A Time Series Analysis of the Divorce Rate in Japan Using a Precedent-Based Index

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EXTENDED ABSTRACT

This paper undertakes a time series analysis of the Japanese divorce rate using annual data over the period 1964 to 2006. One of the key innovations of the paper is to use court decisions on divorce disputes to construct an index that seeks to measure how the probability of a success in a divorce suit has changed over time. The computed index suggests that if it the culpable party lodging the divorce suit, the probability of the suit being successful has clearly increased over time. However, this legal change does not appear to be an important factor in explaining the rise in the Japanese divorce rate. The divorce rate appears to be counter-cyclical, and the increasing proportion of women who are regular employees appears to have increased the divorce rate.

1. INTRODUCTION

Over the past four decades, Japanese divorce rates have been increasing. With the start of a new pension system started in 1 April 2007 that allows divorced couples to split pension payments for the corporate employees' pension and mutual-aid pension plans, a great deal of attention has been paid to divorce-related issues in Japan recently. This paper focuses on the question of what are the factors that have led to the increase in the divorce rate in Japan.

There are a number of hypotheses suggested to explain the upward trend in divorce rates in the U.S: the increase in women's earning ability; the shift to no-fault and unilateral divorce laws in many states; the rise of feminism in the 1960s; and the diminished stigma associated with being divorced. Early research focuses on the effects of an increase in the earning ability of women in the labour market on divorce rates (Becker et al. (1977), O'Neill (1981), Sander (1985), and Johnson and Skinner (1986)).

Another stream of research stems from the debate that the upward trend of the divorce rate in the U.S. can be explained by legal changes, namely, the shift from consent divorce laws to unilateral divorce laws. Since the 1970s, family law in the U.S. has been shifting to no fault unilateral divorce laws, which enable a married person to seek a marital dissolution without the consent of their spouse.

In the absence of transactions costs, the Coase Theorem when applied to marital bargaining predicts that changes in the legal regime change will have no effect on divorce rates. However, the empirical results in support of the Coase Theorem for this case are mixed. Peters (1986) argues that the regime change from consent divorce laws to no-fault divorce laws did not have an impact on divorce rates in the U.S. Allen (1992) disagreed with Peters' findings, but was subsequently, rebutted by Peters (1992). On the other hand, Friedberg (1998) asserts that changes in the legal regime to allow unilateral divorce explains 17 percent of the increase in divorce rates in the sample period. More recently, Wolfers (2003) suggests that unilateral divorce laws cannot explain much of the rise in the U.S. divorce rate.

Although the Japanese divorce rate has also increased significantly over the last 40 years, there appears to be little literature in English examining the reasons for and the effects of this increase in the divorce rate (apart from Ogawa and Ermisch (1994)). This paper examines what factors might

have caused the increase in the Japanese divorce rate. Following previous studies in the U.S., this paper investigates the effects of increases in the earnings ability of women and changes in the legal regime on the divorce rate. It is said that the Japanese legal system has also been shifting to a no fault divorce regime. This regime change is not because of changes in the law, but rather is the result of case law, and can be highlighted by a legal precedent established in 1987 when the Japanese Supreme Court granted a divorce in a case where the divorce petition had been lodged by the culpable spouse. Using time series techniques, this paper examines the extent to which the transition from fault divorce to no fault divorce can account for the increase in the divorce rate in Japan.

This paper uses time series data for testing the Coase Theorem. Using legal precedents for divorce cases decided by the Supreme Court and High Courts in Japan, a legal precedent index is constructed to capture the shift from a fault divorce regime to no fault divorce regime.

Section 2 provides some of the key features of the Japanese legal system concerning divorce. Section 3 discusses the identification strategy, the models to be estimated, and the data. Section 4-1 reports the results of estimation used to create the legal precedent index, and section 4-2 reports the results of a time series analysis of the divorce rate. A brief conclusion is contained in section 5.

2. DIVORCE IN JAPAN

Japan's divorce law is contained in Articles 763-771 of the Japanese Civil Code (Minpo). It provides for two principal types of divorce: divorce by consent (Kyogi-rikon) and divorce by legal suit (chotei-rikon). In Japan, if there is mutual agreement between the parties, it is possible to dissolve marriage without a legal suit.

If the parties fail to reach a mutual agreement concerning their divorce, the couple concerned can request the Family Court to mediate their case. If the mediation by the Family Court fails, the Family Court has the authority to decide whether a divorce should be granted. A divorce is completed by a Family Court decision when a divorce cannot be established by mediation. From this stage, the divorce case becomes a public court case. If the Family Court's judgment is rejected by one of the parties, an appeal can be lodged and the District Court takes over the case.

According to Article 770 of the Japanese Civil Code, there are only five grounds for a contested

divorce: infidelity; malicious abandonment; whereabouts unknown; serious mental illness and serious misconduct. Applying the Civil Code, the District Court allocates assets and determines which party is responsible for the breakdown of the marriage. Either party in the divorce has the right to appeal to a higher court against any decision made in a lower court, and an appeal can be made all the way up to the Supreme Court. Between 1949 and 2005, there were 33 divorce cases where both parties were Japanese that were appealed all the way to the Supreme Court.

It is worth noting that very few divorce cases actually reach the District Court. Most (around 90%) divorces are settled by mutual agreement, whereas only around 1% of cases are appealed to a District Court. Given the extremely small number of District Court cases, it might be argued that judicial judgments have little, if any, impact on people's decisions on marital dissolution as most divorces are by mutually consent

Changes in the probability that a District Court is likely to grant a divorce in a particular case will affect the costs and benefits of both parties when they go to court, especially if the loser has to pay the court costs of the winner (see Posner (1998) and Ramseyer (2000) for general discussions of settlements). It is, however, possible to argue that if the probability of being granted divorce in a court case increases, then people will be more likely to reach mutual agreement in order to save the significant transaction costs that result from court cases.

3. ESTIMATION STRATEGY AND THE MODRELS
3.1. Time Series Analysis

As Becker *et al.* (1977) outline in their theory of divorce, "a couple dissolves their marriage if, and only if, their combined wealth when dissolve exceeds their combined married-wealth". For married women who do not work, increases in the labour force participation rate of women, women's wages and the educational level of the woman concerned will increase the expected earnings of women who divorce her husband and then begin to work. By increasing the benefits associated with divorce, these factors can be expected to increase the divorce rate.

Given the assumptions of symmetric information and no transaction costs, the Coase (1960) Theorem suggests a change in the law from fault divorce to no fault divorce will not increase the divorce rate, but would only change the distribution of property rights.

This paper conducts time series analysis for testing whether the Coase Theorem applies to divorce law in Japan. Previous studies of the divorce rate in other countries typically include female labour force participation, female income, male income, birth rates, and the unemployment rate as explanatory variables in a divorce equation (see, for example, Bremmer and Kesselring (2004) and Jr-Tsung (2003)). In specifying an equation to explain movements in the divorce rate, this paper follows these existing studies. Moreover, this paper views divorce form women's point of view as around 70 percent of divorce petitions are made by wives.

The following cointegration relationship is postulated:

$$DIV_t^* = \beta_0 + \beta_1 PRED_t + \beta_2 U_t + \beta_3 FLFPR_t$$
$$+ \beta_4 FRE_t + \beta_5 \left(RFINC_t / RMINC_t \right) + v_t \quad (1)$$

where DIV_t is the divorce rate in Japan in year t (includes divorce by mutual agreement, divorce by mediation and divorce by court judgement), PRED is the probability of a divorce suit being successful, U_t is the unemployment rate, $FLFPR_t$ is the female labour force participation rate, FRE_t is the ratio of female regular workers to the population aged 15 or more, $RFINC_t$ [$RMINC_t$] is the real monthly income of females [males] computed as the female [male] monthly income divided by the consumer price index, and v_t is an error term. If the Coase's Law holds for divorce law in Japan, then an increase in the probability of a divorce suit being successful should have no impact so that $\beta_1 = 0$ is expected to hold. In the presence of transactions costs, as a result of changing the cost and benefits of going to court, it is expected that PRED has a positive impact on the divorce rate, that is, $\beta_1 > 0$. If the divorce is pro - (counter-)cyclical, then β_2 is expected to be negative (positive). Increases in the female labour participation rate suggest that it is easier for married wives who are not working to obtain a job if they divorce, increasing the benefits of divorce and thus increasing the divorce rate, that is, $\beta_3 > 0$. Similarly, increases in the ratio of female regular workers can be expected to enhance the bargaining position of women, and lead to increases in the divorce rate, that is, $\beta_4 > 0$. Increases in female income relative to male income can also be expected to have similar effects, so that $\beta_5 > 0$ is expected.

Details of the data and their sources are summarized in Table 1. Equation (1) is estimated by ordinary least squares (OLS), and then an

Engle-Granger (1987) test is applied to the residuals from this model to test whether v_t is an I(0) or I(1) process. If v_t is found to be an I(0) process, then equation (1) can be interpreted as a long-run relationship, and an error correction model for DIV_t is then estimated. If v_t is found to be an I(1) process, then equation (1) as it stands cannot be interpreted as a long-run relationship, and a differenced model for DIV_t is then estimated.

However, there is a problem with using the female labour force participation rate in this analysis. The female labour force participation rate has not really increased over the past 40 years due to the aging population. It does not reflect the fact that women have taken more active roles in the labour market. The problem is that the participation rate does not reflect changes in the composition of the female workforce with a higher proportion of females being employed as regular workers. Thus, the female regular employment rate is used to examine the increase in divorce rate.

3.2. Legal Precedent Index

In order to test the Coase Theorem, there is a need to construct a proxy variable to capture the regime change from fault divorce to no fault divorce. This paper uses published legal precedents relating to divorce cases decided by the Supreme Court and High Courts to create an index. The *Judicial Information System* of *Dai Ichi Hoki* database is used to pick up relevant precedents between 1949 and 2005. Among divorce related cases that were decided by the High Courts and Supreme Court, we limit the precedents to those picked up by the keyword "divorce petitions" (rikon seikyu). We also eliminated the divorce cases where one of the parties was a foreigner since the reasons these cases are taken to the District Court and higher courts, for example, obtaining Japanese citizenship or retaining residence in Japan, are quite different from those where both parties are Japanese.

In September 1987, the Supreme Court handed down a historic decision in relation to divorce requests by culpable spouses (*Kono v. Kono* (Supreme Court, 2 September 1987). Prior to this decision, Japanese courts had not granted divorce in response to requests by culpable spouses. In September 1987, the Supreme Court stated the conditions for granting divorce to a culpable spouse were: (1) the period the parties had been separated was sufficiently long enough; (2) there are no minor child; and (3) the divorce does not place the other party in a mentally, socially, and economically severe situation.

Using the *Judicial Information System* of *Dai Ichi Hok* database, judgments handed down by the High Court and the Supreme Courts between 1949 and 2005 in divorce cases picked up by the "divorce petitions" keyword were examined. This resulted in 162 judgments, of which 33 were made by the Supreme Court. Where possible, data was collected on the following variables: the date of the judgment, for High Court judgments the region of the High Court, where there were children in the marriage which parent was granted child custody, whether the divorce suit had been lodged by a party that was at fault, the sex of the claimant, the birthday of both spouses, the length of the couple's separation, the length of the couple's cohabitation, the number of minor children, the number of adult children, whether the defendant was sick, and whether the defendant was suffering from a mental illness.

Various special cases of the following model were estimated:

$$DIV_i^* = \gamma_0 + \gamma_1 CLAIM_i + \gamma_2 CULP_i + \gamma_3 SEPY_i$$
$$+ \gamma_4 DMAJOR_i + \gamma_5 \left(DMAJOR_i * CULP\right)$$
$$\gamma_6 \left(DMAJOR_i * SEPY_i\right) + w_i \qquad (2)$$
$$DIV_i = 1 \quad \text{if } DIV^*_i > 0$$
$$\qquad\qquad\qquad\qquad\qquad (3)$$
$$= 0 \quad \text{if } DIV^*_i \leqq 0$$

where DIV^*_i is an unobserved latent variable, $CLAIM_i$ is a 0-1 dummy variable taking the value unity if the divorce suit is lodged by the husband and zero otherwise; $CULP_i$ is a 0-1 dummy variable taking the value unity if the divorce suit is lodged by a culpable party and zero otherwise, $SEPY_i$ is the number of years that the couple have been separated, $DMAJOR_i$ is a 0-1 dummy variable taking the value unity for all cases decided on and after the Supreme Court's path breaking decision in September 1987 and zero otherwise., DIV_i is a 0-1 dummy variable taking the value unity if the divorce suit is approved by the court and zero otherwise, and w_i follows a standard normal distribution. It is expected that compared to a suit lodged by a party that is not at fault, a culpable party has a lower probability of succeeding (γ_2 <0), and that as the years of separation increase the likelihood of a divorce being granted increase (γ_3 >0). The landmark nature of the Supreme Court's decision in September 1997 suggests that after the decision culpable parties have a higher likelihood of winning (γ_4 >0) and years of separation will have more value (γ_5 >0). The assumption that w_i follows a standard normal distribution means that (2) and (3) can be estimated as a probit model.

4. RESULTS

Section 4.1 presents the results of estimating models to explain the outcomes of the court cases and also how the precedent based index was constructed, while section 4.2 presents the results of estimating equation (1).

4.1. Estimates of Probit Models

The results of estimating various special cases of equations (2) and (3) are presented in Table 2. Equation (4-1) in Table 2 would appear to indicate that males lodging a divorce suit have a lower probability of succeeding, but it should be pointed out of the 156 cases analysed in equations (4-1) and (4-2), males lodged the suit in 112 of the cases. When the lodging party was culpable (68 cases), they were much more likely to be male (60 cases). So in equation (4-2), it is found that compared to parties that are not at fault, culpable parties lodging a suit are much less likely to have their claim upheld. This finding appears to be quite robust as can be seen in equations (4-3) to (4-5).

In line with the Supreme Court's 1987 decision, equation (4-3) includes the years of separation and it can be seen that an increase in the number of years of separation increases the likelihood of the suit being approved. However, including this variable leads to a sizeable reduction in the number of observations that can be analyzed. If it is true that the Supreme Court decision in 1987 was really a landmark change, it might be expected that there would be some structural change in the model estimated in equation (4-3). Equations (4-4) and (4-5) seek to pick up the impact of structural change. Equations (4-4) and (4-5) suggest the major impact of the Supreme Court's decision in 1987 was to increase the probability that suits lodged by culpable parties would succeed.

With this structural change is mind, equation (4-3) was estimated recursively starting with the first 40 observations and then successively increasing the number of observations used to estimate the model by one. For a "model divorce suit" which assumed the couple had been separated ten years (roughly the sample mean) and the party lodging the suit was culpable, the probability of the suit succeeding was estimated using each set of recursive estimates of equation (4.3). Since divorce suits are sometimes concentrated in particular years and do not occur in other years, the estimated probabilities from recursively estimating equation (4-3) are then mapped into annual data, with the result being reported in Figure 1. In performing this mapping, the estimated probability of success for any year is obtained as the estimated probability computed using all the data available up until the end of the previous year. In line with our expectations, the probability of a divorce suit being successful increases substantially after 1987. The predicted success rate in 1987 was 0.072 against a rate of 0.251 in 2006. The estimates in Figure 1 are now used in the time series model used to explain movements in the divorce rate in Japan.

4.2. Time Series Model of the Divorce Rate

Using the estimation technique suggested by Engle and Granger (1987), equation (1) was estimated by ordinary least squares (OLS), and the results are presented in Table 3. The Engle-Granger test suggests that this relationship can be interpreted as a long-run cointegrating relationship. The standard errors associated with the estimated coefficients are not so meaningful in this case, but are presented as a guide to the significance of the variables. It should be noted that PRED and RFINC/RMINC can be eliminated from equation (1) without causing the finding of cointegration to change suggesting that these variables do not have a long-run impact on DIV. However, removing one of U, FLFPR or FRE will cause the relationship to have an error with a unit root. This suggests that the coefficients of U, FLFPR and FRE in the long-run relationship are all non-zero.

The sign of the estimated coefficient of unemployment suggests that unlike Becker's (1988) finding for other developed countries, divorce rates in Japan are counter-cyclical, that is, when unemployment rises the divorce rate rises. One interpretation for this is that when the unemployment rate rises leading to unemployment for the breadwinner husband (or an increased expectation that the breadwinner husband will become unemployed) the benefits of staying in the marriage are significantly reduced. Increases in the ratio of women employed as regular workers leading to increases in the divorce rate are consistent with the interpretation that an in increase in this ratio indicates that a non-working wife will have a higher change of being employed as a regular worker in the case of a divorce. The only potential problematic sign is the negative coefficient on the female participation, but changes in the female participation rate have two possible effects: the probability of non-working wives finding a job but remaining in the marriage may increase leading to an increase in the benefits of staying in the marriage; and/or the probability of non-working wives finding a job but divorcing leading to an increase in the benefits of divorcing.

That is, this variable can have an impact on the benefits of staying in the marriage and divorcing.

For the sake of completeness, Table 4 presents estimates of an error correction model for the divorce rate. One key finding in this model is that the error correction term, ECM(-1), is significant. In addition, the estimates suggest that short-run movements of the divorce rate are influenced principally by changes in the unemployment rate.

While the estimates presented in Tables 3 and 4 use all the available annual data available, it should be pointed out that the number of observations used to estimate the model is rather small, 40, and way below the number of observations usually considered acceptable for time series analysis involving unit roots and cointegration. A key finding is that PRED is not significant here, so that changes in the estimated probability of winning a divorce suit influence neither long-term nor short-term movements of the divorce rate in Japan.

5. CONCLUSION

This paper has examined why the Japanese divorce rate has increased overt the past 40 years. The analysis is in two parts, first an analysis is conducted of decisions of the High Courts and Supreme Court to estimate the probability of a divorce suit being successful. This estimated probability is then used in a time series model of the divorce rate. It is found that the estimated probability has neither a long-run nor a short-run impact on the divorce rate in Japan. This result is consistent with the prediction of the Coase Theorem that changes in the legal regime may not have any impact.

In order to increase the number of observations in the time series analysis, the analysis could be extended to using monthly data. Since some data is available on divorce rates at the prefectural level, it is also possible to extend the analysis to a panel data analysis. While the law applicable across Japan is the same, it is possible that High Courts with limited regional jurisdictions apply use their legal discretion in slightly different ways that might be reflected in differences in regional divorce rates.

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Table 1: Data and Sources for Analysis

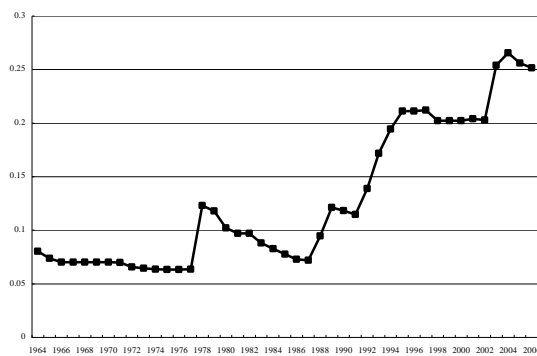|	Defnitions	Sources
DIV	divorce rates (per 1,000 population)	Vital Statistics
U	unemployment rate	Labour Force Survey
FLFP	female labour force participation rate	Labour Force Survey
REGRAT	100*(female regular employees/15 years old above population)	Labour Force Survey
MINC	male monthly income	Basic Survey on Wage Structure
FINC	female monthly income	Basic Survey on Wage Structure
CPI	consumer price index	Consumer Price Index
PRED	predicted values of divorce equation	Judicial Information System
CLAIM	sex of the claimer (husband=1, wife=0)	Judicial Information System
CULP	dummy variable for petitions from culpable spouse=1	Judicial Information System
SEPY	years of separation	Judicial Information System
RMINC	MINC/CPI	
RFINC	FINC/CPI	
PRED	Probability of a divroce suit	Computed from legal precedents
DMAJOR	dummy variable for the 1987 Supreme Court ruling (thereafter=1)	Judicial Information System

Figure 1: Legal Precedent Index (CULP=1, SEPY=10)

Table 2: Binary Probit Model of Divorce Granted (Quadratic hill climbing)

	(4-1) Coef	(4-1) Std. Error	(4-2) Coef	(4-2) Std. Error	(4-3) Coef	(4-3) Std. Error
Constant	0.748	0.209***	1.030	0.227***	0.460	0.216**
CLAIM	-0.815	0.241***	-	0.262*	0.449	
CULP			-1.225	0.228***	-1.595	0.290***
SEPY					0.047	0.018***
Observations	156		156		114	
Log likelihood	-101.05		-85.96		-61.62	

Table 2: Continued

	(4-4) Coef	(4-4) Std. Error	(4-5) Coef	(4-5) Std. Error
Constant	0.371	0.228	0.382	0.274
CLAIM				
CULP	-2.443	0.428***	-2.454	0.466***
SEPY	0.061	0.021***	0.061	0.027**
DMAJOR			-0.049	0.514
DMAJOR*CULP	1.420	0.428***	1.476	0.705**
DMAJOR*SEPY			-0.001	0.044
Observations	114		114	
Log likelihood	-55.31		-55.31	

Notes: *, **, and *** indicate the coefficient is significant at the 10%, 5%, and 1% significance level, respectively.

Table 3: Time Series Analysis of Divorce

	Coefficient	Std. Error	
Constant	1.071	0.731	
PRED	0.102	0.400	
U	0.278	0.022	***
FLFPR	-0.021	0.012	*
FRE	0.037	0.010	***
RFINC/RMINC	-0.551	0.671	
Sample Period	1964: 2006		
observations	43		
$\overline{R}^2$	0.977		

Engle-Granger (1987) test statistic   -4.98
5% critical value for Engle-Granger test (see Hamilton (1994, Table B.9)   -4.40
Notes: *, **, and *** indicate the coefficient is significant at the 10%, 5%, and 1% significance level, respectively.

Table 4: Error Correction Model for Divorce Equation

	Coefficient	Std. Error	
Constant	0.013	0.012	
$\triangle$DIV(-1)	0.980	0.187	***
$\triangle$PRED(-1)	-0.570	0.503	
$\triangle$U(-1)	-0.105	0.050	**
$\triangle$FLFPR(-1)	-0.011	0.019	
$\triangle$FRE(-1)	-0.008	0.024	
$\triangle$ (RFINC(-1) / RMINC(-1))	-0.275	0.439	
ECM(-1)	-0.412	0.138	***
Sample Period	1966:2006		
Observations	41		

$\overline{R}^2$	0.420		

Notes: *, **, and *** indicate the coefficient is significant at the 10%, 5%, and 1% significance level, respectively.