^{-i}} + (1 - \gamma_i) (V_m^i - V_d^i)^{\gamma_i} (V_m^{-i} - V_d^{-i})^{-\gamma_i} \frac{\partial V_m^{-i}}{\partial m^{-i}} = 0 \quad (10d)$$

Thus the proposition below follows.

Proposition 3.

- a) Married employment in the Coasean case exceeds married employment in the non-Coasean case.
- b) Marriage production in the Coasean case exceeds marriage production in the non-Coasean case.

Proof is in the Appendix.

This result is perhaps not that surprising as the Coasean bargain can attain the socially optimum, whereas the non-Coasean outcome cannot. Thus our previous discussion, following expressions (5a), (5b), (7a) and (7b), with regard to the under-provision and free riding issues pertains to the non-Coasean case only. In the Coasean case in contrast agents put in more effort on average in order to make it work. The Coasean bargain implies some give and take so that each individual increases her/his effort, relatively to the purely selfish outcome, making the marriage more resilient. One way the Coasean bargain avoids the breakup of viable marriages is for individuals to work harder in the labour market. Another is to work harder within marriage

production. This indicates that there are more routes to marital bliss than the theory of comparative advantage usually suggests. Indeed the paper illustrates that giving and receiving in a marriage takes several forms where contributions to and benefits from the marriage manifests themselves both through the level of labour market income and the production of marriage specific goods. This does not have to involve the specialisation that comparative advantage models are so often associated with. Indeed we postulate, with differences in labour and marital productivity across marriages, that the degree of specialisation will vary across marriages. Thus in some marriages more equal division of marital tasks and labour market are used to sustain successful unions, whereas in others more traditional division of labour patterns are possible to make the marriage work.

Using (10a) and (10c), then (10b) and (10d) respectively yields:

$$\gamma_i (V_m^{-i} - V_d^{-i}) \left(\frac{\partial V_m^i}{\partial l_m^i} - \frac{\partial V_m^i}{\partial l_m^{-i}} \right) = (1 - \gamma_i) (V_m^i - V_d^i) \left(\frac{\partial V_m^{-i}}{\partial l_m^{-i}} - \frac{\partial V_m^{-i}}{\partial l_m^i} \right) \quad (11a)$$

$$\gamma_i (V_m^{-i} - V_d^{-i}) \left(\frac{\partial V_m^i}{\partial m^i} - \frac{\partial V_m^i}{\partial m^{-i}} \right) = (1 - \gamma_i) (V_m^i - V_d^i) \left(\frac{\partial V_m^{-i}}{\partial m^{-i}} - \frac{\partial V_m^{-i}}{\partial m^i} \right) \quad (11b)$$

Proposition 4.

Symmetry and ceteris paribus yields, in the Coasean case:

- i) With $\varphi^i > \varphi^{-i}$ it follows that $l_m^i > l_m^{-i}$ and that $m^i > m^{-i}$.
- ii) With $s^i < s^{-i}$ it follows that $l_m^i > l_m^{-i}$ and that $m^i > m^{-i}$.
- iii) With $w^i > w^{-i}$ it follows that $l_m^i < l_m^{-i}$ and that $m^i < m^{-i}$ when $s^i > 1/2$.
- iv) With $w^i > w^{-i}$ it follows that $l_m^i \leq l_m^{-i}$ and that $m^i \leq m^{-i}$ when $s^i = 1/2$ and $l_m^i \leq l_d^i$ and $l_m^i \leq l_d^{-i}$

The proof is in the appendix.

In the Coasean case it follows from part i) that if individual i is faced with a more favourable ex post realisation of marriage than individual -i, that individual i will increase efforts both at home as well as in the labour market. This result seems intuitive since an increase in an individual's value of marriage will induce her/him to strive to ensure the marriage has the best possibilities of surviving. A reduction in the value of marriage can likewise be used as bargaining leverage by a negatively affected individual, given the now more credible threat to leave, eliciting a higher effort from that individual's partner, who works harder in the market and at home in order to save the marriage. In other words, as long as it is in the joint benefit of the spouses to stay married, Coasean bargaining implies an arrangement can be found so that the partner who gains the most sacrifices the most in order for the marriage to survive.

Part ii) is equally straightforward to interpret as an increase in the divorce settlement share of the couple's joint labour income increases the outside option of the individual. This creates a leverage that can be exploited in the bargain.

Part iii) suggests that the individual with the largest wage will if he/she also receives the lion share in the divorce settlement labour market put less effort into labour market and marriage productive activities. Since we know from part ii) that a higher share in the ex post division of household income increases the individual bargaining position and a higher own wage will do the same, part iii) of the proposition follows. The person with the lowest wage and the lowest ex post share, on the other hand, is doubly unlucky when the divorce occurs, yielding a weak bargaining situation forcing her/him to exert higher effort within the marriage. Thus inequitable divorce shares do not only affect the individuals should a divorce occur, it also affects the individuals within the marriage.

Part iv) suggest a similar effect to part iii) is obtained with equal shares ex post if the divorced labour supply exceeds marital labour supply. A wage increase in such a situation would benefit the individual more in divorce than whilst married. Thus an increase in labour market productivity strengthens the bargaining position of the individual causing the negative correlation between labour supply and wages. Similarly a wage increase will cause the spouse to work more, in sharp contrast to the non-Coasean case where a spouse's wage increase would be accompanied by a reduction in labour supply. This therefore provides a testable hypothesis to distinguish Coasean bargains from hedonistic non-cooperative behaviour.

Whereas the actual working time is jointly determined with time allocated to marriage specific production whilst married, the divorcee is freed from this latter activity when single so that the allocation of labour (and therefore implicitly leisure) is simply characterised by: $\frac{\partial V_i^d}{\partial l_m^i} = 0$. Comparing pre and post-divorce labour market outcomes yields unambiguous results in the non-Coasean case:

Proposition 5.

If $s^i \leq \frac{1}{2}$ then $l_d^i > l_m^i$ in the Non-Coasean case.

The proofs are in the Appendix.

That spouses, who receive the lowest share (or equal share) of the ex post divorce income, work more if divorced than if married is in the non-Coasean case caused by two effects. First, the marginal utility of market production has increased (or stayed constant if $s^i = \frac{1}{2}$) as the divorcee gets less (or the same) of the joint income when divorced than when married. Thus the divorcee tends to work more (or not change

her/his working time). Second, as divorces are associated with the complete fall off in joint marital production, it follows that the time an individual spends on her/his own will increase after a divorce. This causes the marginal utility of leisure to fall, which in turn tends to suggest that the divorcee substitutes away from leisure into market productive activities. The net effect of both these two effects is therefore to work more when $s^i \leq \frac{1}{2}$.

That we cannot generalise Proposition 5 to the case when $s^i > \frac{1}{2}$ is due to the reversal in the sign of the first of the effects mentioned above. In other words, for individuals who receive a share $s^i > \frac{1}{2}$, the marginal utility of consumption of market goods falls, when moving to the divorced state. This yields a negative impact on labour supply. However, becoming divorced will increase the marginal utility of leisure regardless of s^i and will therefore tend to increase the amount of labour supplied. Whether the overall impact of divorce on labour supply is positive or negative, when $s^i > \frac{1}{2}$, depends on which of the two opposing forces that dominate. Thus it is a matter that is impossible to ex ante predict without further restriction and which can otherwise only be concluded by empirical investigations.

Comparing propositions 5 and 3 yields some interesting conclusions and illustrates that the result of Proposition 5, valid in the non-Coasean case, does not necessarily translate to the Coasean case. Recall that Proposition 3 states that a Coasean bargain tends to yield higher labour market activity whilst married than its non-Coasean counterpart. It is therefore possible that the Coasean bargaining could induce higher labour supply within a marriage than in a divorce. Thus, while the move into a divorce state will free up more 'pure' leisure time, inducing a substitution effect into labour, the Coasean transfers provide a reason for the spouse to stay within the marriage to countervail this substitution effect. Hence, there is a possibility that Coasean trading partners, who are induced to work hard in order to keep their marriage from collapsing, would with a termination of their marriage work less. This realisation provides yet another way to examine whether or not marriages are subject to Coasean bargains or not. A finding that spouses work less after a marriage under equitable sharing rules would in the context of this model suggest that marriages are governed by Coasean bargains, whereas the opposite finding would exclude neither of the two cases.

We have so far not investigated the impact of labour market ability, as measured by the wage, has on the propensity to divorce. This is critically dependent on two factors; first, the ex post sharing rule s^i of joint labour income in the event of a divorce and second on the labour supply variation across marital status. Through Propositions 3

and 5 we know more about the latter of these factors and are now better equipped to investigate the relationship between labour market productivity and marital breakup.

We make the simplifying assumptions that a larger share in the ex post split in income and a larger increase in ex post labour supply increases the marginal net value of an increase in the wage:

$$\left. \frac{\partial u(s^i(w^i l_m^i + w^{-i} l_m^{-i}) + w^i(l_d^i - l_m^i))}{\partial w^i} \right|_{s^i > s^i} > \left. \frac{\partial u(s^i(w^i l_m^i + w^{-i} l_m^{-i}) + w^i(l_d^i - l_m^i))}{\partial w^i} \right|_{s^i = s^i} \quad (12a)$$

$$\left. \frac{\partial u(s^i(w^i l_m^i + w^{-i} l_m^{-i}) + w^i(l_d^i - l_m^i))}{\partial w^i} \right|_{l_d^i > \bar{l}_d^i} > \left. \frac{\partial u(s^i(w^i l_m^i + w^{-i} l_m^{-i}) + w^i(l_d^i - l_m^i))}{\partial w^i} \right|_{l_d^i = \bar{l}_d^i} \quad (12b)$$

Whilst the first of these inequalities perhaps is obvious the second also makes intuitive sense. The higher the employment in the divorced state relative to the married state, the higher is the effect of an increase in the wage on the divorcee's utility.

Proposition 6.

Part 1: An increase in one's own labour market ability will;

a) have no effect on $\frac{\partial \varphi_i^*}{\partial w^i}$ in the case of $s^i = 1/2$ when the individual's labour supply is

invariant to marital status (i.e. $l_d^i = l_m^i$), but will increase (decrease) $\frac{\partial \varphi_i^*}{\partial w^i}$ when $l_d^i > l_m^i$ ($l_d^i < l_m^i$).

b) decrease $\frac{\partial \varphi_i^*}{\partial w^i}$ in the case of $s^i < 1/2$ when $l_d^i \leq l_m^i$.

c) increase $\frac{\partial \varphi_i^*}{\partial w^i}$ in the case of $s^i > 1/2$ when $l_d^i \geq l_m^i$.

Part 2: An increase in the spouse's labour market ability will;

a) have no effect on $\frac{\partial \varphi_i^*}{\partial w^{-i}}$ in the case of $s^i = 1/2$ when the individual's labour supply is

invariant to marital status (i.e. $l_d^i = l_m^i$), but will decrease (increase) $\frac{\partial \varphi_i^*}{\partial w^{-i}}$ when $l_d^i > l_m^i$ ($l_d^i < l_m^i$).

b) decrease $\frac{\partial \varphi_i^*}{\partial w^{-i}}$ when $s^i < 1/2$ and $l_d^i > l_m^i$, ambiguous otherwise.

c) increase $\frac{\partial \varphi_i^*}{\partial w^{-i}}$ when $s^i > 1/2$ and $l_d^i < l_m^i$, ambiguous otherwise.

The proof is in the Appendix.

Proposition 6 makes it immediately apparent that there are few conclusions to be made with regards to the impact of labour market ability/wage on the married couples' overall divorce probability, with an inequitable sharing rule after a divorce. We will therefore concentrate on the equitable sharing rule, where a rich picture emerges, and present our summarised findings in Table 1.

Though we distinguish between the Coasean and non-Coasean divorces in Table 1, it illustrates the effect of labour market ability on the overall propensity to divorce are observably equivalent between Coasean and non-Coasean behaviour. Consider a situation where one individual's propensity to divorce increases in response to higher labour market ability, $\frac{\partial \varphi_i^*}{\partial w^i} > 0$, whereas her/his spouse's propensity to seek a divorce decreases $\frac{\partial \varphi_{-i}^*}{\partial w^i} < 0$. We then have an indeterminate effect on the overall divorce probability in both the non-Coasean and Coasean instance. Similarly, if individual propensities to divorce of both spouses fall (increase) in response to labour market ability increases then the overall divorce probability will fall (increase) both with and without Coasean transfers.

Table 1 The effect of labour market ability increases under equitable sharing.

Case	Sign of $l_d^i - l_m^i$	Sign of $l_d^{-i} - l_m^{-i}$	Sign of $\frac{\partial \varphi^i}{\partial w_i}$	Sign of $\frac{\partial \varphi^{-i}}{\partial w_i}$	Non-Coasean Divorce Propensity	Coasean Divorce Propensity
1	0	0	0	0	0	0
2	0	+	0	-	-	-
3	0	-	0	+	NA	+
4	+	0	+	0	+	+
5	+	+	+	-	?	?
6	+	-	+	+	NA	+
7	-	0	-	0	NA	~
8	-	+	-	-	NA	~
9	-	-	-	+	NA	?

In cases 1, 2, 4, and 5 both Coasean and non-Coasean bargains are possible.¹³ However, following Proposition 5 non-Coasean interactions are not applicable in the cases where an individual works more in marriage than after divorce. Thus cases 7-9 can only occur in Coasean bargains, since the individual, whose labour market ability is increasing, ends up working less in divorce than in marriage. Non Coasean behaviour

¹³ We assume here for Case 1 only that the individuals are in fixed hour contract employment where they cannot alter working hours following. It should however be noted from Proposition 5 that Case 1 is not applicable in the non-Coasean case if individuals can freely change working hours since the individuals would both want to reduce labour supply after a divorce.

can also not occur in cases 3, 6, and 9 where the spouse of the individual reduces her/his labour supply in response to a divorce.

Traditional gender role models saw the male as the main family breadwinner with a wife working less than her husband. Though this division of labour within a family has weakened over time, it still persists. Whether this is because of the perseverance of stereotypical gender roles, merely a reflection of family optimisation or a combination of both is not clear. Booth and van Ours (2008) suggest that married couple satisfaction with hours of work and job satisfaction is highest when the male works full-time and the female works part-time. If we then take as a premise that many workers are constrained by working time, see Bell et al. (2012) for a discussion, it may very well be that there are a number of marriages where a full time working husband would find it difficult to change his working time after a divorce, whereas a part time working female may find it easier to increase her working hours. This is the situation described under cases 2 and 4 in Table 1. These cases illustrate that a marriage consisting of a full time working and a part time working spouse may be more likely to survive if the wage of the full time worker increases and the part time working spouse's wage decreases. It is therefore possible that such circumstances give support to the adage that full time males resent their wives making investments that increase their wage in the labour market. These conditions are consistent and may help explain why young males' preferences for stereotypical work division persist whilst females give more emphasis to non-monetary aspects, see Fortin (2008), and why part time work by females is associated with a downgrading of skills, as found in Connolly and Gregory (2008). Cases 2 and 4 are further consistent with assortative matching as for instance argued by Burdett and Coles (1998). It also aligns well to the Becker argument where comparative advantage tends to suggest specialisation of tasks with one partner working more in the labour market and the other producing more home goods to the benefit of successful marriages. It finally gives theoretical support to Hoffman and Duncan (1995) who provide evidence of a negative correlation between the probability of divorce and a wife's wage.

Nevertheless one must not overstate the assortative matching effect. For other models the division of labour may also work well for a marriage. For instance, it is interesting to note cases 2 and 4 also imply that increasing both spouses' wages have an ambiguous effect on the overall divorce probability. Therefore it can be argued that we need empirical investigation to shed more light on the issue such as Whittington and Alm (1997) who find that both own and spouse's after tax income increases reduce the

dissolution of marriages. Hence such evidence may suggest there are more routes to marital bliss than assortative matching.

There are also other cases in Table 1 to evaluate. Consider the instance where both spouses work full time and cannot alter hours worked. This is arguably applicable to case 1, where under equitable division rules any change in labour market remuneration will have no effect on divorce. Such a case may have become increasingly more applicable with time with both an increase in equitable post-divorce sharing and an increase in female labour participation (full-time work) over time.

The remaining cases are all inconsistent with non-Coasean behaviour. Though we will not discuss all these cases extensively a couple are worth a brief mention. Cases 3 and 7 are cases where only one individual cuts their labour supply after a divorce. This might encompass situations where one spouse who works hard within a marriage to make it work, finds it optimal to reduce her/his labour supply in the event of a divorce. In Case 3, the spouse cuts labour supply after a divorce. The own propensity to seek a divorce remains unchanged to an increase in own labour market ability but the spouse's individual divorce propensity increases thus increasing the overall divorce probability. In Case 7 it is own labour supply that falls after the failure of the marriage, leading thus to a fall in the probability of divorce as own ability increases. Whilst cases 6 and 8 have changes in both individuals in the initial couple after a divorce, they are similar in intuition to cases 3 and 7 respectively. Finally cases 5 and 9 relate to marriages where both individuals either increase or reduce labour supply after a divorce. Any change in labour market ability for such individuals will have an indeterminate effect on overall divorce propensities.

6. Conclusion.

Though the Coasean and the non-Coasean cases are similar in many ways, there is more to divide them than the mere effect that follows the introduction of unilateral divorce laws. This paper has sought to shed further light on what identifies one case from another. Perhaps one of the most dramatic results of the paper is the reaction of an individual to the increase in her/his spouse's wage. In the non-Coasean case this will lead to a substitution away from own labour supply, whilst in the Coasean case there is instead a positive response in both own labour supply and marital production. Starting from the premise that Coasean bargains facilitate marital survival it is now apparent that there are more ways to avoid marital breakdown than the theory of comparative advantage would seem to suggest. For whereas that theory proposes specialisation in

tasks should enhance a marriage, thus making breakup less likely, our model shows that Coasean bargains lead to more effort in both the labour market as well as in marital production. This co-movement is only possible by relaxing the all-pervasive assumption that time is simply divided into work and leisure to instead introduce a new tripartite treatment of time, missing from previous literature, where time is divided into the activities of labour production, marital production and leisure.

Whereas by construction, there is an absence of reactions to adverse shocks in the non-Coasean case, no such failures materialise in the Coasean case, where the analysis produces several a priori unknown but ex post intuitive results. One of the more notable of these is the effect that shows it is the partner who experiences less adverse shock who works harder in order to save the marriage. It is likewise worth noting that individuals with higher shares in income after a divorce can extract more from their spouses by getting them to contribute more within the marriage. Higher own wages tend to induce higher effort levels from the spouse, more concerned about marital break-up, though this result is dependent on the judicial sharing rule following a divorce.

The results presented here further demonstrate how legal structures within family law play an important role for outcomes relating to labour market decisions. The consideration of how property rights, to marital income during a marriage and after a divorce, affect the marriage outcome and divorce decision has been a neglected area of research. This paper seeks in part to rectify this. Though all our results are not contingent on equal treatment with regards to income sharing within marriage and divorce, many are conditional on this assumption. It is in this respect worth reemphasising that this condition does not need to mean that the share of income attributed to any individual in marriage and divorce is always necessarily 50%, but rather that the share an individual receives is insensitive to marital status. We have argued that the wider interpretation covers a range of legal jurisdictions. Furthermore the more narrow 50-50 split assumption is less restrictive than what previously might have been the case, as we have seen a trend in legal practices and social convention that produce a greater emphasis on the equal treatment of individuals across gender divides. Assuming the trend continues the results of this paper are set to become ever more relevant, thereby inviting and facilitating future empirical tests.

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APPENDIX.

Proof of Proposition 1.

The proof in the non-Coasean case follows directly from expression (3):

$$\frac{\partial \varphi_i^*}{\partial A^i} = -\frac{m^i}{2} \nu' \left(\frac{A^i m^i + A^{-i} m^{-i}}{2} \right) < 0 \quad (\text{A1a})$$

$$\frac{\partial \varphi_i^*}{\partial A^{-i}} = -\frac{m^{-i}}{2} \nu' \left(\frac{A^i m^i + A^{-i} m^{-i}}{2} \right) < 0 \quad (\text{A1b})$$

It follows that expressions (A1a) and (A1b) together confirm the proposition in the non-Coasean case. Given that the both own and spouses marriage productivities reduce the critical shock an individual can bear in the non-Coasean case it is trivial to show by the use of expression (3) and (4) that this results also carries through to the Coasean case. QED.

Proof of Proposition 2:

By the total differentiation of the expressions (5a) and (5b) we have:

$$\begin{bmatrix} \frac{\partial^2 V_m^i}{\partial l_m^i{}^2} & \frac{\partial^2 V_m^i}{\partial l_m^i \partial m^i} \\ \frac{\partial^2 V_m^i}{\partial m^i \partial l_m^i} & \frac{\partial^2 V_m^i}{\partial m^i{}^2} \end{bmatrix} \begin{bmatrix} dl_m^i \\ dm^i \end{bmatrix} = \begin{bmatrix} -\frac{\partial^2 V_m^i}{\partial l_m^i \partial w^{-i}} \\ 0 \end{bmatrix} dw^{-i} \quad (\text{B1})$$

Where: $\frac{\partial^2 V_m^i}{\partial l_m^i \partial w^{-i}} = \frac{w^i l_m^{-i}}{4} u'' \left(\frac{w^i l_m^i - w^{-i} l_m^{-i}}{2} \right) < 0$ and $\frac{\partial^2 V_m^i}{\partial l_m^i \partial m^i} = \nu'' (1 - l_m^i - m^i) < 0$

Note from, profit maximisation that the standard second order conditions hold, that is:

$\frac{\partial^2 V_m^i}{\partial m^i{}^2} < 0$, $\frac{\partial^2 V_m^i}{\partial l_m^i{}^2} < 0$ and $\frac{\partial^2 V_m^i}{\partial l_m^i{}^2} \frac{\partial^2 V_m^i}{\partial m^i{}^2} > \left(\frac{\partial^2 V_m^i}{\partial l_m^i \partial m^i} \right)^2$. By Cramer's rule:

$$\frac{dl_m^i}{dw^{-i}} = \frac{-\frac{\partial^2 V_m^i}{\partial l_m^i \partial w^{-i}} \frac{\partial^2 V_m^i}{\partial m^i{}^2}}{\frac{\partial^2 V_m^i}{\partial l_m^i{}^2} \frac{\partial^2 V_m^i}{\partial m^i{}^2} - \left(\frac{\partial^2 V_m^i}{\partial l_m^i \partial m^i} \right)^2} < 0 \quad (\text{B2a})$$

$$\frac{dm^i}{dw^{-i}} = \frac{\frac{\partial^2 V_m^i}{\partial l_m^i \partial w^{-i}} \frac{\partial^2 V_m^i}{\partial l_m^i \partial m^i}}{\frac{\partial^2 V_m^i}{\partial l_m^i{}^2} \frac{\partial^2 V_m^i}{\partial m^i{}^2} - \left(\frac{\partial^2 V_m^i}{\partial l_m^i \partial m^i} \right)^2} > 0 \quad (\text{B2b})$$

QED

Proof of Proposition 3:

Note the following cross derivatives:

$$\frac{\partial V_m^{-i}}{\partial l_m^i} = \frac{w^i}{2} u' \left(\frac{w^i l_m^i + w^{-i} l_m^{-i}}{2} \right) \quad (\text{C1a})$$

$$\frac{\partial V_m^{-i}}{\partial m^i} = \frac{A^i}{2} \nu' \left(\frac{A^i m^i + A^{-i} m^{-i}}{2} \right) \quad (\text{C1b})$$

For the marriage to survive the surplus at the end of the bargain must be positive for both parties. Thus $(V_m^i - V_d^i) > 0$ and $(V_m^{-i} - V_d^{-i}) > 0$. Note also from (C1a) that $\frac{\partial V_m^{-i}}{\partial l_m^i} > 0$. And similarly

from (C1b) $\frac{\partial V_m^{-i}}{\partial m^i} > 0$ It then follows from (10a) and (10b) respectively that $\frac{\partial V_m^i}{\partial l_m^i} < 0$ and $\frac{\partial V_m^i}{\partial m^i} < 0$.

Comparing this Coasean outcome to the non Coasean outcome where $\frac{\partial V_m^i}{\partial l_m^i} = 0$ and $\frac{\partial V_m^i}{\partial m^i} = 0$. It is straightforward to show that the same inferences hold for individual -i. The proposition follows. QED

Proof of Proposition 4

Note that:

$$\frac{\partial V_m^i}{\partial l_m^i} = \frac{w^i}{2} u' \left(\frac{w^i l_m^i + w^{-i} l_m^{-i}}{2} \right) - \nu' (1 - l_m^i - m^i) - c_l^i (l_m^i) \quad (\text{D1a})$$

$$\frac{\partial V_m^i}{\partial m^i} = \frac{A^i}{2} \nu' \left(\frac{A^i m^i + A^{-i} m^{-i}}{2} \right) - \nu' (1 - l_m^i - m^i) - c_m^i (m^i) \quad (\text{D1b})$$

For part i) of the proposition we have the following:

(C1a) implies $\frac{\partial V_m^{-i}}{\partial l_m^i} = \frac{\partial V_m^i}{\partial l_m^{-i}} > 0$ and that the proof of Proposition 3 shows $\frac{\partial V_m^i}{\partial l_m^i} < 0$. Expressions (D1a), (C1a) and symmetry yields $\frac{\partial V_m^i}{\partial l_m^i} - \frac{\partial V_m^i}{\partial l_m^{-i}} < 0$ (and $\frac{\partial V_m^{-i}}{\partial l_m^{-i}} - \frac{\partial V_m^{-i}}{\partial l_m^i} < 0$). Assume symmetry in preferences, costs and bargaining strength. With spouse i facing a more favourable ex post state than her/his spouse, $\varphi^i > \varphi^{-i}$ we then have by implication of (1) that $V_m^i > V_m^{-i}$. This in turn implies $(V_m^i - V_d^i) > (V_m^{-i} - V_d^{-i})$. This combines with (11a) to imply $\frac{\partial V_m^i}{\partial l_m^i} < \frac{\partial V_m^{-i}}{\partial l_m^{-i}}$, such that $l_m^i > l_m^{-i}$. Similarly, with $\frac{\partial V_m^i}{\partial m^i} < 0$ from proof of Proposition 3 it follows from (11b) that $\frac{\partial V_m^i}{\partial m^i} < \frac{\partial V_m^{-i}}{\partial m^{-i}}$ which implies that $m^i > m^{-i}$.

Part ii) with symmetry and $s^i < s^{-i}$ can be shown by a similar/identical proof to part i) and is therefore omitted.

For part iii) of the proposition we note: $V_m^i = V_m^{-i}$ and that: $V_d^i > V_d^{-i}$ when $w^i > w^{-i}$ and $s^i > 1/2$, in which case $(V_m^i - V_d^i) < (V_m^{-i} - V_d^{-i})$. Note from above that $\frac{\partial V_m^i}{\partial l_m^i} - \frac{\partial V_m^i}{\partial l_m^{-i}} < 0$ (and $\frac{\partial V_m^{-i}}{\partial l_m^{-i}} - \frac{\partial V_m^{-i}}{\partial l_m^i} < 0$)

It therefore follows from (11a) that $\frac{\partial V_m^{-i}}{\partial l_m^i} < \frac{\partial V_m^i}{\partial l_m^i}$, such that $l_m^i < l_m^{-i}$. By symmetry we similarly have $m^i < m^{-i}$.

For part iv) of the proposition we note when $s^i = 1/2$, $l_m^i \leq l_d^i$, $l_m^i \leq l_d^{-i}$ and $w^i > w^{-i}$ that $V_m^i = V_m^{-i}$ and that: $V_d^i \geq V_d^{-i}$ in which case $(V_m^i - V_d^i) \leq (V_m^{-i} - V_d^{-i})$. Note from above that $\frac{\partial V_m^i}{\partial l_m^i} - \frac{\partial V_m^i}{\partial l_m^{-i}} < 0$ (and $\frac{\partial V_m^{-i}}{\partial l_m^{-i}} - \frac{\partial V_m^{-i}}{\partial l_m^i} < 0$) It therefore follows from (11a) that $\frac{\partial V_m^{-i}}{\partial l_m^i} \leq \frac{\partial V_m^i}{\partial l_m^i}$, such that $l_m^i \leq l_m^{-i}$. By symmetry we similarly have $m^i \leq m^{-i}$. QED

Proof of Proposition 5

Proof follows by contradiction. The optimal choice of employment after divorce is given by:

$\frac{\partial V_d^i}{\partial l_d^i} = 0$. This can be derived and re-expressed by using expression (2):

$$w^i u' \left(s^i (w^i l_m^i + w^{-i} l_m^{-i}) + w^i (l_d^i - l_m^i) \right) - v'(1 - l_d^i) = c_1^i(l_d^i) \quad (E1)$$

The labour supply condition in the non-Coasean case can be derived from first order condition (5a):

$$\frac{w^i}{2} u' \left(\frac{w^i l_m^i + w^{-i} l_m^{-i}}{2} \right) - v'(1 - l_m^i - m^i) = c_1^i(l_m^i) \quad (E2)$$

Assume contrary to Proposition 5;

$$\text{That if } s^i \leq 1/2 \text{ then } l_d^i < l_m^i \quad (E3)$$

The statement in (E3) leaves the left hand side of expression (E1) strictly greater than the left hand side of expression (E2), by necessity yielding $c_1^i(l_m^i) < c_1^i(l_d^i)$, thus implying $l_m^i < l_d^i$, which contradicts (E3). Hence Proposition 5 is instead confirmed. QED

Proof of Proposition 6

Expression (3) implies:

$$\frac{\partial \varphi_i^*}{\partial w^i} = \left[(s^i l_m^i + (l_d^i - l_m^i)) u' \left(s^i (w^i l_m^i + w^{-i} l_m^{-i}) + w^i (l_d^i - l_m^i) \right) - \frac{l_m^i}{2} u' \left(\frac{l_m^i w^i + l_m^{-i} w^{-i}}{2} \right) \right] \quad (F1a)$$

$$\frac{\partial \varphi_i^*}{\partial w^{-i}} = \left[s^i l_m^{-i} u' \left(s^i (w^i l_m^i + w^{-i} l_m^{-i}) + w^i (l_d^i - l_m^i) \right) - \frac{l_m^{-i}}{2} u' \left(\frac{l_m^i w^i + l_m^{-i} w^{-i}}{2} \right) \right] \quad (F1b)$$

With $s^i = 1/2$ and $l_d^i = l_m^i$ it follows that both above expressions are equal to zero. With $s^i = 1/2$ and $l_d^i > l_m^i$ it follows automatically that (F1b) is negative. Expression (F1a) is more complicated, but be written as:

$$\frac{\partial \varphi_i^*}{\partial w^i} = \left[\frac{\partial u \left(\frac{l_m^i w^i + l_m^{-i} w^{-i}}{2} + w^i (l_d^i - l_m^i) \right)}{\partial w^i} - \frac{\partial u \left(\frac{l_m^i w^i + l_m^{-i} w^{-i}}{2} + w^i (l_d^i - l_m^i) \right)}{\partial w^i} \right]_{l_d^i = l_m^i} \quad (F2)$$

(F2) is positive given assumptions (12b). The opposite follows when $l_d^i < l_m^i$. Thus Parts 1a) and Part 2a) are proved.

Similarly, in the case of $s^i < 1/2$ and $l_d^i \leq l_m^i$ it follows, from assumptions (12a) and (12b), that expression (F1a) is negative. Expression (F1b) is likewise negative when $s^i < 1/2$ and $l_d^i > l_m^i$. Parts 1b) and 2b) are thus proved.

In the case of $s^i > 1/2$ and $l_d^i \geq l_m^i$ it follows from assumptions (12a) and (12b) expression (F1a) is positive. Expression (F1b) is likewise positive when $s^i > 1/2$ and $l_d^i < l_m^i$. Parts 1c) and 2c) are thus proved. QED

Figure 1. The non-Coasean divorce propensity.

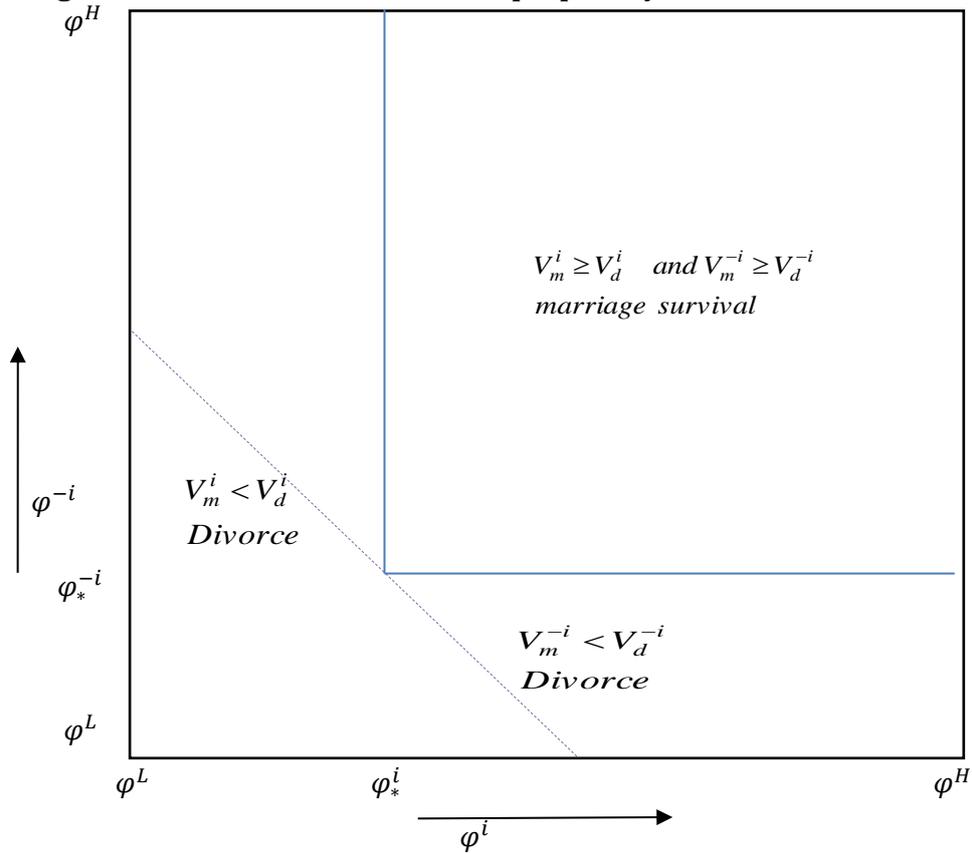


Figure 2. The Coasean bargains divorce propensity

