

Individuals who proactively make their own long term decisions on asset accumulation tend to make their decisions based on their predicted financial needs as they expect in their future plans. Therefore, these individuals may be more inclined to manage their own assets using a lump-sum capital.

Hypothesis 2: Individuals who lay out their specific future plans are more likely to cash out their pension capital.

Weaker demand for pension annuity could result from risk-sharing behaviors among household members, particularly in a household of double earners with full-time income jobs (Kotlikoff and Spivak, 1981, Brown and Poterba, 2000). A typical double-earner household in Japan is characterized by full-time employed husband and part-time employed wife. It is expected however that the annuity choice based on risk-sharing optimization could be achieved only for the couples with full-time jobs for both spouses. Thus, our third hypothesis is:

Hypothesis 3: An employee with a spouse with a full-time job is more likely to choose a lump-sum payout and less likely to choose annuity.

Kaneko (1999) finds that a lump-sum retirement cash-out in Japan is primarily used for the payment of mortgage loan and financing education for children. In practice, some provisions which determines the individual corporate pension plans in detail permit the form of a lump-sum cash-out only for the usages of mortgage loans and financing children's education in Japan. As a consequence, the liquidity constraints are considered to have an impact on annuity choice of corporate pension

plans. Employees with mortgage loans and more dependent children are more likely to choose a lump-sum payout than those with no mortgage and a fewer children. The number of children is also related to bequest motives. Thus, a married employee with children is more likely than others to choose a lump-sum payout due to the bequest motive.

Moreover, Turra and Mitchell (2004) point out the importance of medical expenses in the post-retirement period. Longevity in Japan, in comparison with any other developed countries, raises a serious concern for an expected increase in medical expenses. As a result, it is expected that the coverage by private medical insurance plans alleviate the needs of precautionary savings for future medical expenses. Therefore, employees with a medical insurance coverage are more likely to choose annuity rather than a lump-sum, relative to those with no medical insurance.

Hypothesis 4: Liquidity constraints, due to mortgage loan and financing for children's education, impose a negative impact on annuity choice, and precautionary savings for future medical expenses have a positive impact on the choice of annuity.

A typical Japanese company provides an S-shaped compensation path, with employee's salary and retirement payout increasing rapidly after a certain period of service length. In particular, the eligibility to receive a corporate pension benefit in the form of annuity is given to employees with a certain years of service to the company. Therefore, an employee with longer tenure is likely to have an annuity option. As a consequence, long tenure is expected to have a positive impact on the choice of annuity.

In contrast, individuals with higher turnover, particularly those who voluntarily quit from previous employers, are expected to choose a lump-sum payout.

Hypothesis 5: Employees with longer tenure are more likely to choose annuity than those with short tenure. Employees with a higher inclination to change jobs are less likely to choose annuity.

The following section examines the above hypotheses based on multivariate estimation results.

Estimation Results

An empirical investigation of annuity choice involves the standard bivariate probit estimation. The dependent variable is set to equal 1 if an employee expects to receive partial or full pension benefit in the form of annuity, and 0 if one chooses a lump-sum. Table 2 shows the estimation result with AEW, age, marital status, education dummies, and occupation dummies as explanatory variables. The first column shows that the AEW has a positive impact on annuity choice, which is consistent with the theory and previous findings. The second column indicates that the positive effect of AEW on annuity choice is robust even after controlling employees' age, marital status, college graduation status and occupation types. Older workers are more likely to choose a lump-sum, and married manager are more likely to choose annuity compared to unmarried clerical workers.

The third and fourth columns in table 2 show the robustly positive and significant effect of AEW on annuity choice, regardless of the inclusion of the demographic (age,

marital, college and occupation) controls. The knowledge of employees' corporate retirement benefits shows a positive and marginally significant effect without the demographic variables, but the significance disappears when the covariates are included. Moreover, it is important to note that the variable is a proxy for individual knowledge on retirement plans, based on whether the related information was provided by employers. Therefore, the proxy variable may not be capturing the true effect of pension knowledge on annuity choice. Nonetheless, the result indicates that dissemination of information may have a positive impact on individual annuity choice through enhancement of related knowledge. The result only weakly supports our first hypothesis.

The last column in table 2 shows that employees who have more or less clear vision of their future plans are more likely to choose a lump-sum pension payout rather than choosing annuity. The result shows a marginal significance, but our finding supports the second hypothesis that individuals with a clear and longer horizon tend to self-manage own assets rather than expecting to receive a periodically paid out annuity. The result supports our second hypothesis.

In order to examine the impact of risk-sharing among household members on individual annuity choice, a binary variable for existence of a "spouse with a full-time job" is included in the estimation. The existence of a spouse with a full-time job, with the full coverage of retirement pension, is expected to have a negative impact on individual choice of annuity. As predicted, the first column in table 3 shows a significant and negative effect, suggesting that married individuals consider their

spouse's post-retirement income sources. Therefore, the result supports our third hypothesis on the risk-sharing in a double-income household.

The second and third columns in table 3 examine the impact of liquidity constraints, due to mortgage loan and children's educational expenses, on individual choice of annuity. The result in the second column shows an intuitively opposite coefficient, indicating that employees with mortgage loans are more likely than those without mortgage loans to choose an annuity. This may be due to financial knowledge obtained by individuals who managed to finance the purchase of houses. Purchasing a house entails profound investigation and information collection as to the possible future income streams. This process may help individuals gain significant knowledge on the values of annuity and a lump-sum payoff from their pension plans, helping them realize the advantage of withdrawal in the form of annuity. Also, for individuals with a longer horizon, the relationship between mortgage loans and annuity choice is negative. After controlling for the effect of mortgage loans and the interaction between mortgage loans and future plans, having a longer horizon itself has no significant effect on individual annuity choice. The third column in table 3 shows the effect of children living in a household on respondent's annuity choice, as a proxy for another source of liquidity constraints. The result indicates a positive but insignificant effect on the choice of annuity. Consequently, our findings suggest that the liquidity constraints from mortgage loans and children's educational expenses have little impact on individual choice of corporate pension annuity in Japan.

The fourth specification in table 3 examines the effect of precautionary savings for

future medical expenses on employees' choice of pension annuity. A variable showing whether an employee purchased a voluntary medical plan is used as a proxy for the existence of precautionary savings for future medical expenses. The result shows a positive and significant effect of precautionary savings on annuity choice, supporting our hypothesis. Because these medical plans partially cover employees' medical expenses in the future, the covered individuals' demand for lump-sum cash will be reduced, increasing the demand for annuity instead.

Finally, the impacts of long tenure and job change on annuity choice are examined. Table 4 shows that employee's tenure has positive and significant effect on annuity choice. Moreover, employees with a higher inclination to change jobs are more likely to choose a lump-sum payout rather than choosing annuity. These findings are consistent with our argument and hypothesis.

Conclusions

This paper analyzes the role of corporate pensions and tested the rationality of employee choice of payout options in the Japanese corporate pension plans. Using the data set which contains information on individual backgrounds, we find strong impact of annuity value, risk-sharing within families, and precautionary savings on individual choice of annuity. Also, estimation results indicate that preference for annuity would be enhanced by improving worker knowledge of the benefit and their financial literacy. We find no evidence that home purchase and educational expenditure for children, which are generally thought to be primary reason for choosing lump-sum in Japan, has

negative impact on annuity choice. From our findings, individual annuity decisions are rational, although there is much to be done to improve individual preference for annuity to supplement their post-retirement income.

In order for corporate pension plans to further supplement the public pension benefits in a rapidly aging Japanese society, it is imperative that employee knowledge of pension systems and financial commodities be significantly improved; introduction and expansion of voluntary medical insurance plans would also enhance employee choice of annuity. Our findings also reveal that employees' tenure has a positive impact on annuity choice, while employees with high job turnover tend to choose a lump-sum payment. If the observed patterns of individual pension payouts is the result of the sorting effect (Ippolito, 1997), employers may implement a pension scheme, e.g., DB or DC pension, which optimizes the pension costs and employee turnover.

References

- Bernheim, D.D. (1991). How Strong Are Bequest Motives? Evidence Based on Estimates of the Demand for Life Insurance and Annuities. *The Journal of Political Economy*, 99(5), 899-927.
- Brown, J. R. (2001). Private Pensions, Mortality Risk and the Decision to Annuities. *Journal of Public Economics*, 82, 22-62.
- Brown, J.R. and Poterba, J.N. (2000). Joint Life Annuities and Annuity Demand by Married Couples. *Journal of Risk and Insurance*, 67(4), 527-553.
- Buetler, M. and Teppa, F. (2007). The Choice Between an Annuity and a Lump Sum: Results from Swiss Pension Funds. *Journal of Public Economics*, 91, 1944-1966.
- Dushi, I. and Webb, A. (2004). Household Annuity Decisions: Simulations and Empirical Analysis. *Journal of Pension Economics and Finance*, 3(2), 109-143.

- Finkelstein, A. and Poterba, J. N. (2002). Selection Effects in the Market for Individual Annuities: New Evidence from the United Kingdom. *Economic Journal*, 112, 28-50.
- Hurd, M., Lillard, L., and Panis, C. (1998). An Analysis of the Choice to Cash Out Pension Rights at Job Change or Retirement. RAND Discussion Paper DRU-1979-DOL.
- Inkmann, J., Lopes, P. and Michaelides, A. (2007). How deep is the Annuity Market Participation Puzzle? Netspar Discussion Paper 2007-011
- Ippolito, R. A. (1997). Pension Plans and Employee Performance: Evidence, Analysis and Policy. The University of Chicago Press.
- Kotlikoff, L.J. and Spivak, A. (1981). The Family as an Incomplete Annuities Market. *Journal of Political Economy*, 89(2), 372-391.
- Mitchell, O.S., Poterba, J.M., Warshawsky, M., and Brown, J.R. (1999). New Evidence on the Money's Worth of Individual Annuities. *American Economic Review*, 89(5), 1299-1318.
- Mitchell, O.S. (1988). Worker Knowledge of Pension Provisions. *Journal of Labor Economics*, 6(1), 21-39.
- Turra, C. M. and Mitchell, O.S. (2004). The Impact of Health Status and Out-of-Pocket Medical Expenditures on Annuity Valuation. University of Michigan Retirement Research Center Working Paper 2004-086.
- Yaari, M. (1965). Uncertain Lifetime, Life Insurance and the Theory of the Consumer. *Review of Economic Studies*, 32, 137-150.
- Kaneko, Y. (1999). Chūkōnensha no Tenshoku to Kigyō Nenkin no Shito · Kigyō Nenkin no Chochiku Bunseki, *Nenkin to Koyō*, 17(4), 13-21.

Table 1. Summary statistics

n = 864	Mean	S.D.	Min.	Max.
AEW	1.05	.02	1.03	1.18
Annuity choice (Yes = 1)	.47	.50	0	1
Public pension (x 10,000 yen)	211.41	24.13	153	290
Lump-sum (x 10,000 yen)	949.53	754.38	5	5,000
Corporate pension (x 10,000 yen)	78.61	62.49	0	414
Life annuity (Yes = 1)	.10	.30	0	1
% Pre-annuitized	.76	.14	.29	1.00
Male (Yes = 1)	.72	.45	0	1
Age	40.58	10.34	19	70
Married (Yes = 1)	.64	.48	0	1
Spouse with full-time job (Yes = 1)	.34	.47	0	1
Number of children	.99	1.06	0	4
College degree and over (Yes = 1)	.60	.49	0	1
Mortgage loan (Yes = 1)	.36	.48	0	1
Medical insurance coverage (Yes = 1)	.27	.45	0	1
Pension knowledge (Yes = 1)	.25	.43	0	1
Job change (Yes = 1)	.41	.49	0	1
Current financial asset (x 10,000 yen)	685.37	1,227.4	0	13,000
Future plan (Yes = 1)	.50	.50	0	1

Source: *Survey on Employer Sponsored Fringe Benefits 2002*, The Japan Institute of Life Insurance.

Table 2. Impact of pension knowledge on annuitization

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5	Spec. 6
n = 864	19.22 *** (7.56)	21.08 *** (7.09)	19.11 *** (7.64)	20.77 *** (7.03)	19.02 *** (7.63)	20.70 *** (7.02)
AEW						
Age	.009 *** (-4.18)	.009 *** (-4.18)	.006 *** (-3.30)	.009 *** (-4.27)	.006 *** (-3.07)	.009 *** (-4.09)
Pension knowledge (Yes = 1)			.078 * (1.86)	.065 (1.52)	.082 * (1.94)	.070 (1.62)
Future plan (Yes = 1)					-.043 (-1.18)	-.061 (-1.64)
College degree and over (Yes = 1)		.043 (1.11)		.040 (1.02)		.045 (1.15)
Married (Yes = 1)		.077 * (1.85)		.076 * (1.84)		.083 * (1.99)
Occupation dummies (omitted = Clerical):						
Manager		.143 *** (2.88)		.138 *** (2.78)		.141 *** (2.82)
Sales		.024 (.40)		.017 (.29)		.016 (.27)
Engineer		-.044 (-.54)		-.049 (-.61)		-.051 (-.63)
Specialist		-.006 (-.080)		-.005 (-.06)		-.001 (-.01)
Other		.193 (1.20)		.184 (1.14)		.181 (1.12)
Log likelihood		-533.20	-526.47	-517.70	-525.77	-516.36
Pseudo R ²	.108	.132	.119	.134	.120	.136

Reported coefficients are the marginal effect of the probit. Numbers in parentheses are t-ratios.
 *** significant at the .01 level; ** significant at the .05 level; * significant at the .10 level.

Table 3. Impact of liquidity constraints, precautionary savings and intra-family risk-sharing on annuitization

	Spec. 1	Spec. 2	Spec. 3	Spec. 4
n = 864				
AEW	23.00 *** (6.23)	23.35 *** (6.25)	23.35 *** (6.25)	23.47 *** (6.16)
Age	-.009 *** (-4.02)	-.009 *** (-4.24)	-.009 *** (-4.24)	-.010 *** (-4.49)
Pension knowledge (Yes = 1)	.066 (1.53)	.066 (1.54)	.067 (1.55)	.065 (1.49)
Future plan (Yes = 1)	-.061 (-1.64)	-.018 (-0.38)	-.018 (-0.38)	-.022 (-0.47)
Spouse with full-time job (Yes = 1)	-.080 * (-1.74)	-.078 * (-1.69)	-.078 * (-1.67)	-.083 * (-1.75)
Mortgage loan (Yes = 1)		.149 ** (2.50)	.148 ** (2.46)	.146 ** (2.40)
Future plan × Mortgage loan		-.131 * (-1.68)	-.131 * (-1.67)	-.133 * (-1.69)
Number of children at home			.0001 (0.06)	.004 (.16)
Medical insurance (Yes = 1)				.129 *** (3.06)
Married (Yes = 1)	.075 * (1.77)	.045 (1.02)	.044 (.91)	.036 (.74)
Education dummies	Yes	Yes	Yes	Yes
Occupation dummies	Yes	Yes	Yes	Yes
Log likelihood	-514.80	-511.64	-511.64	-506.94
Pseudo R ²	.139	.144	.144	.152

Reported coefficients are the marginal effect of the probit. Numbers in parentheses are t-ratios.

*** significant at the .01 level; ** significant at the .05 level; * significant at the .10 level.

Table 4. Impact of tenure and job turnover on annuitization

n = 864	Spec. 1	Spec. 2
AEW	23.54 *** (6.06)	22.60 *** (5.99)
Age	-.010 *** (-4.42)	-.011 *** (-4.15)
Pension knowledge (Yes = 1)	.060 (1.38)	.045 (1.01)
Future plan (Yes = 1)	-.032 (-.67)	-.062 (-1.60)
Spouse with full-time job (Yes = 1)	-.100 ** (-2.09)	-.066 (-1.37)
Mortgage loan (Yes = 1)	.153 ** (2.55)	.145 ** (2.39)
Future plan×Mortgage loan	-.136 * (-1.72)	-.138 * (-1.74)
Medical insurance (Yes = 1)	.128 *** (3.04)	.119 *** (2.78)
Current financial asset (x 10,000)	.000 ** (2.25)	.000 * (1.82)
Number of children	-.018 (-.75)	-.015 (-.61)
Tenure		.003 * (1.85)
Job change (Yes = 1)		-.140 *** (-3.51)
Married (Yes = 1)	-.100 ** (-2.09)	.052 (1.03)
Education dummies	Yes	Yes
Occupation dummies	Yes	Yes
Log likelihood	-504.01	-494.40
Pseudo R ²	.157	.173

Reported coefficients are the marginal effect of the probit. Numbers in parentheses are t-ratios.

*** significant at the .01 level; ** significant at the .05 level; * significant at the .10 level.

Female Labor Market Conditions and Family Formation

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Abstract

Slack labor market conditions for women relative to men increase marriage rates for young women. One concern is that this increase may be from marginal marriages due to some females lowering their reservation match quality, and so lead to future divorces and possibly to increases in female headship and poverty. This paper examines the long-term consequences of such marriages using data from the Survey of Income and Program Participation and the Panel Study of Income Dynamics. I find that the marriages induced by relatively poor economic conditions for women reflect shifts in the timing of marriage among young women who would eventually marry anyway. Labor market conditions at age 18-20 do not affect the fraction of women who will marry by age 30. Further, labor market conditions at marriage are uncorrelated with the probability of divorce or with spouses' characteristics, and marrying young in response to labor market shocks does not significantly affect a woman's fertility or labor supply. These findings are consistent with a model in which economic conditions affect women's search intensity without affecting their reservation match quality.

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1 Introduction

Most developed countries have experienced a substantial long-run decline in the marriage rate associated with women's improved position in the labor market. This effect also exists in the short run: Better labor market opportunities for women relative to men decrease the fraction of married women in the local labor market (Schultz 1994, Blau, Kahn and Waldfogel 2000). These effects on marriage incidence are often interpreted as changes in the number of women who will ever marry. For example, many studies on the effect of labor market conditions on marriage formation, including Blau et al (2000) and Schultz (1994), have referred to the increased number of single mothers as a motivation for studying marriage incidence. Yet, whether a decline in marriage incidence for young women really increases the number of single mothers depends on whether it decreases the number of women who will enter stable marriages during their lifetimes. Although the contemporaneous effects of labor market conditions on marriage incidence are well-documented, there remains much to learn about how labor market conditions in youth affect transitions in marital status in the long run.

This paper examines the long-term consequences of marriages induced by temporary labor market fluctuations. If a negative shock to the female labor market induces some couples who would not marry otherwise to marry, it may increase the probability of future divorce. However, it is possible that economic conditions only shift the timing of marriage without affecting the total number of marriages ever formed by women in the affected cohort. Acceleration in the formation of stable marriages has quite different implications for demographic trends and public welfare than an increase in poorly matched, short-lived marriages. Since previous analyses relied on cross-sectional data, they were not able to distinguish between the two. To overcome this limitation, this paper exploits individual women's marriage histories taken from the Survey of Income and Program Participation (SIPP) and the Panel Study of Income Dynamics (PSID), which are linked with unemployment rates by gender at the state-year level.

Using these data, I confirm that young women are more likely to marry when labor market conditions for women are bad relative to those of men. Despite this contemporaneous effect on the marriage rate, gender-specific unemployment rates at the time of marriage are not systematically

correlated with the probability of divorce later in life. Also, unemployment rates by gender at age 18-20, when these women enter the marriage market, do not affect the fraction who will marry by age 30 in the affected cohort. These findings suggest that increases in the incidence of marriage due to gender-specific labor market shocks are primarily due to acceleration in the timing of marriage among people who would eventually marry without these shocks and that they are due to increased search effort rather than decreased reservation match quality. I also find that the contemporaneous effects on marriage incidence for women older than 24 are opposite in sign to those for younger women, and that this heterogeneity is not attributable to differences in factors such as educational backgrounds, employment status, and the likelihood of having children before marriage.

Furthermore, I find little evidence that the fertility and the labor supply of women are affected by marrying younger due to gender-specific labor market conditions favorable for marriage. Unemployment rates by gender at marriage are not correlated with the likelihood of having a child or the number of children ever born to a woman. Neither are unemployment rates at age 18-20, despite their significant effects on marriage timing. Moreover, an increase in marriage incidence for young women due to worse female labor market conditions is not accompanied by any changes in the prevalence of single parenthood. In addition, gender-specific unemployment rates in youth do not have significant effects on labor supply and income in the mid-thirties, except that a higher female unemployment rate slightly increases weeks worked.

These findings can be interpreted using a marital search model with endogenous search intensity. Since the probability of marriage is a product of the probability that a woman meets a man and the probability that they agree to marry conditional on meeting, an increase in the incidence of marriage must come either through an increase in search effort or a reduction in reservation match quality which is compensated for by a temporary rise in the relative earnings of men. The negligible effects on the divorce probability imply that women do not lower their reservation match quality in order to increase the probability of marriage. On the other hand, an increase in search effort accelerates the timing of marriage without affecting the likelihood of future divorce. Moreover, if search frictions are modest so that a temporary increase in search effort does not change the probability of meeting a suitable mate over one's lifetime, the fraction

of women who eventually marry does not change either.

The rest of the paper is organized as follows. The next section reviews the background literature. Section 3 describes the data, and Section 4 presents the empirical results. Section 5 discusses how and to what extent the empirical findings can be explained by a simple model of marital search. Section 6 gives concluding remarks.

2 Background Literature

Becker (1973) provides a theoretical framework in which, under certain conditions, better labor market conditions for women increase the opportunity cost of marriage and better labor market conditions for men increase the gain from marriage. In his model, a decline in the male wage rate has a negative effect on marriage incidence if the marginal utility from income is higher for a married couple than for a single man¹ and marriage does not reduce men's labor supply. Then, for a decline in the female wage rate to have a positive effect on marriage incidence, a married woman's labor supply must be sufficiently lower than a single woman's to compensate for the higher marginal utility from income for a married couple.²

Although this condition does not hold for all women, empirical evidence suggests that this condition holds for the majority of young couples in the United States. Keeley (1975) empirically shows that the correlation between wages and the age at first marriage is positive for women and negative for men. Furthermore, Van Der Klaauw (1996) finds that gains from marriage for a woman are decreasing in her wage rate and increasing in her husband's earnings, using a structural model that addresses the interdependence between marital status and labor supply. Moreover, even though the gender wage gap has narrowed considerably since the 1970s, it is still largely the case that wives spend more time on child-rearing and, on average, the labor supply of married women remains considerably lower than that of unmarried women with the same age and educational background.³

¹This assumption is plausible if a spouse's consumption has a positive externality.

²Note that the effects of male and female wage rates are not necessarily symmetric in the magnitude.

³Among non-Hispanic white women aged 17-35 in the SIPP 1996 and 2001 panels, married women are 13.8 percentage point less likely to be fulltime employed and have worked for 5.8 percent less weeks during the reference periods than single women with the same age and educational background living in the same state.

Hence, the gain from marriage to a woman decreases in employment opportunities for women and increases in the opportunities for men, as long as marriage reduces female labor supply sufficiently and each spouse's wage rate changes with the labor demand for the corresponding gender. In light of this theoretical prediction, empirical studies have found that better opportunities for women in the local labor market decrease the fraction of ever married young women (Freiden 1974, Preston and Richards 1975, White 1981, Schultz 1994, Blau et al. 2000) while better opportunities for men increase it (Freiden 1974, Schultz 1994, Wood 1995, Blau et al. 2000).⁴

While empirical studies on the effects of gender-specific labor market conditions on marriage incidence date back to the 1970s, Blau et al. (2000) is the most comprehensive. Using MSA-level panel data constructed from Census 1970-1990, they find that gender-specific labor market opportunities⁵ affect the fraction of young women who are married even after controlling for year- and MSA- fixed effects. This paper departs from the literature by investigating not only the contemporaneous effect of gender-specific labor market conditions on the probability of marriage but also the long-term outcomes of marriages induced by temporary labor market fluctuations. The use of panel data enables me to distinguish the effects through marriage formation from the effects through marriage dissolution, which studies using the Census inevitably confound. In addition, the annual fluctuations in unemployment rates are less correlated with permanent income than decennial changes taken from the Census. The empirical design is similar to that of Dehejia and Lleras-Muney (2004),⁶ in the sense that I examine the relationship between unemployment rates at the time of marriage and long-term outcomes, including selection into marriage.

Although not linked with the effects of labor market conditions on marriage formation, a number of studies have explored the relationship between the timing of marriage and its long-term implications. The pioneering work by Becker, Landes and Michael (1977) establishes the

⁴Also, Loughran (2002) and Gould and Paserman (2003) find that the expansion of male wage inequality in the local labor market decreases the marriage rate.

⁵As an index for labor demand, Blau et al (2000) use weighted average of the relative employment of each industry-occupation group in each area by the national importance of each gender-education-race group in each industry-occupation group. I choose to use unemployment rates rather than the same index as Blau et al (2000) because unemployment rates are easier to understand and less noisy when calculated from the CPS, whose sample size is much smaller than the Census.

⁶Dehejia and Lleras-Muney (2004) investigate the relationship between the unemployment rate at the time of a baby's conception and parental characteristics, parental behaviors, and babies' health.

negative correlation between the age at marriage and the probability of divorce.⁷ Yet, it is less clear whether this correlation represents a causal effect. If there is a causal effect, couples who are induced to marry younger by worse female labor market conditions should be more likely to end in divorce. In this sense, this paper is related to the literature on the link between marriage timing and the stability of marriage.

This paper is also related to the literature on the motherhood wage penalty. Waldfogel (1997) has established evidence for substantial wage gap between mothers and non-mothers even after controlling for individual fixed effects and the decreased labor supply due to child rearing. Several studies find that the motherhood wage penalty is larger for women who bear children earlier (Blackburn, Bloom and Neumark 1990, Taniguchi 1999, Miller 2007).⁸ Thus, if the shift in the timing of marriage leads to a shift in the timing of first births, marrying young in response to labor market shocks may also affect women's income and labor supply in the long-run.

This paper focuses on legal marriage. Although the practical reason for this is the limited availability of information on premarital cohabitation, there are reasons to believe that legal marriage still matters despite the increase in premarital cohabitation and out-of-wedlock childbearing. First, at least for the majority of non-Hispanic white Americans, cohabitation is a step toward marriage rather than a substitute for marriage. Studies based on National Survey of Families and Households 1987-88 (Bumpus, Sweet and Cherlin 1991, Cherlin 1992, Manning and Smock 1995) show that most cohabitators expect to marry their current partners, and that half of the cohabiting never-married non-Hispanic white couples actually marry within two years. Stevenson and Wolfers (2007) confirm similar expectation towards marriage among cohabiting couples based on data collected in the 2000s. Second, even though it is possible for a couple to raise their children together without being legally married, marriage is the most effective way for a man to commit to the fatherhood of his partner's child (Edlund, 2006). Although this commitment could be re-

⁷One of the most recent follow-up studies is Lehrer (2008), who shows the relationship between age at marriage and marital instability is strongly negative up to the late twenties.

⁸Since the timing of the first birth is endogenous, it may be correlated with the inherent earning capacity. Given this concern, Miller (2007) uses biological fertility shocks as an instrument for the age at first births and finds that motherhood delay leads to a substantial increase in earnings. This may appear to contradict with Hotz, McElroy and Sanders (2005), who show teenage childbearing has few long-term negative effects using miscarriage as an instrument. Yet, this apparent contradiction is likely to be attributable to heterogeneity in the effects across different population, since the motherhood wage penalty is larger for high skilled women (Ellwood, Wilde and Batchelder, 2004).

pealed by divorce, divorce is much more costly than the separation of unmarried couples. Finally, more than 80 percent of non-Hispanic white American women marry by the age of 30, and more than 80 percent of first births by non-Hispanic white mothers occur after first marriage. Albeit on the decline, legal marriage is still an important step in the family formation of American women.

3 Data

3.1 Individual Level Data: SIPP and PSID

The main source of individual women's data is the Survey of Income and Program Participation (SIPP) 1990-2004 Panels.⁹ The SIPP is a series of short panel surveys conducted by the Census Bureau, with sample sizes ranging from approximately 14,000 to 36,700 households. Although each SIPP core panel covers at most four years, supplementary topical modules provide rich retrospective information. I use the Marriage History and Migration History Topical Modules attached to the Wave 2 of each panel to construct panel data of the marital status and the state of residence going back to the 1970s. I pool seven panels from 1990 to 2004 and use the appropriate sample weights to address the different sample design between pre- and post- 1996 panels.¹⁰

The SIPP's sample size is larger than most of the other datasets that have information on marriage histories. Another important advantage of the SIPP is that sample attrition due to divorce is virtually non-existent, because the survey does not actually trace people every year.¹¹ At the same time, the available retrospective information is limited: employment status and income are available only for the period covered by the core panel, and information on spouses

⁹I restrict my sample to women because some information including fertility history is available only for women. Since the SIPP is a household survey, most of the married men in the data are spouses of women in the same data. The results on marriage formation and dissolution (section 4.1) are confirmed to be the same when estimated with the sample of men.

¹⁰While households in panels prior to 1996 are taken from the representative US population, from 1996 onward households living in high poverty areas are oversampled. Another important difference is that panels prior to 1996 overlap each other. Until 1993, A new panel had been introduced every year. Then, the 1996 redesign replaced it with larger, non-overlapping panels. Nevertheless, results from 90-93 panels are similar to those estimated with 1996-2004 panels. Therefore, I believe that the change in sampling scheme does not bias the results in this paper.

¹¹Strictly speaking, divorced women are about 3-4 percentage points more likely to lack information on the state of residence at the time of marriage than those who are still in their first marriage. They are dropped not only from regressions on gender-specific unemployment rates at marriage, but also from the marriage hazard regression on the contemporaneous unemployment rates. I believe this is less problematic than attrition after marriage, which is typical in longitudinal household data such as the Panel Study of Income Dynamics, because I can include all marriages that contribute to the estimated effects on the marriage hazard in the subsequent analyses.

is also available only if the marriage is still intact at the survey date. Also, since the Fertility History Topical Module asks the year of birth of only the first and last children, it cannot be determined whether a woman's second child was born before she was at a certain age if she has three or more children at the survey date. Another issue is that the state of residence in a given year cannot be determined if the respondent has moved across states twice or more since that year; the appendix provides more detail on this issue.

I also use the Panel Study of Income Dynamics (PSID) for supplemental analyses. The PSID started in 1968 as a nationally representative sample of households in the United States and has tried to trace all households formed by members of the original sample households, as well as all new individuals who joined or were born to the sample households. The PSID contains richer information on the spouse's characteristics than the SIPP, although the PSID's sample size is smaller.

I focus on the first marriage of non-Hispanic white women in the contiguous United States to avoid the issue of selectivity into second marriages and complications arising from differences in social norms about marriage across ethnic groups. Also, I drop women who had married by 1978 because unemployment rates by gender can be calculated at the state level only after 1977. Further, since the majority of women marry by their early twenties, the sample is restricted to women born during the period 1956-1980.

Table 1 presents summary statistics for women born in 1956-1980. Column A is the SIPP sample weighted by the sampling weights and Column B is the PSID sample. The SIPP sample is slightly older and more likely to have "some college" education, but the age at first marriage and the age at first births are reasonably similar. Figure 1a shows the transitions in marital status of women in the SIPP sample. More than 80 percent of the women marry at some point between age 17 and 35, and about half have married by 23. Since very few women marry at age 16 or younger, I drop them from the sample. Also, since fewer cohorts are followed up to older ages, marriages after age 35 are omitted and those who had not married until 35 are treated as if never married. Lastly, Figure 1b presents the composition of age at first marriages among women who are 30 years old or older at the survey date. It confirms that the majority of marriages occur in the late teens and early twenties.