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1. Introduction

Since the introduction of the federal income tax, the tax system has treated different groups in different ways: blind and elderly persons receive additional exemptions; married couples have different marginal tax schedules, different personal exemptions and different standard deductions from unmarried individuals; and individuals with children receive dependent exemptions. One defense of many of these differences is that they reflect that different people have different abilities to pay taxes.[2] The same tax bill might impose a very different burden on a couple with two children than on a single unmarried person with the same income. However, some of these distinctions, for example those based upon legal marital status or number of children, might also affect behavior. The real value of the dependent tax exemption might affect individuals' choices regarding either the timing of children or the total number of children the individual has. Likewise, distinctions based upon legal marital status might affect decisions regarding the timing of marriage, the decision to marry, or even the decision to divorce. This paper addresses the second set of questions: do tax differentials based upon marital status appear to affect marriage and divorce decisions.

The difference between the income tax a married couple pays and the income tax that an unmarried couple with the same individual incomes would pay is the **marriage tax**. Potentially, this can be either positive or negative. Positive marriage taxes (the couple pays higher taxes when married) are called **marriage penalties**, and negative marriage taxes (the couple pays lower taxes when married) are called **marriage subsidies**. Although the average marriage tax has been rather modest over time, many couples face large marriage penalties while others face large marriage subsidies. For example, Feenberg and Rosen (1994) found in 1994 that although the average **marriage tax** was only a modest $124, the average penalty for the 52% of couples paying **marriage penalties** was $1,244 and the average **marriage subsidy** for the 38% of married couples who received a subsidy was $1,399. Further, they found some high income couples paid marriage penalties in excess of $10,000. For tax systems with increasing marginal tax rates, a couple's marriage tax depends largely upon two factors: the combined income of the couple, and the division of income between the two partners. In general, marriage taxes increase as the couple's joint income increases and as the two individual incomes get closer together.

This paper addresses three questions: does the marriage tax affect decisions to marry; does the marriage tax affect decisions to divorce; and does the marriage tax affect the timing of marriage. The paper expands upon earlier work on the correlation between trends in marriage taxes and marriages [Alm

[2] See Groves (1963, Chapter 1) or Pechman (1987, Chapter 4) for a discussion of this issue.

and Whittington (1995a,1995b) and Sjoquist and Walker (1995)] by increasing the length of the period studied and by disaggregating aggregate data into three age groups. Alm and Whittington (1995a,1995b) found that the percentage of women who are currently married is statistically significantly correlated with average marriage taxes. This result is consistent with the hypothesis that marriage penalties either discourage unmarried persons from marrying or encourage married couples to divorce. In contrast, Sjoquist and Walker (1995) and Alm and Whittington (1995b) find that the **marriage rate**, defined to be the number of marriages per 1000 unmarried women, is not statistically significantly correlated with average marriage taxes. One possible explanation for this difference is that marriage taxes might primarily affect divorce ♦ the percent of women who are married is affected by both marriage and divorce decisions, while the marriage rate is only affected by marriage decisions. We also examine correlations between trends in divorce and trends in marriage taxes to see whether this explains the different results. Finally, using individual data from the National Longitudinal Survey of Youth (NLSY) and aggregate U.S. data, we study whether marriage taxes appear to affect the timing of marriage. The main findings are:

1. As in Sjoquist and Walker (1995) and Alm and Whittington (1995b), we find little time series evidence that marriage taxes affect aggregate marriage rates (see definition above). However, also consistent with Alm and Whittington (1995a,1995b), we find some evidence that the percent of women who are currently married is negatively correlated with the average marriage tax.
2. Marriage taxes are statistically significantly correlated with both marriage and divorce trends for only the youngest group of women studied ♦ those aged between 25 and 34. Only the aggregate **divorce rate**, defined to be the number of divorces per 1000 married women, is statistically significantly correlated with the average marriage tax for women aged 35 to 44. Finally, marriage taxes are not statistically significantly correlated with any of the divorce or marriage variables studied for women aged between 45 and 64.
3. For women aged between 25 and 34 and between 35 and 44, trends in divorce rates are positively correlated with trends in marriage taxes. This is consistent with the assertion that high marriage taxes encourage divorce. Since marriage rates are uncorrelated with marriage taxes, it may explain the difference between results in Sjoquist and Walker (1995) and results in Alm and Whittington (1995a,1995b).
4. Using individual data from the NLSY, we find strong evidence that couples who marry in December tend to have lower marriage taxes than couples marrying at other times of the year. This would be consistent with the hypothesis that couples facing marriage penalties delay marriage until the next tax year to avoid marriage taxes, or couples receiving marriage subsidies accelerate marriage plans to

December. Results using aggregate month of marriage data are broadly consistent with the results using the individual data.

5. Despite being statistically significant, the effects of marriage taxes are small in magnitude throughout the analysis. This may indicate that few couples take the tax consequences of marriage into account when making marriage decisions.

The paper is organized as follows. Section 2 gives a brief history of changes in the U.S. individual income tax law and demographic changes that have affected the marriage tax over the last half century. Section 3 presents a simple theoretical model of marriage and marriage taxes based on Becker's marriage model. Section 4 studies the effects of marriage taxes have on marriage and divorce trends. Section 5 looks at the effect that marriage taxes have on marriage timing decisions and Section 6 concludes.

2. A Brief History of the Marriage Tax[3]

One issue for any income tax system is deciding the appropriate unit on which to assess taxes.[4] For example, the tax system could tax individual incomes, family income, or household income. Since 1948, the taxable unit in the United States has been the family. Married couples pay taxes on their joint income, have different tax rates than single persons, and receive different deductions and exemption.[5] Much of the debate over the appropriate taxable unit has centered around the question of the ability to pay taxes.[6] If 'ability to pay" is a primary concern, one argument for treating the family as the basic unit is that if families pool their income, the ability of one spouse to pay taxes depends upon the income of the second spouse. The amount of taxes an individual with an annual income of $10,000 is able to pay may be very different if the individual's spouse earns $5000 or if the individual's spouse earns $50000.

However, taxing families rather than individuals results in other problems. In particular, marriage penalties and subsidies are the result of taxes being assessed on families rather than individuals.[7] Treating the family as the taxable unit results in conflict among three mutually incompatible, but individually desirable, goals: (i) marriage neutrality; (ii) progressivity, and (iii) horizontal equity between couples with the same income.[8] **Marriage neutrality** is the principle that the

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[3] See MacCafferrey (19 93) for a more complete history. For the period prior to 1963 see Groves (1963).
[4] See, for example Munnell (1980), Groves (1963) or Pechman (1987).
[5] Although married couples can file separately, the tax schedule that they use has rate brackets and exemptions set at half the married levels, rather than the levels for single persons.
[6] Defining "ability to pay" is a similarly delicate issue. This is also discussed extensively in the public finance literature. See Groves (1963), Goode (1976) or Pechman (1987).
[7] In the individual is considered the "correct" unit to assess taxes on essentially means deciding that horizontal equity between couples is unimportant (since "ability to pay" depends on individual, not family, income.
[8] A formal proof of the marriage impossibility theorem is shown in Lowell (1982).

tax paid by a couple should not depend upon marital status - a couple should pay the same tax whether they are legally married or not.[9] **Progressivity** is the principle that marginal tax rates should increase as the couples' (or individuals') income increases.[10] Finally, **horizontal equity between couples with the same income** says that couples who have the same total income should pay the same tax regardless of which partner earns the income: a couple with a combined income of $10,000 should pay the same tax whether one earns $10,000 and one earns nothing, or whether both earn $5,000. Although each goal has desirable properties, especially if one is concerned about tax effects on marriage and divorce decisions, no tax system can simultaneously achieve all three.

Prior to 1948, federal individual income taxes were levied on individuals rather than families. Because of this, marriage did not affect the total tax the couple paid, and so upheld the principle of marriage neutrality. However, married couples with the same total income could potentially face vastly different tax burdens, violating the third goal of horizontal equity.[11] In 1948, in the wake of a Supreme Court decision allowing married couples in states with community property laws to split their income for tax purposes (*Poe v. Seaborn*), Congress allowed couples in all states to do the same. This restored horizontal equity between married couples, but meant that a married couple could pay lower taxes than an unmarried couple with the same income, violating marriage neutrality.[12] In 1969, to reduce the difference between the taxes a single person and a married couple with the same total income would pay, Congress introduced a lower tax schedule for single persons. The new schedule meant that married couples paid higher taxes than two single persons each with half the married couple's total income each, but lower taxes than one single person with the same total income as the couple combined. As before, the law still retained horizontal equity and violated marriage neutrality. However, the law change meant that some couples faced marriage penalties and others received marriage subsidies. Prior to 1969, all married couples received marriage subsidies. In addition to these law changes, numerous adjustments to rate schedules have also affected the size and prevalence of marriage penalties and subsidies. For example, Rosen (1987) found that the Tax Reform Act of 1986 (TRA86) flattened the rate schedule and

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[9] If marriage is viewed as desirable social behavior then subsidizing marriage may be thought to be appropriate. Likewise if marriage is viewed as socially undesirable then taxing marriage may be appropriate.

[10] Lowell (1982) shows that a linear tax schedule with a lump sum transfer can be progressive in the sense that the share of income paid as taxes increases as income increases while remaining marriage neutral and preserving horizontal equity between couples.

[11] An individual supporting a spouse with no income could benefit from the spouse's personal exemption., and so taxes were not completely marriage neutral.

[12] Since the (maximum) standard deduction was the same for married couples and single persons, at least in theory, some couples could pay marriage penalties even at this time. The introduction of a minimum standard deduction in 1965 meant some low income couples might also face small marriage penalties.

lowered the average marriage tax, and Feenberg and Rosen (1994) found that changes in the 1994 rate schedule and Earned Income Tax Credit raised the average marriage tax.

Tax law changes are not the only thing to affect marriage taxes. The increased labor force participation of women has changed both the size and prevalence of marriage taxes. As noted in the introduction, the marriage tax a couple faces depends upon both the couple's total income and the relative size of the two partners' incomes. In general, progressive marginal tax rates mean that at any given income level, the more equal the two married partners' incomes are, the higher the marriage tax. As the labor force participation of married women has increased, so has the share of income attributable to women, and therefore so has the marriage tax. In 1950 only about 30% of married women participated in the labor force ♦ by the mid-1990s it was fast approaching the labor force participation of single women, 75% (see figure 6 below). If the income attributable to the female partner had stayed at 1950 levels, then the average marriage tax would still be a marriage subsidy rather than a marriage penalty.

A final demographic change that may affect perceptions of the marriage tax is the change in the prevalence of cohabitation outside of wedlock. Since cohabiting couples can pay taxes as if single, horizontal equity between couples only applies to legally married couples. Unmarried cohabiting couples can have different tax burdens from either married or unmarried couples with the same total income. Since 1970 the number of persons cohabiting with a partner of the opposite sex has increased from 523,000 to 3,661,000.[13] For women aged between 25 and 34, the percentage of women cohabiting with a member of the opposite sex more than doubled between 1980 and 1994. This option, which has presumably become more socially acceptable over the past few decades, may be important if couples avoid legal marriage in order to avoid the marriage tax.[14]

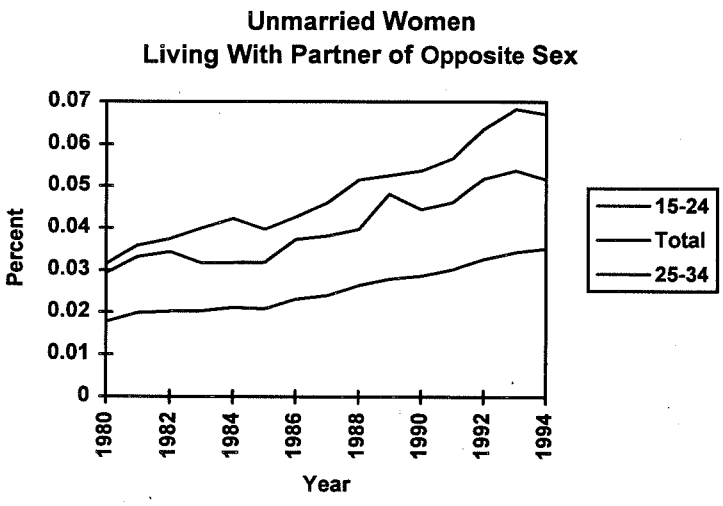

Figure 1: Percentage of Women Cohabiting with Men.

[13] Bureau of the Census. 1995.*Statistical Abstract of the United States,* Table 60.

[14] Feenberg and Rosen (1994) report a *Wall Street Journal* story about a California couple who put off marriage to avoid a marriage tax of around $7000.

3. Theoretical Framework

This section adapts the economic model of marriage due to Becker (1973, 1974, and 1981) with the intent of developing testable hypotheses about the effect changes in marriage taxes and income have on marriage and divorce trends. Becker presents a marriage model where utility maximizing individuals choose to marry when their joint household production when married is greater than the sum of the separate household production of the two individuals. In Becker's treatment there is no explicit consideration of any legal aspects of marriage. He states "my definition of marriage in terms of whether a man and a woman share the same household differs from the legal definition because my definition includes persons in 'consensual' and casual unions..." (Becker (1973), p 820). Since the primary focus of this paper is the tax system, it is necessary to distinguish between cohabitation and marriage. Each household is assumed to maximize a household utility function subject to a budget constraint. Conditions under which rational individuals agree to maximize the joint utility function are discussed below. Because we are primarily interested in legal marriages which, in the United States, require the different sex partners, we subscript the wage and time arguments with "m" for male, and with "f" for female. Throughout, a super-script denotes marital status (w for legal marriage, c for cohabitation and s for single) and a sub-script denotes sex (m for male, f for female). Married and cohabiting couples jointly maximize the household utility function over three arguments: x, a vector of private goods; t_m, the male's time investment in household production; and t_f, the female's time investment in household production. Each individual's time investment in home production is constrained between zero and T, the time endowment. An argument "s" denotes legal marital status. This assumes that couples either get utility from legal marriage or that legal marriage qualifies individuals for legal or social privileges not available to unmarried couples. For example, married persons may get utility from parental or societal approval of legal marriage, or may qualify for health insurance from a spouse's employer.[15] Since taxes depend upon marital status, if the household utility function did not, then couples facing marriage penalties (i.e. $\tau^w \geq \tau^s$) would choose to cohabit rather than marry. This result would not be attractive since, many couples are observed to pay quite large marriage penalties (See Feenberg and Rosen (1994)). To ensure individual couples choose marital status consistently for given wage and tax profiles, the following assumption is made throughout:

[15] Alternatively, some legal protections may only be given to unmarried persons. For example, if a poor woman has had children by a different man than her present partner, she may qualify for AFDC and Medicaid payments if she cohabits with rather than marries her present partner. If the partner is the father of the children, even if he is not legally married to the woman the children are categorically ineligible for AFDC if he lives with the mother. (Moffitt, Reville and Winkler (1995)).

Assumption 1: Total household utility, when married or cohabiting, is assumed to be transferable between the members of the household. If total household production is Z^w then if $(Z_f^w + Z_m^w) \leq Z^w$ the division (Z_f^w, Z_m^w) is feasible.[16]

This assumption ensures that rational individuals choose to maximize household production when in the same household. If not, both individuals could increase their individual utilities by increasing production by an infinitesimal amount and splitting the increase between them. This assumption also ensures that for all points in the core the couple chooses the same marital status. For example, suppose there are points where the couple marries and points where the couple cohabits in the core and assume without loss of generality that $Z^w > [\geq] Z^c$. (Z_f^c, Z_m^c) can not be in the core for any feasible division of output because both partners prefer $(Z_f^c + \varepsilon/2, Z_m^c + \varepsilon/2)$ $[(Z_f^c, Z_m^c)]$ when married to (Z_f^c, Z_m^c). By choosing $0 < \varepsilon < Z^w - Z^c$ such a bundle would be feasible. Hence (Z_f^c, Z_m^c) is not in the core. Similar arguments rule out other cases.

For married and cohabiting couples the maximization problem is:

$$(1) \qquad \underset{x, t_m, t_f, s}{\text{Max}} \quad \text{such that} \quad \begin{array}{c} \tilde{Z}(x, t_m, t_f; s) \\ p\,x + w_m t_m + w_f t_t + \tau(w_m, w_f, T - t_m, T - t_f; s) = w_m T + w_f T \\ 0 \leq t_m \leq T, \quad 0 \leq t_f \leq T \end{array}$$

The tax function, τ ($\bullet$), is a function of wages (w) and time spent in market activity (T - t_m). For notational purposes the production function has a tilde over it, while the function evaluated at the maximum omits the tilde.[17] If an individual neither marries nor cohabits then she maximizes her individual household production with the additional constraint that the partner's time spent on household production, t_m, is constrained to be zero (t_f is constrained for males), and "s" (marital status) is constrained to be "unmarried."[18] Her maximization problem, assuming that a single person's tax burden does not depend upon her a potential partner's wage, becomes:

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[16] Letting the first argument be the female's share of production and the second argument be the male's share of production.

[17] The function evaluated at the maximum is denoted in this way rather than with the more traditional star notation because the additional star would be bulky given the other sub- and super-scripts.

[18] This rules out cases where two individuals marry for tax purposes, but maintain their own separate households.

$$\underset{x,t_f}{\text{Max}} \quad \tilde{Z}(x,0,t_f;u)$$

(2) $$\text{such that} \quad x + w_f t_t + \tau(w_f, T - t_f; u) = w_f T$$
$$0 \le t_f \le T$$

The man solves an identical problem. If the couple cohabits rather than legally marrying, the tax they pay is equal to the tax that they would pay if they were two single persons living separately, as is the present case in the United States. Their tax function is:

(3) $$\tau(w_m, w_f, T - t_m, T - t_f; u) = \tau(w_m, T - t_m; u) + \tau(w_f, T - t_f; u)$$

This gives the couple three options:

1. Legal Marriage.
2. Cohabitation (living in a household together but paying taxes as if single).
3. Remaining unmarried and living alone.

The couple will choose to marry when both partners' share of household utility when married is greater that their share when cohabiting and greater than their individual household production when single. For the male to choose marriage over remaining single or cohabiting, the following conditions must hold (with the utility function evaluated at the appropriate maximum):

$$Z_m^w \ge Z_m^c$$
and
$$Z_m^w \ge Z_m^s$$

Similar conditions must also hold for the woman. Likewise, the couple will cohabit if:

$$Z_m^c > Z_m^w$$
and
$$Z_m^c \ge Z_m^s$$

with similar conditions for the woman. The strictly greater than sign ensures that the couple will be able to choose between marriage and cohabitation. If the couple can neither agree to marry, nor to cohabit, then they remain single (if the female's utility when single is strictly greater than her share of total utility when married or cohabiting or the male's utility when single is greater than his share when married).

In the next subsection we consider lump-sum taxes which depend upon marital status. The lump-sum tax a married couple pays is not necessarily equal to the sum of the lump-sum taxes for two single persons (or by equation (3) for one cohabiting couple).

3.1 Marriage Taxes.

In this subsection we make the following assumptions.

Assumption 2: $Z^s(x, t_m, t_f)$ is (weakly) increasing in time devoted to household production for both partners and for private goods for all marital states, s.[19]

Assumption 3: The tax is a lump-sum tax. That is, $\tau (w_m , w_f , T-t_m , T-t_f ; s) = \tau^s$.

Although the taxation in this section is referred to as lump-sum taxation, this is strictly a misnomer. The tax paid does depend upon a variable under the control of the individual - marital status. It is **not** assumed that $\tau^w = \tau^u + \tau^u = \tau^c$. Another assumption is that the tax will not bankrupt individuals. It is assumed that $\tau^w \leq w_m T + w_f T$, and that $\tau^u \leq \min \{w_m T, w_f T\}$. The first result is immediate.

Proposition 1: Increasing the lump-sum tax for married [unmarried] persons τ^w [τ^u] (weakly) decreases household utility when married [single and cohabiting].

The intuition is that when the lump-sum tax when married is increased the budget constraint shifts inwards, weakly decreasing household production. Under an alternative non-satiation assumption household production is strictly decreasing as the lump-sum tax increases. As a result, when lump-sum tax for married couples increase and lump-sum tax for unmarried persons stay the same, fewer couples should choose marriage. For general income taxes of the form $\tau^w(w_m (T - t_m) + w_f (T-t_f))$, if the tax increases at all income levels, then the budget constraint will shift inwards in the same way, and proposition 1 will hold once again.

This result can also be described in the Freiden's (1974) adaptation of Becker's framework (also used in Sjoquist and Walker (1995)). This framework is described below. As Sjoquist and Walker (1995) point out, an increase in a lump-sum marriage tax is equivalent to shifting the derived demand for males downwards. This results in fewer marriages in equilibrium [See figure 2.]

The effects of changes in male and female wages are ambiguous. Increasing male wages affects the budget constraints in all three cases, it (weakly) increases household utility for both married and

[19] A local non-satiation property for $Z(\bullet)$ is sufficient for the results in this section.

cohabiting, and also weakly increases household production the man when single. This means that it is difficult, a priori, to know what effect changes in male and female wages will have on marriage rates. To clarify this point, it is discussed below using Freiden's (1974) specific adaptation of Becker's framework.

3.2 Freiden's (1974) Framework and the Effect of Changes in Wages.

Sjoquist and Walker (1995) describe the effect of lump-sum marriage taxes using Freiden's (1974) framework. This model can also demonstrate the ambiguous effect of wages on marriage. This model does not include cohabitation. Once again household utility, Z^s, is subscripted with an m to denote "male", and an f to denote "female", with an additional subscript of i to denote the ith male or female. Household utility when married, Z^w, is assumed identical for all married couples, while single male and females utility, Z^u_{fi} and Z^u_{mi} vary by individual.[20]

The i'th male will marry when his utility when married is greater than his utility when single (i.e. $Z^w_{mi} \geq Z^u_{mi}$). Figure 2, similar to Figure 1 in Freiden (1974, p.354) has the number of males on the horizontal axis and has male's share of household production on the vertical axis. The minimum income an individual male will accept when married, his marriage reservation price, is his potential income when single (Z^u_{mi}). As the male's share of household utility when married rises, more men will wish to marry. Ordering the males from most to least productive gives a "supply curve" for males (see Figure 2). However, the greater the share of household utility that the man gets, the smaller the share the woman gets. Therefore, when the man's share of household production is high only the least productive females wish to marry (recall Z^w was assumed the same for all couples in this subsection only). Likewise, ordering the females from least to most productive gives a derived demand curve for males (husbands).

[20] Freiden (1974) claims his basic result from this setup, that the proportion of women married in positively related to the ratio of men to women, also holds when couples are sorted so that total output of the community is maximized.

In this context, imagine the effect of an increase in male wage rates. If the man works in the marketplace when married, this increases household utility (Z^w) and shifts the derived demand for males upwards.[21] However, if he also works when single, the household production of single males increases shifting the supply curve for males upwards. Therefore the number of women who are married depends upon the relative size of the shifts and the relative slopes of these two curves. Under certain strong assumptions, it may be possible to predict the effects of a small shift in female (or male) wages. Suppose, for example, married women (married men) do not work (i.e. we have a corner solution in maximization problem (1) above) both before and after the shift in female (male) wages but that single women (men) do work. Then the utility of single women (men) increases but household utility of married couples stays the same. This results in a shift in the derived demand curve for men (supply curve of men) without a shift in the supply curve of men (derived demand curve for men) and results in fewer marriages.

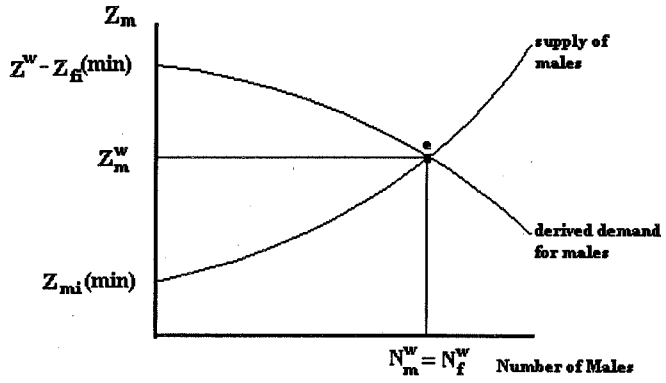

Figure 2: Freiden's Marriage Market

4. Empirical Evidence on the Effect of Taxes on Marriage and Divorce.

The theoretical section suggests several empirical tests.

1. As the marriage tax increases the attainable maximum household utility for married couples decreases. Therefore, we would expect marriage rates to decrease and divorce rates to increase.
2. Increases in male or female wages increase the maximum attainable household utility for married couples, cohabiting couples and for the appropriate individual when single. Therefore, it does not follow immediately from theory that increases in male or female wages will either increase or decrease marriage and divorce rates. For example, an increase in female wages increases household utility of married couples, making females more attractive spouses (and also more attractive

[21] Once again, assuming some kind of nonsatiation property.

cohabiting partners) for men, but also increases income when single raising the woman's reservation price for marriage.

In this section, we look at the effects of marriage taxes on trends in marriage and divorce, and in the next section we look at the effect on timing decisions. Throughout the analysis, we divide the aggregate data into three age groups: women aged between 25 and 34; women aged between 35 and 44; and women aged between 45 and 64.[22] One reason for this is that marriage taxes might affect younger women more strongly than older women. If the joint production of children is an important motivation for marriage then young women might be more likely to be close to the margin. Likewise, if remarriage possibilities upon divorce for woung women are better than marriage possibilities are for older women, therefore more young women might be close to this margin also.[23] Another reason for subdividing the data is that trends in marriage and divorce differ between groups, as do trends in marriage taxes. For example, in the late 1980s the average marriage tax for older women becomes a marriage subsidy, but remains a penalty for younger women. Finally, dividing the data into subgroups means that changes in the aggregate composition of the population will not have as large an effect on results. For example, in the late 1940s and early 1950s, younger women were far more likely to be presently married than older women, and so changes in the relative sizes of these population would change the aggregate figures even if the shares of married women within groups remained the same.

As noted earlier in the paper, several papers have tested the effects of marriage taxes upon marriage and divorce decisions. In general, results indicate that marriage taxes only have modest effects on aggregate marriage and divorce decisions. Table 1 below summarizes the results in these papers, including the dependent variable, the time period, and the estimation results.

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[22] A fourth group of women aged 15-24 is excluded because low labor force participation rates and low incomes among those with positive incomes means that at the median income,individuals pay no taxes either when married or single. The decline in marriage rates for this group is even steeper than for women aged 25 to 34. It declined from around 40% in the early 1950s to under 20% by the early 1990s. Much of this decline is probably due to increased high school and college enrollment rates.

[23] For example, young women may believe that the number of remaining years of fertility affects their marriage possibilities if children are a primary motivation for men also.

Table 1: Results from Previous Work on the Effects of Marriage Taxes on Marriage, Divorce and Timing of Marriage Decisions.

Paper	Data	Dependent Variable	Results for Marriage Tax Variable.
Alm and Whittington (1992)	Aggregate Data from 1947 to 1987	Married Women Aged 15-44 as Percent of All Women	Negative and statistically significant with elasticity of less than -0.05.
	Individual Data from the PSID	Dummy Variable Coded 1 if the Woman Marries in that Year	Discrete time hazard model for time to first marriage. Negative and statistically significant with elasticity of -0.01. (preliminary results).
Alm and Whittington (1995a)	Aggregate Data from 1947 to 1988	Married Women Aged 15-44 as Percent of All Women	Negative and statistically significant with elasticity of less than -0.05. The difference between the average marginal tax rates for couples when married and single are statistically insignificant.
Alm and Whittington (1995b)	Aggregate Data from 1947 to 1988	Married Women Aged 15-44 as Percent of All Women	Negative and statistically significant (as above).
	Aggregate Data from 1947 to 1988	Marriage Rate for Women Aged 15-44	Positive but statistically insignificant.
	Individual Data from the PSID	Dummy Variable for First Marriage	Negative and statistically significant with elasticity of -0.01.
	Individual Data from the PSID	Dummy variable for divorce	For women, positive and statistically significant with elasticity of 0.02-0.03. Positive and sometimes statistically significant with elasticity of 0.03-0.04 for men.
	Individual Data from the PSID	Probability Of Delaying Marriage From The Last Quarter Of One Year To The First Quarter Of The Next.	Statistically significant and positive (high marriage taxes increase probability of delaying marriage).
	Individual Data from the PSID	Probability Of Accelerating Divorce From First Quarter Of Year To Previous Year	Statistically insignificant.
Sjoquist and Walker (1995)	Aggregate Data for 1948-1987	Marriage Rates for Women Over 15	Positive but statistically insignificant.
	Aggregate Date for 1948-1987	Number of Weddings in November and December Divided by Number in March and April of Next Year.	Negative and statistically insignificant.

Over the past fifty years marriage, divorce and fertility patterns in the United States have changed remarkably. In this section we study whether changes in the tax treatment of marriage may have affected these trends. [24] However, first we define some terms: married refers to women who are currently married (including women who are legally separated); and unmarried includes women who have never been married, who are divorced or who are widowed. "Single" refers to only never married women. Data on the number of divorces and marriages, used for marriage and divorces rates, is from Vital Statistics of the United States, and the data on the marital status of the population is from the Current Population Survey, P-20 Series.

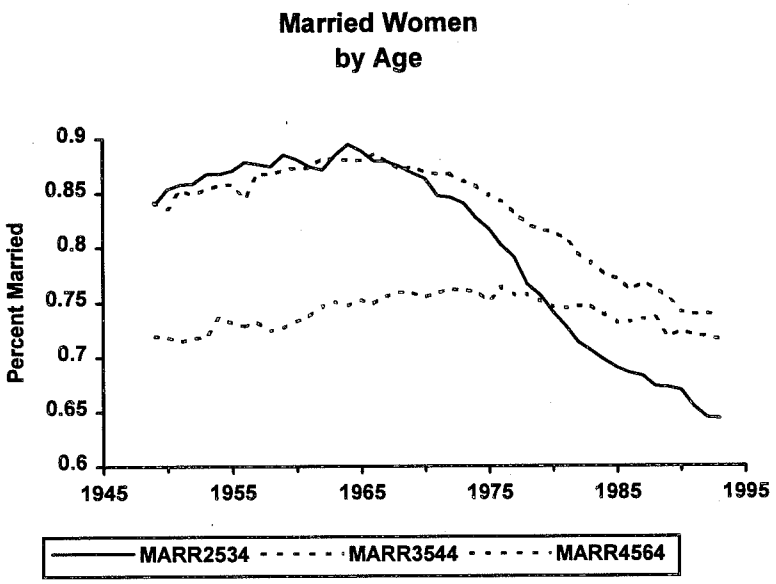

Figure 3: Married Women by Age

Figures 3 and 4 show trends in the married women as a percent of all women and divorced women as a percent of ever married women for these three age groups. The trends in the percent of women that are married are broadly similar for the two younger groups of women. The percent of women who are currently married was flat or gently increasing between 1947 and the mid 1960s. In the late 1960s, perhaps later for women aged 35 to 44, the percentage of married women started to drop. The decline was far sharper for women aged 25 to 34, no doubt reflecting that women are marrying later and later.[25] The trend for older women is less similar: it is flat or increasing until the mid 1970s when it starts to a gentle decline.

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[24] Throughout the paper we use marriage and divorce rates for women rather than the analogous rates for men. However, Alm and Whittington (1994) notes that the trends for male and female rates for marriage rates are very similar

[25] Although the decline for women aged 25 to 34 was nowhere hear as steep as the decline for women aged 15 to 24 over the same time period.

The trends in divorce among are more similar than the trends in marriage (See Figure 4). The percentage of women currently divorced was under 5% for all three groups from 1947 until the 1960s. After this, the percentages for all three groups began to increase. The main difference between the age groups is the percentage appears to level off for women aged between 25 and 34 in the late 1970s, and to level off in the mid-1980s for women aged between 35 and 44. and not to level off at all for older women.

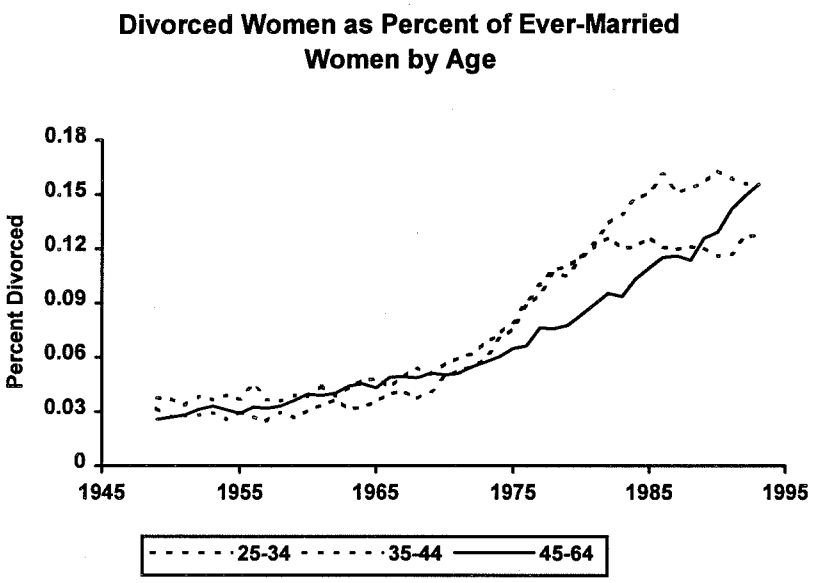

Figure 4: Divorced Women by Age

The simple correlations between divorce rates (defined as the number of divorces per 1000 married women) confirm that the trends in divorce are similar. The simple correlations are greater than 0.9 for the three groups. (See Table 1). However, this may be due to the strong time trend all three groups exhibit. The simple correlations between the divorce rates and a simple time trend are 0.92, 0.97 and 0.96 for women aged between 25 and 34; 35 and 44; and 45 and 64 respectively. ***Changes*** in divorce rates are far less highly correlated. (Table 2).

Table 2: Correlations of Divorce Rate Among Women of Different Ages.

	Women 25-34	*Women 35-44*	*Women 45-64*
Women 25-34	1.0000	0.9759	0.9541
Women 35-44		1.0000	0.9769
Women 45-64			1.0000

Table 3: Correlations of Changes in Divorce Rates Among Women of Different Ages

	Women 25-34	*Women 35-44*	*Women 45-64*
Women 25-34	1.0000	0.6491	0.4101
Women 35-44		1.0000	0.4194
Women 45-64			1.0000

Marriage rates (defined as the number of marriages per 1000 unmarried women) are less highly correlated between the three groups, especially between the youngest and the oldest women. Because marriage rates follow a U-shape rather than following a trend, they are also less strongly trended (respective correlations of -0.54, 0.10, and 0.49 with a simple time trend). Changes in marriage rates are even less highly correlated. (See Tables 3 and 4 below).

Table 4: Correlation of Marriage Rates Among Women of Different Ages

	Women 25-34	*Women 35-44*	*Women 45-64*
Women 25-34	1.0000	0.5587	0.3259
Women 35-44		1.0000	0.7976
Women 45-64			1.0000

Table 5: Correlation of Changes in Marriage Rates Among Women of Different Ages

	Women 25-34	*Women 35-44*	*Women 45-64*
Women 25-34	1.0000	0.0720	0.3654
Women 35-44		1.0000	0.5274
Women 45-64			1.0000

4.1 Marriage Tax Data.

The procedure used to calculate the marriage tax is the same procedure as that used in Alm and Whittington (1992, 1995a, 1995b) and Sjoquist and Walker (1995). For each age group, the male with median income is assumed to marry the female with median income, where median incomes are calculated (including the persons who report no income) from the distributional data contained in the Current Population Reports, P-60 series (various years).[26] Tax when single is calculated by assuming each partner files a single tax return using the standard deduction and a single personal exemption. Tax when married is calculated by assuming the median couple files a joint return using the standard deduction and two personal exemptions. For 1981 through 1986, since the data does not distinguish between earned and unearned income, the two earner deduction is applied to the entire income of the lower earning partner. The marriage tax is then the difference between tax paid when married and tax paid when single: for example, a negative marriage tax means the couple pays higher taxes when married. As with other nominal variables, this is adjusted to 1990 prices using the CPI-U.[27]

[26] Although this is a strong assumption, it may be reasonable given that there is strong evidence of positive assortive mating - couples tend to marry individuals similar to themselves in many human capital related traits (Sse Becker (1991)).

[27] Note that the marriage tax is calculated using current-price incomes to use the current-price tax schedules, and is adjusted to 1990 prices after that.

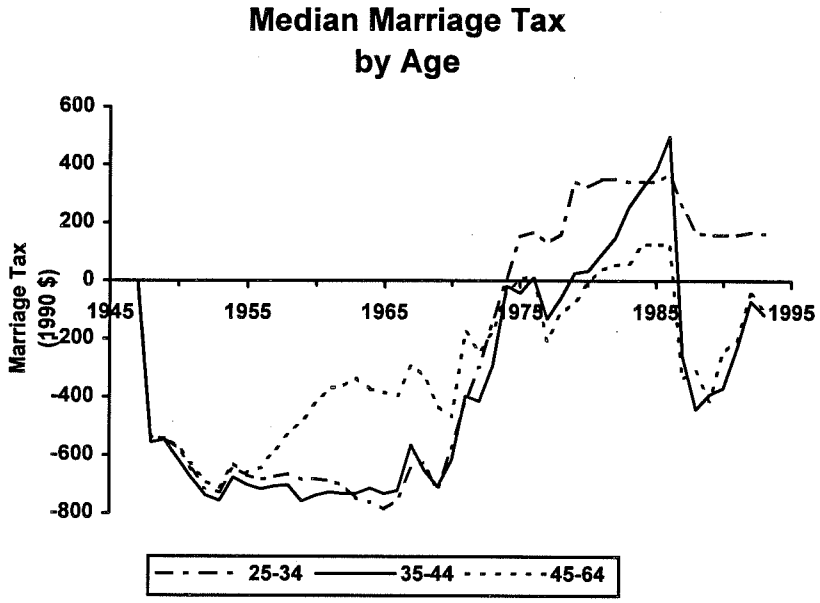

Figure 5: Marriage Taxes by Age

Figure 6 shows the average marriage tax for the three age groups between 1947 through 1993. Prior to 1971, when the introduction of single tax rate schedule eliminated the full advantage of income splitting, there was a marriage subsidy for all three groups. However, the median woman's income was low enough through the mid-1970s for subsidies to remain even after this change. In the late 1980s, the flattening of tax rates in the Tax Reform Act of 1986 meant older couples once again received a marriage subsidy. However, couples between 25 and 34 still paid a marriage penalty[28] The marriage tax variable calculated in this paper follows a similar trend to the marriage tax variable calculated in Alm and Whittington (1995a, Figure 2, p.29). However, there are two differences worth noting. The first is that the subsidy calculated for the 1950s and 1960s is much larger in this paper than in Alm and Whittington (1995a). One explanation for this may be that Alm and Whittington (1995a) used the income of single women, rather than income for all women . Figure 4 shows that most women in

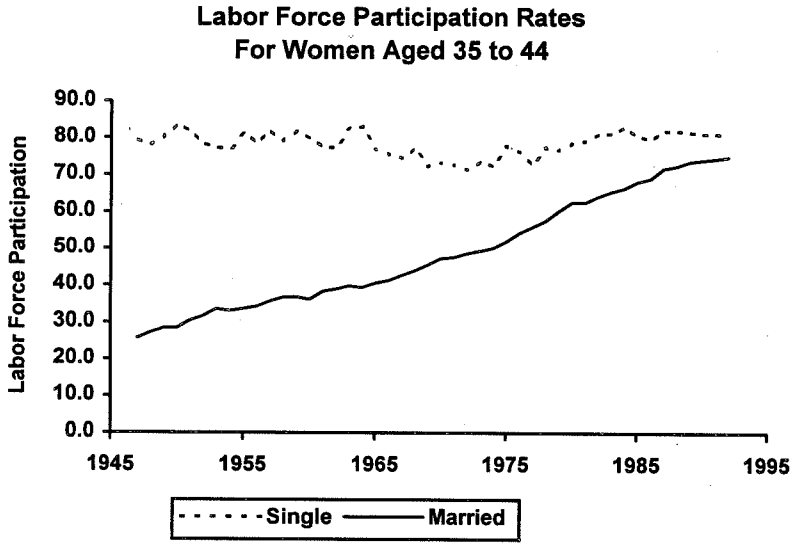

Figure 6: Labor Force Participatio Rates for Married Women

[28] Performing a similar calculation for all couples (aged over 15) also indicates a marriage tax exists for this group also.

these age groups were married during the 1950s and the 1960s, making the income of all women closer to the median income of married women. At this time most single women were in the labor force, while most married women were not. The end effect is that for much of the time period, married women had very little income of their own . The median income for each age groups was zero until 1963, 1960, and 1956 for women aged 25 to 34, 35 to 44, and 45 to 64 respectively.[29]. Since marriage taxes are higher when the two incomes are closer, the higher labor force participation rates of single women in the period prior to 1970 means it is likely that marriage subsidies would be smaller when calculating the tax using the median single woman's income. The second main difference between our calculations and those in Alm and Whttington (1995a) is that the marriage tax calculated here is a subsidy for the two older groups after 1986. As noted above, when aggregating over all age groups as in Alm and Whittington (1995a), we calculate a penalty rather than a subsidy with our data as well.

Despite the difference after 1986, the marriage taxes for different age groups are fairly highly correlated (Table 5). The highest correlations are, once again, between the two younger groups. The changes in marriage taxes, which are driven by both changes in income and in the tax code, are also highly correlated, a sharp contrast to marriage and divorce rates. (Table 6).

Table 6: Correlation of Marriage Taxes Among Women of Different Ages

	Women 25-34	*Women 35-44*	*Women 45-64*
Women 25-34	1.0000	0.9246	0.8308
Women 35-44		1.0000	0.9089
Women 45-64			1.0000

Table 7: Correlation of Changes in Marriage Taxes Among Women of Different Ages

	Women 25-34	*Women 35-44*	*Women 45-64*
Women 25-34	1.0000	0.7136	0.8671
Women 35-44		1.0000	0.7171
Women 45-64			1.0000

4.2 Other Variables

Other than the marriage tax, the median male and female incomes are the main variables of interest. As noted above, there is no reason to expect these variables to either increase or decrease the likelihood of marriage. For example, an increase in a woman's income increases both her "reservation price" for marriage, the lowest income she would accept when married, and her contribution to

[29] Labor Force Participation rates reached 50% for married women in 1977,1974, and 1985 respectively..

household income when married. If women did not participate in the labor force when married then an exogenous increase in female wages would decrease the likelihood of marriage. However, in practice, if changes in wages are associated with changes in human capital and human capital affects household production, then even if married women did not participate in the labor force increases in wages might not decrease the likelihood of marriage. Alm and Whittington (1995a) found a negative correlation between the ratio of female to male income and the percent of women who are married. However, Sjoquist and Walker (1995) found a positive correlation between this ratio and the marriage rate - the number of marriages per unmarried woman.

In this paper, rather than use the ratio of the two incomes, the income variables are entered separately to see how the individual income variables are correlated with the marriage and divorce variables.[30] A potential problem with the female income variable is that the labor force participation rate of married women changed quite dramatically over the past few decades. Since we are using this variable to proxy for the effect of changes in earnings potential, the measure we use is the median income of women with income, rather than the median income of all women. The income data are after-tax measures of income with the tax calculated in a similar way to the way it was calculated for the marriage tax variable. The raw data comes from the Current Population Reports P-60 series (various years).

Other control variables suggested in either Alm and Whittington (1995b) or Sjoquist and Walker (1995) are included in the regression. Where available, the variables are for the specific age group that the dependent variables for. The exceptions are the percent of the population that is Catholic and the percent of the population that are immigrants. Another deviation from this general rule is that the divorce rate (number of divorces per 100 married women) for women aged 45 to 64 is not available, and so the divorce rate of women over 45 is substituted, although the controls are for women between 45 and 64. The other control variables included are:

Percent of Population that is Catholic. The cost of divorce may affect both the divorce rate and the marriage rate. If the cost of divorce is high, couples may delay, or not risk, marriage. The percent of population that is Catholic is a proxy for the cost of divorce, since annulments from the Catholic Church are difficult to obtain and the Catholic Church does not recognize civil divorces. [Data from the Yearbook of American Churches]

[30] Results for the marriage tax varaible are similar to the results presented here when the ratio is used rather than entering the two variables separately.

Demographic Variables. The percent of the population that are immigrants and the percent of the population that is white are included to capture demographic changes.

Unemployment Rate. Marriage and divorce rates may be related to the business cycle since high unemployment reduces the earnings of single persons, and the earnings of potential partners. Further, unemployment reduces the cost of marriage search, and makes home production less costly. Unemployment may also put stress on otherwise fragile marriages and so increase the divorce rate. Note that if one member of the couple is divorced (i.e. in the theoretical model the wage for that person is zero) it increases that member's incentive to stay married (since their potential earning when single is lower). However, it may decrease the other (employed) partner's gain from marriage by decreasing total family income when married.

Ratio of Males to Females. As noted in Freiden (1974) an increase in the ratio of males to females increases the supply of males and so should increase the number of females who marry.

This list of time varying variables is not exhaustive. Further, attitudes towards marriage and divorce may have changed over the past half century. In particular, increased acceptance of pre-marital sex may have encouraged couples to delay marriage, and changing views on divorce may have affected the divorce rate. Although some of these changes may be caused by the marriage and divorce trends, it seems likely that causality runs both ways. To capture these effects a flexible time trend, time and time squared terms, is also included in the regression. Tables 7 - 9 show summary statistics for all variables (including marriage taxes and dependent variables) for each age group.

Table 8: Summary Statistics for Women Aged 25 through 34.

Series for Women Aged 25 - 34	*Mean*	*Std Error*	*Min.*	*Max.*
Median Female Income (1990$)	4296.58	4364.14	0.00	10752.49
Median Male Income (1990$)	19057.44	3288.73	12359.78	24935.02
Percent Catholic	0.22	0.02	0.17	0.24
Divorced Women as Percent of All Women	0.06	0.03	0.02	0.10
Divorced Women as Percent of All Ever Married Women	0.07	0.04	0.02	0.13
Divorces per 1000 Married Women	25.92	10.48	11.29	39.40
Percent of Population that are Immigrants (multiplied by 100)	2.14	1.16	1.00	7.23
Married Women as Percent of All Women	0.80	0.09	0.64	0.89
Ratio of Males to Females	1.04	0.02	1.01	1.09
Marriages per Unmarried Woman	0.160	0.022	0.126	0.204
Marriage Tax	-248.54	444.85	-784.46	369.43
Percent of Population that are Immigrants	0.87	0.02	0.82	0.90
Unemployment Rate	5.3	1.7	2.5	9.7

Table 9: Summary Statistics for Women Aged 35 through 44.

Series for Women Aged 35-44	*Mean*	*Std Error*	*Min.*	*Max.*
Median Female Income (1990$)	4672.04	4510.28	0.00	12027.30
Median Male Income (1990$)	22724.68	4523.49	14029.08	29461.90
Percent Catholic	0.22	0.02	0.17	0.24
Divorced Women as Percent of All Women	0.08	0.04	0.03	0.15
Divorced Women as Percent of All Ever Married Women	0.08	0.05	0.03	0.16
Divorces per 1000 Married Women	16.51	6.70	7.72	24.84
Percent of Population that are Immigrants (multiplied by 100)	0.80	0.09	0.64	0.89
Married Women as Percent of All Women	0.83	0.05	0.73	0.89
Ratio of Males to Females	1.05	0.01	1.02	1.06
Marriages per Unmarried Woman	0.077	0.006	0.064	0.091
Marriage Tax	-366.17	368.20	-757.58	498.52
Percent of Population that are Immigrants	0.88	0.02	0.83	0.91
Unemployment Rate	4.0	1.2	2.2	7.0

Table 10: Summary Statistics for Women Aged 45-64.

Series for Women Aged 45-64	*Mean*	*Std Error*	*Min.*	*Max.*
Median Female Income (1990$)	4308.54	3425.37	0.00	10415.94
Median Male Income (1990$)	20653.34	4469.72	12186.83	26574.62
Percent Catholic	0.22	0.02	0.17	0.24
Divorced Women as Percent of All Women	0.07	0.04	0.02	0.15
Divorced Women as Percent of All Ever Married Women	0.07	0.04	0.02	0.16
Divorces per 1000 Married Women	6.66	1.84	3.97	9.50
Percent of Population that are Immigrants (multiplied by 100)	2.14	1.16	1.00	7.23
Married Women as Percent of All Women	0.74	0.02	0.71	0.76
Ratio of Males to Females	1.09	0.10	1.00	1.71
Marriages per Unmarried Woman	0.021	0.002	0.018	0.025
Marriage Tax	-286.47	248.02	-709.11	126.46
Percent of Population that are Immigrants	0.90	0.02	0.86	0.93
Unemployment Rate	3.7	1.0	1.9	5.9

4.3 Marriage and Divorce Rates

Here, we examine the effect of the marriage tax on marriage and divorce rates. The marriage rate is defined as the number of marriages per 1000 unmarried women and the divorce rate is defined as the number of divorces per 1000 married women. These are flow variables reflecting changes in the number of married persons, rather than stocks of married or divorced persons. Using aggregate marriage rate data for the whole population, Sjoquist and Walker (1995) finds the coefficient on their marriage tax variable was statistically insignificant with a theoretically inconsistent positive sign. Alm and Whittington (1995b) confirms this result with different data. However, Alm and Whittington (1995b) also finds the related stock variable, the percentage of women that are married, is negatively correlated with the marriage rate. Since the percentage of women that are married is affected by both marriage and divorce rates this might be because marriage taxes affects divorce more strongly than marriage. Looking at divorce rates, as well as marriage rates, might indicate whether the data support this hypothesis.

Results from the regression on the marriage rates for each age group are shown in Table 10. The Durbin-Watson statistics fall in the ambiguous range between the lower and upper bounds at a 5% significance level. This may indicate persistence in the error terms, but does not strongly indicate an

AR(1) process. Since there is no a priori reason to expect the errors to follow an AR(1) process, as opposed to a more general time series process, rather than using a Generalized Least Squares or maximum likelihood procedure, we estimate the equation using OLS and a Newey-West (1987) covariance matrix.[31] The Durbin-Watson statistics are similar throughout this section, and so the same procedure is used for divorce rates and the percentages of women who are married and divorced. The R-squared terms statistics are quite large, especially for the divorce rate equation (see Table 11). However, given the strong trends in much of the data this may not be surprising.

The marriage tax variable is statistically insignificant at conventional levels in all three regressions. Further, the coefficient has the sign expected from theory only in the regression for women aged 25 to 34, and even for this group the point estimate of the elasticity is small (see Table 15). These results are consistent with the results in Sjoquist and Walker (1995) and Alm and Whittington (1995b) and confirms that there is little time series support for the hypothesis that the marriage rate is affected by the marriage tax.

Both male and female income are positively correlated with marriage rates for all three age groups, and the correlation is statistically significant for both income variables for the youngest women and for female income for the oldest women. As noted earlier, these variables are proxies for male and female wages and as the preceding section indicates, theory does not predict a sign for the coefficients. For all three age groups the point estimates for the coefficients on female wages are larger than the point estimates for male wages. Elasticities for these variables are shown in Table 16 and Table 17 for women and men respectively.

[31] The results are not highly sensitive to longer or shorter lags for the Newey-West covariance matrix. Further, the results are fairly similar using a Maximum Likelihood or Cochrane-Orcutt estimation procedure assuming an AR(1) process.

Table 11: Effects of Marriage Taxes on Marriage Rates.

Dependent Variable	Marriages per 1000 Unmarried Women		
Mean of Dependent Variable	149.85	76.72	21.42
Age Group	25 to 34	35 to 44	45 to 64
Estimation Method	OLS with Newey West Covariance Matrix (6 Lags)		
Number of Observations	42	42	42
Durbin Watson Statistic	1.23	1.54	1.47
Constant	697.88 (0.69)	538.95* (1.72)	48.88** (3.85)
Marriage Tax (1000s)	-22.74 (-1.05)	3.8839 (1.01)	1.8118 (1.33)
Median Male Income (1000s)	5.9525* (1.83)	0.3923 (0.43)	0.2859 (1.50)
Median Female Income (1000s)	6.3938** (2.21)	0.8180 (0.85)	0.7624** (4.15)
Percent Catholic	34.70 (0.11)	80.45 (0.63)	-29.42 (-1.31)
Percent Immigrant	7.9704** (2.83)	-3.6692** (-2.25)	0.0401 (0.11)
Percent White	-1158.19 (-1.04)	-719.74** (-2.79)	-35.02** (-2.28)
Ratio of Males to Females	324.12** (2.45)	158.94 (0.88)	0.9487 (1.44)
Unemployment Rate	-0.0500 (-0.03)	-1.6472** (-1.82)	-0.3282 (-1.26)
Time	-3.4341 (-0.78)	-0.0062 (-0.00)	-0.0715 (-0.28)
Time Squared	-0.0158 (-0.23)	-0.0244 (-0.90)	-0.0035 (-0.92)
R-Squared	0.861	0.727	0.857

The coefficients on the time trend variables are statistically insignificant at usual significance levels. Dropping the time squared term makes the trend variable becomes significant at conventional levels but does not affect any other results.[32] The proportion of the population that is white is negatively correlated with the marriage rate for all age groups, and is statistically significant at the five percent level for the two older age groups. The unemployment rate is only statistically significant in the equation for

[32] The only noticeable changes are that the coefficient on male income is statistically significant at a 10% level in the equation for women aged 35 to 44, and the coefficient on the marriage tax variable becomes statistically significant at a 10% level in the equation for women aged 45 to 64 with a theoretically inconsistent positive sign. This confirms the prior result that there is little evidence that high marriage taxes decrease the likelihood of marriage.

women aged between 35 and 44, although it has a negative sign in all three equations. This would be consistent with the assertion that unemployment makes couples delay marriage. Finally, for all age groups the ratio of males to females increases the marriage rate for females. This is consistent with Freiden's (1974) prediction that as males become more numerous relative to females a larger proportion of females marry. However, the coefficients are statistically insignificant for the two older groups of women.

Table 12: Effects of Marriage Taxes on Divorce Rates.

Dependent Variable	**Divorces per 1000 Married Women**		
Mean of Dependent Variable	25.92	16.51	6.66
Age Group	25 to 34	35 to 44	45 and Older
Estimation Method	**OLS with Newey West Covariance Matrix (6 Lags)**		
Number of Observations	36	36	36
Durban Watson Statistic	1.25	2.02	1.52
Constant	-109.71 (-1.09)	21.26 (0.79)	-19.85** (-2.34)
Marriage Tax (1000s)	13.24** (4.73)	1.2335** (2.78)	0.0590 (0.13)
Median Male Income (1000s)	1.3868** (2.46)	0.7657** (7.49)	0.2104** (3.64)
Median Female Income (1000s)	-0.9704** (-2.77)	-0.7547** (-3.80)	0.2088** (3.65)
Percent Catholic	-69.25 (-1.15)	-106.08** (-7.07)	-43.04** (-8.13)
Percent Immigrant	0.7751** (2.04)	0.9508** (5.45)	0.4001** (5.64)
Percent White	123.25 (1.22)	14.815 (0.78)	30.79** (6.12)
Ratio of Males to Females	10.46 (0.25)	-18.18 (-0.89)	-1.9466 (-0.37)
Unemployment Rate	0.4157 (1.52)	0.7414** (8.64)	0.2777** (5.04)
Time	0.1826 (0.24)	0.1319 (0.95)	-0.0065 (-0.07)
Time Squared	0.0075 (0.67)	0.0053 (2.30)	0.0015 (1.08)
R-Squared	0.991	0.996	0.989

Results for female divorce rates are shown in Table 11. Once again the Durbin-Watson statistics fall in the range between the upper and lower bounds, and so to be prudent we use a Newey-West (1987) covariance matrix.

The marriage tax results in this subsection are generally consistent with theory. The marriage tax is positively correlated with the divorce rate for women aged 25 to 34 and aged 35 to 44 at a 1% significance level. These results are consistent with the hypothesis that high marriage taxes encourage divorce. For women aged 45 to 64, the coefficient on the marriage tax is positive but is not statistically significant. The elasticities calculated at the means of all variables are small: the point estimates are 0.13, 0.03, and 0.00 (see Table 15 below)). This indicates marriage taxes do not have a large effect on divorce decisions, although the direction of the effect is consistent with theory.

The coefficients on income variables are statistically significant and, except for the coefficient on median female income for women aged over 45, have consistent signs across age groups. The coefficient on male income is positive and significant for all three groups, indicating that higher median male income is correlated with higher divorce rates. Although this may seem counter-intuitive since higher income makes men more attractive partners, it also makes being single more attractive for males. This result is not consistent with results in the next section that find that the percentage of women who are divorced is negatively correlated with male income. Median female income is negatively correlated with divorce rates for younger women, but positively correlated with divorce rates for older women.

Although the percentage of the population that is Catholic is not significantly correlated with marriage rates for all groups (see Table 10), it is negatively correlated with divorce rates. This correlation is statistically significant for women aged between 35 and 44, and women aged over 45. Given that it is difficult to obtain an annulment in the Catholic Church, this result is not surprising.

The coefficient on the unemployment rate is positive for all three age groups, and is statistically significant for women aged 35 to 44 and women over 45. This is consistent with the hypothesis that unemployment increases the stress on fragile marriages, and so increases the likelihood of divorce. A one percentage point increase in unemployment rates increases the number of divorces per 1000 married women by about 0.7 for women aged 35 to 44 and 0.3 for women over 45. The elasticities are .18 and .16. Once again the coefficients on the squared time trend are statistically insignificant. However, excluding this term does not affect the results and makes the coefficient on the simple trend statistically significant in most regressions.

4.4 Percentage of Women That Are Married and Divorced.

This subsection studies stock, rather than flow, variables. The dependent variables are the percent of women who are married, and the percent of ever-married women who are divorced rather than marriage and divorce rates.[33] Unlike the marriage and divorce rates, these variable reflect both entries and exits from divorce. For example, the number of divorced women depends upon both the number of married women who get divorced and the number of divorced women who remarry. One potential problem is that marriage and divorce decisions are long-term decisions. A couple who decide to marry rather than cohabit to get a marriage subsidy due to a change in the tax law (which they believe at the time to be permanent) may be unwilling to get a divorce if the change is reversed (again in a way that they believe to be permanent). Hence, we expect marriage taxes to only have a small effect on these variables.

Table 12 shows the same base regression with the percentage of women who are currently married as the dependent variable. The marriage tax is only statistically significant for women aged 25 to 34. For this group, the results are consistent with the hypothesis that high marriage taxes either encourage unmarried women to remain unmarried or encourage married women to divorce. Since the marriage tax is not significantly correlated with marriage rates (entrances) but significantly correlated with divorce rates (exits), this result may be due to the correlation between marriage taxes and divorce rates. The effect is small: the point estimate of the elasticity (estimated at the means of all variables) is only -0.02 (see Table 15). The coefficient on the marriage tax is statistically insignificant for women aged between 35 and 44, but has the expected sign.

The signs of the coefficients on the income variables are different for different age groups and are often statistically insignificant. The coefficient on male income is positive for all three age groups, but is statistically significant only for women aged 25 to 34. The coefficient on female income is positive for women aged 25 to 34, and positive and statistically significant for women aged 45 to 64, but negative (and statistically insignificant) for women aged 35 to 44. In all cases the point estimates of the elasticities are quite small.

[33] In an appendix, the regression results for the percent of all women who are divorced are also shown. The results are broadly similar to the results for the percent of ever-married women who are divorced.

Table 13: Effects of Marriage Taxes on Percent of Women who are Currently Married

Dependent Variable	Percent of Women Currently Married		
Mean of Dependent Variable	0.80	0.83	0.74
Age Group	25 to 34	35 to 44	45 to 64
Estimation Method	OLS with Newey West Covariance Matrix (6 Lags)		
Number of Observations	45	45	45
Durban Watson Statistic	1.64	1.84	1.64
	Coeff (t-stat)	Coeff (t-stat)	Coeff (t-stat)
Constant	-0.9573* (-1.90)	1.7752** (4.33)	0.9696** (6.23)
Marriage Tax (1000s)	-0.0583** (-3.20)	-0.0060 (-0.92)	0.0104 (1.03)
Median Male Income (1000s)	0.0022** (2.01)	0.0008 (1.15)	0.0012 (1.50)
Median Female Income (1000s)	0.0042 (1.12)	-0.0005 (-0.44)	0.0024** (2.62)
Percent Catholic	0.8990** (2.02)	0.7523** (4.21)	-0.2482** (-2.24)
Percent Immigrant	-0.0005 (-0.29)	-0.0006 (-0.61)	0.0016 (1.48)
Percent White	1.7086** (2.63)	-1.4834** (-3.18)	-0.2615 (-1.63)
Ratio of Males to Females	0.0147 (0.15)	0.2362** (2.66)	-0.0067** (-2.11)
Unemployment Rate	0.0007 (0.70)	-0.0010 (-1.06)	0.0001 (0.05)
Time	-0.0004 (-0.15)	0.0017 (1.52)	0.0032** (2.53)
Time Squared	-0.00005 (-1.24)	-0.0001** (-5.64)	-0.00010** (-4.90)
R-Squared	0.996	0.988	0.912

The coefficients on the demographic variables do not follow a consistent pattern. For example, the coefficient on the percent of the population that is Catholic is positive and significant for women aged 25 to 34 and aged 35 to 44, but negative and significant for older women. The inconsistent pattern of the coefficients on the demographic and income variables in this subsection may encourage the reader to have greater confidence in the results of the last subsection when compared to this subsection. The trend variables in this subsection are more often statistically significant than in the previous subsection.

The marriage tax is only significantly correlated with divorced women as a percentage of ever-married women for women aged between 25 and 34. As expected from theory, high marriage taxes are

correlated with high percentages of divorced women for this age group. Once again, the elasticity is small (see Table 15). The correlations for the two groups of older women are statistically insignificant and the point estimates of the elasticities are even smaller, but the coefficient does have the expected sign. The coefficients on male income indicate that high male income is correlated with low numbers of divorced women. This is puzzling because in the last subsection it was correlated with high divorce rates. It is possible that the difference is due to higher remarriage rates when incomes are high, since the stock variable captures both entries and exits, while the divorce rate only capture entrances. However, as shown in the previous section, male income appears to have only a weak effect on overall marriage rates.

The percentage of ever-married women who are divorced is not statistically significantly correlated with the percentage of the population that is Catholic for two of the groups. It is significant and negative for women aged 35 to 44. Although, divorce rates were more strongly correlated with this percentage, this might reflect the fact that the Catholic Church also makes it more difficult for divorced persons to remarry. The coefficients on the other control variables are generally insignificant.

One conclusion from this subsection is that only the youngest group of women appears to be affected by changes in the marriage tax. Both the percentage of married women and the percentage of divorced women are statistically significantly correlated with the marriage tax for women aged 25 to 34, but not for either of the two older groups. In the previous subsection, the divorce rate was also correlated with the marriage tax for women aged 35 to 44.

Table 14: Effects of Marriage Taxes on Percent of Ever Married Women who are Currently Divorced.

Dependent Variable	Divorced Women Per 100 Ever Married Women		
Mean of Dependent Variable	6.95	8.33	6.77
Age Group	25 to 34	35 to 44	45 to 64
Estimation Method	OLS with Newey West Covariance Matrix (6 Lags)		
Number of Observations	45	45	45
Durban Watson Statistic	1.43	1.22	1.40
Constant	13.26 (0.34)	-96.02** (-2.05)	11.90 (1.61)
Marriage Tax (1000s)	3.3524** (2.17)	0.7233 (1.08)	0.6206 (1.18)
Median Male Income (1000s)	-0.0950 (-0.91)	-0.2021** (-2.35)	-0.1657** (-3.97)
Median Female Income (1000s)	-0.4927** (-2.05)	0.0618 (0.39)	0.0400 (0.55)
Percent Catholic	-54.87 (-1.63)	-71.83** (-2.99)	10.51 (1.54
Percent Immigrant	-0.1342 (-1.44)	-0.2676 (-1.44)	0.0069 (0.20)
Percent White	-12.91 (-0.27)	134.39 (2.24)	-9.0199 (-1.16)
Ratio of Males to Females	15.65** (2.39)	-5.3684 (-0.58)	0.0672 (0.46)
Unemployment Rate	0.0360 (0.40)	0.0772 (0.76)	-0.0949** (-2.00)
Time	0.4343* (1.89)	0.4026** (3.20)	0.0271 (0.46)
Time Squared	-0.0023 (-1.12)	0.0048* (1.75)	0.0058** (6.11)
R-Squared	0.990	0.988	0.995

4.5 Elasticities.

As noted throughout the text, the elasticities with respect to the marriage tax, calculated at the means of all variables, are small (see Table 15). The largest in absolute value are the elasticities for women aged 25 to 34 for each of the dependent variables. Further, except for the divorce rate for women aged 35 to 44, these are the only statistically significant results.

For women aged between 25 and 34, the elasticities for the divorce rate and for the percentage of women divorced are both about 0.12. Their respective 90% confidence intervals are (0.03,0.21) and (0.08,0.17) . The point estimate of the elasticity of the percent of women who are currently married with respect to the marriage tax is even smaller, -0.02. These small effects could be because few couples take marriage taxes into account when making marriage and divorce plans. Interestingly, the marriage tax appears to affect divorce decisions more strongly than marriage decisions. This is consistent with the observation in both this paper, and Alm and Whittington (1995b), that the percentage of women who are currently married, which is affected by both marriage and divorce decisions, is negatively correlated with the marriage tax, but that the marriage rate. This result is surprising given that cohabitation is possible for unmarried couples, but less plausible for divorced couples. Hence, unmarried couples could avoid the tax while still living together.

For women between 35 and 44, only the divorce rate is statistically significantly correlated with the marriage tax. The point estimate of the elasticity is smaller for this group than for the younger group. Coefficients on the marriage tax variables for the percentage of women who are married and the percentage of ever-married women who are divorced are in the expected directions but are statistically insignificant. For these dependent variables, the point estimates of the elasticities are smaller for women aged 35 to 44 than for women aged 25 to 34 also. For women aged between 45 and 64, the coefficients are all statistically insignificant.

Table 15: Elasticities of Dependent Variables With Respect to the Marriage Tax

Age Group	Elasticity	90% Confidence Interval
Divorced Women as Percent of Ever-Married Women		
25-34	0.121**	(0.029,0.212)
35-44	0.032	(-0.017,0.081)
45-54	0.027	(-0.010,0.064)
Divorces Per 1000 Married Women		
25-34	0.128**	(0.083,0.172)
35-44	0.028**	(0.011,0.044)
45-54	0.003	(-0.030,0.035)
Married Women As Percent of All Women		
25-34	-0.018**	(-0.028,-0.009)
35-44	-0.003	(-0.007,0.002)
45-54	0.004	(-0.002,0.011)
Marriages Per 1000 Unmarried Women		
25-34	-0.038	(-0.097,0.021)
35-44	0.019	(-0.012,0.049)
45-54	0.025	(-0.006,0.055)

In general , the elasticities associated with the median male and female incomes are larger in absolute value than for the marriage tax. However, the pattern among the estimated directions of changes is less consistent. In particular, the elasticities of the divorce rate with respect to median male income are significant and positive for all age groups, while the elasticities of the percent of ever-married women who are divorced are all negative and significant for two of the groups. Otherwise, the directions are generally the same for the pairs of divorce and the pairs of marriage variables where they are statistically significant. For example, the point estimate of the elasticity of the divorce rate with respect to female income is -0.36 and the point estimate for divorced women as percent of ever-married women is -0.69.

Table 16: Elasticities of Dependent Variables With Respect to Median Female Income

Age Group	Elasticity	10% Confidence Interval
Divorced Women as Percent of Ever-Married Women		
25-34	-0.69**	(-1.24,-0.14)
35-44	0.075	(-0.24,0.39)
45-54	0.060	(-0.12,0.24)
Divorces Per 1000 Married Women		
25-34	-0.36**	(-0.58,-0.15)
35-44	-0.46**	(-0.66,-0.26)
45-54	0.32**	(0.18,0.46)
Married Women As Percent of All Women		
25-34	0.051	(-0.023,0.125)
35-44	-0.006	(-0.029,0.017)
45-54	0.033**	(0.012,0.054)
Marriages Per 1000 Unmarried Women		
25-34	0.41**	(0.11,0.72)
35-44	0.11	(-0.10,0.32)
45-54	0.36**	(0.22,0.51)

Table 17: Elasticities of Dependent Variables With Respect to Median Male Income

Age Group	Elasticity	10% Confidence Interval
Divorced Women as Percent of Ever-Married Women		
25-34	-0.29	(-0.82,0.24)
35-44	-0.63**	(-1.08,-0.19)
45-54	-0.63**	(-0.89,-0.37)
Divorces Per 1000 Married Women		
25-34	1.15**	(0.38,1.92)
35-44	1.21**	(0.95,1.48)
45-54	0.81**	(0.44,1.17)
Married Women As Percent of All Women		
25-34	0.059**	(0.011,0.107)
35-44	0.025	(-0.011,0.061)
45-54	0.042	(-0.004,0.087)
Marriages Per 1000 Unmarried Women		
25-34	0.85*	(0.09,1.62)
35-44	0.13	(-0.38,0.64)
45-54	0.34	(-0.03,0.72)

5. Empirical Evidence on the Timing of Marriage.

One conclusion from the previous section is that, in general, the results suggest that marriage taxes have only a modest effect on long-term marriage and divorce decisions. Although, for many couples, tax considerations may not play a large role in long-term decisions, it is still possible that they affect short-term decisions. Couples may not cancel marriage plans altogether, but may delay it for a short period of time. Likewise, couples going through divorce (or legal separation) may work harder to get them through more quickly. Although these will affect the aggregate number of persons who are married, or divorced, at any given time, they would have to be quite substantial to effect the aggregate rates.

This section addresses two specific questions regarding timing of marriage - whether couples postpone end of the year marriages to avoid marriage penalties and whether they accelerate beginning of the year marriages to get marriage subsidies. Three recent papers have addressed these questions. Alm and Whittington (1995b), using individual data from the Panel Study of Income Dynamics (PSID), report that they find that couples postpone marriages from the last quarter of the tax year to the first quarter of the next year to avoid marriage penalties. Sjoquist and Walker (1995), using aggregate data from the United States for 1948-1987, find that the ratio of marriages in the last two months of the tax year to marriages in March and April of the next tax year is negatively and significantly correlated with the

median marriage tax for that year.[34] Finally Gelardi (1996), using aggregate data from England and Canada finds that tax law changes in these countries, which stopped couples marrying at the end of the year from getting the full tax advantages of marriage, reduced the share of marriages in the month prior to the end of the tax year, and increased the share of marriages in the traditional summer months.

This paper looks at these two separate questions using two types of data. First, we use individual data from the National Longitudinal Survey of Youth (NLSY) to see whether the couples marrying at the beginning or end of the tax year have marriage taxes that are systematically different from couples who marry at other times of the year. We also test whether the main effects appear to be caused by couples delaying marriages to avoid marriage taxes or whether couples are accelerating marriages to receive marriage subsidies. Second, we expand upon the work of Sjoquist and Walker (1995) by addressing the question of whether marriage taxes affect weddings at the beginning of the year and whether they affect marriages at end of the year separately using aggregate data.

5.1 Individual Data from the National Longitudinal Study Of Youth.

Table 1 presents average marriage taxes in the first year of marriage, weighted by sample weights, for first marriages of women in the NLSY. The months we are most interested in are the first and last few months of the year, since presumable it is less costly for couples who would like to marry in these months to postpone, or accelerate, wedding plans to the previous, or next, tax year. If couples facing high marriage penalties postpone end of the year weddings to avoid marriage taxes, then all other things being equal, couples who marry at the end of the tax year should, on average, have lower marriage taxes than couples who marry at other times of the year. Likewise, if couples accelerate marriage plans from early in the tax year to the previous year, to take advantage of marriage subsidies, then the average marriage tax for couples who marry at the beginning of the year should be higher than for other months (Recall that marriage subsidies are negative and marriage penalties are positive throughout the analysis).

The strongest support for either of these two hypotheses is that couples marrying in December have lower marriage taxes than those who marry at other times of the year. The third lowest marriage tax in December is $16.15, and it is substantially lower than the yearly average of $178.37. However, the average marriage tax for couples marrying in November is very close to the average marriage tax, and the marriage tax for couples who marry in October is the highest average marriage tax for any month. The evidence for the hypothesis that couples marrying in the first quarter of the year have higher marriage

[34] They use March and April rather than January and February because few marriages occur in the first two months of the year. They report that this result is not robust to either using marriages in January and February rather than March and April or to other possible specifications (p. 556).

taxes is less encouraging. Couples marrying in January and February have the lowest overall marriage taxes, although neither month is a popular month for weddings.[35] The months where couples have the highest average marriage taxes are on either side of the summer - April, May, September and October.

Table 18: Average Marriage Taxes for Couples in the NLSY.

Month	*Number of Observations*	*Average Marriage Tax*	*Average Male's Income*	*Average Female's Income*
Total	2404	$178.37	$20,080.66	$10,803.29
January	99	-$173.52	$20,790.37	$7,543.48
February	121	-$88.04	$19,719.19	$8,367.09
March	144	$198.54	$19,577.48	$10,969.24
April	162	$204.87	$19,363.02	$10,174.28
May	254	$312.34	$20,863.65	$12,354.73
June	334	$159.33	$19,935.16	$10,822.79
July	204	$42.16	$19,525.64	$9,806.98
August	284	$171.14	$20,767.36	$10,771.76
September	232	$272.82	$20,079.70	$11,240.75
October	216	$469.56	$22,298.72	$13,192.34
November	171	$158.99	$20,254.46	$9,565.12
December	183	$16.15	$16,392,13	$10,740.26

Some differences may be due to other socio-economic variables. For example, the incomes of the two spouses also differ significantly by month (Table 17). Further, other socio-economic differences may affect both the marriage month and be correlated with marriage taxes.[36] To control for other potential differences a multi-nomial logit model is estimated where the probability of a birth in a given season is a function of the marriage tax, each partner's income and other socio-economic variables. Because the NLSY gives more in depth information on the subject who is a participant in the survey than it does on the subject's spouse, far more information is available on the subject than on the subject's spouse. As a result, we limit the sample to females in the NLSY since combining both male and females in the same regression without adequate controls could be problematic. It is hoped that controlling for characteristics of the women will also control for characteristics of the men they choose to marry, since

[35] One possibility might be that couples who marry in the unpopular winter months are more likely to be marrying because the woman is pregnant. Couples who wish to marry prior to the birth will have less control over the preferred date than other couples. Although this does appear true in the sample used in this study, about 10% of winter marriages are followed by a birth within five months versus about 7% of all marriages, excluding marriages followed shortly by a birth does not affect the results.

[36] For example, winter weddings may be more common in southern states where the weather is more clement in the winter, and perhaps less clement in the summer, and overall incomes tend to be lower in the south.

women tend to marry partners with similar traits to their own.[37] As noted below, where possible, we control for characteristics of their husbands also.

5.1.1 Variables

The NLSY is an annual survey of persons aged between 14 and 22 in 1979. It has followed the marriage, fertility, and work profiles of these individuals since 1979. In this study we look at characteristics of women in the sample, and see if the characteristics affect the month of their first marriage.

The main independent variables included in the regression are:

Marriage Tax: The difference between taxes paid when the couple is married and when they are not married. A positive marriage tax indicates a marriage penalty: the couple pays higher taxes when married. A negative marriage tax indicates a marriage subsidy: the couple pays lower taxes when married. This is calculated by calculating the tax the couple would pay on their joint income when married, and subtracting the tax they would each on their individual incomes if they were single. When single the following assumptions are made: if the woman has no children, the two individuals file as if single using the standard deduction and one personal exemption each. If the woman has children then she is assumed to file as Head of Household with the appropriate number of personal exemptions. Married couples are also assumed to take the standard deduction. In both cases, only federal taxes are considered. All dollar figures in the sample are converted to 1990 prices by the CPI-U. For couples marrying between 1981 and 1986, the two earner deduction is applied to earned income of the lower earning partner.

Male and Female Income: The income variables used are the after tax income of the male and female partners in the sample when single. The tax is calculated in much the same way as for the marriage tax variable is.[38] As well as capturing socio-economic differences, income variables could be important since the cost of a wedding can vary quite substantially depending upon when it is performed. Potentially, male and female income may affect probabilities differently if, for example, the bride's parents are more likely to pay for the wedding than the groom's parents. Further, the importance of a traditional summer wedding may differ between persons of different income classes or persons of different ages.

Other socio-economic variable are included as controls:

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[37] Becker (1991), p.117.

[38] In practice, this assumption does not affect results. The results are basically the same as the results shown in the text if women with children prior to marriage are excluded, if they are assumed to file as single with no dependents, or if they are assumed to file as single with an exemption for each child.

Region of Residence: Three regional dummies are included: the South, Northeast and North Central. The omitted region is for western states. These variables are included to control for social norms that may differ between regions, and because inclement weather may make winter weddings less attractive in the north.

Family Background: Variables controlling for family background are also included in the regression. These socio-economic variables may control for things such as how highly the couple values a more traditional summer wedding, or how willing they are to pay premiums for weddings at more popular times of the year. The variables include dummies for who the woman lived with at age 14: the included dummies are for living with her natural mother and father, with only her mother, and with only her father (the omitted category is for other marital states, for example living with a parent and a stepparent). Race dummies, dummies for religious affiliation, and variables indicating the woman's educational achievement and the educational achievement of her mother are also included.

Church Attendance: The base regression includes a dummy variable indicating whether the woman reported going to church at least once a week. Other dummies indicating different degrees of church attendance (i.e. about once a month, never) were statistically insignificant and did not affect the main results. Church weddings may be harder to arrange at certain times of the year, and women's preference for church versus non-church weddings may be influenced by church attendance.

Military Dummy: The base regression includes a dummy variable indicating whether the woman or her spouse is active in the military in the year of their marriage. This could be important if for some military personnel (for example those in the navy) leave is less easily arranged than for civilians.

Family Attitudes: Women with more traditional attitudes towards family decisions may also have more traditional attitudes towards wedding. To try to control for this, two dummy variables are included which are coded "1" if the woman "agrees" or "strongly agrees" and "0" if the woman "strongly disagrees" or "disagrees" with the following statements: [39]

Attitudes Home	A woman's place is in the home, not in the office or shop.
Attitudes Traditional	Women are much happier if they stay at home and take care of children.

5.1.2 Econometric Modeling.

[39] These questions were asked in 1979, 1982 and 1987. The responses used in this study were the answers from 1979. Results were similar for the answers given in 1982 and 1987 (although individuals' answers did change).

The probability the couple marries in any given period (month, quarter etc.) k for k = 1 , ... , K is:

$$Prob(Period = k) = \frac{\exp[\beta_k (MarriageTax) + \gamma_k Z]}{1 + \sum_i \exp[\beta_i (MarriageTax) + \gamma_i Z]}$$

$$Prob(Period = 0) = \frac{1}{1 + \sum_i \exp[\beta_i (MarriageTax) + \gamma_i Z]}$$

The "Z" variables are the demographic variables discussed in the previous section. The period including the traditional summer months is denoted period zero and so the coefficients can be interpreted as the difference between the coefficients on these variables for the traditional summer months and the period in question.

Columns (1) and (2) in Table 18 show results from the first model. The year is divided into three periods: January through April, May through August, and September through December. If high marriage taxes discourage weddings in the latter third of the then the coefficient on the marriage tax variable for that period should be negative. In fact, the coefficient is positive but statistically insignificant. A positive sign would indicate that marriage penalties **increase** the probability of a marriage in the last third of the year. For the first quarter, the coefficient on the marriage tax variable is also insignificant (Column 1), but does have the theoretically expected sign. Results from regressions dividing the year into quarters (and using July through September as the dummy period) and dividing the year into three periods with January through March as the first period, April through September as the second period and October through December as the third period are basically similar to the results in Table 18. For these models, the coefficient on the marriage tax variable for the fourth quarter is negative, as expected from theory, but is insignificant. Overall, these preliminary results do not provide much support for the claim that marriage taxes affect the timing of marriage.

One possible explanation might be that the marriage tax does not affect all months at the beginning and end of the year equally. For example, couples who get married in September and October tend to have higher than average marriage penalties, although those couples that get married in December (and possibly in November) do have lower than average marriage penalties. The negative results presented above may be caused by the marriage tax only affecting weddings at the very beginning and the very end of the year.

Results when the dependent variable is recoded to three periods: January through February; March through October ; and November through December are similar to those in columns (1) and (2) in

Table 18.[40] In particular, the marriage tax is insignificant for both periods, and the sign on the coefficient for the marriage tax for November and December is positive.[41] Recoding the dependent variable once more, dividing the year into January; December; and February through November (the default period), gives the results shown in Table 18, columns (3) and (4) . The coefficient on the marriage tax for the month of December has the expected negative sign indicating that couples with high marriage taxes are less likely to get married in December. The coefficient on the marriage tax for the month of January is positive, but is statistically insignificant at conventional levels.

Although the coefficient on the marriage tax for December is statistically significant, it is numerically small. Calculating the partial derivatives of the probabilities at the means of all variables, the elasticity of the probability of a December wedding with respect to the marriage tax is about -0.02. This may be deceptively small due to the mean of the marriage tax being so close to zero ($179) despite an extremely large range of values - from a marriage tax of over $6,000 to a marriage subsidy of close to $10,000. A modest increase of $100 in the marriage tax reduces the probability that the couple will get married in December from about 6.9% to 6.8% - a small but not insignificant change.

[40] In this estimation , March through October is the default period and so the coefficient reflect the difference between these months and the rest of the year.

[41] Results are available from the authors upon request.

Table 19: Multivariate Logit Model Of The Effects of Marriage Taxes on January and December Weddings

	Estimation with 1st and 3rd Thirds of Year		Estimation with December and January	
	(1) January -April	(2) September - December	(3) January	(4) December
Variable	**Coefficient (t - statistic)**	**Coefficient (t - statistic)**	**Coefficient (t - statistic)**	**Coefficient (t - statistic)**
Constant	-3.8563* (-1.78)	5.384** (2.88)	-14.52** (-3.45)	-0.273 (-0.09)
Male Partner's Income (1000's)	0.006 (0.95)	-0.006 (-1.09)	0.016 (1.22)	-0.033** (-3.75)
Female Partner's Income (1000's)	-0.021* (-1.73)	0.006 (0.64)	-0.068** (-2.40)	0.033** (2.66)
Marriage Tax (1000's)	0.065 (0.83)	0.054 (0.89)	0.091 0.535	-0.185** (-1.98)
Year of Marriage	0.058* (1.88	-0.073** (-2.76)	0.1380** (2.33)	-0.022 (-0.52)
Age at Marriage (Female Partner)	-0.035 (-1.10)	0.111** (4.04)	-0.1491** (-2.36)	0.048 (1.09)
Female Partner's Education	-0.043 (-1.16)	-0.112** (-3.56)	0.1422** (1.97)	-0.072 (-1.43)
Hispanic (Female)	0.080 (0.30)	-0.064 (-0.26)	0.2681 (0.53)	0.497 (1.43)
Black (Female)	0.102 (0.61)	-0.023 (-0.15)	0.4679 (1.58)	-0.020 (-0.09)
Mother's Education (Female)	-0.027 (-1.28)	-0.023 (-1.25)	0.048 (1.14)	-0.015 (-0.52)
Military Dummy	0.422** (2.29)	0.250 (1.45)	-0.558 (-1.35)	0.496** (2.17)
Lived with Mother and Father at Age 14	-0.218 (-1.61)	-0.355** (-2.99)	0.055 (0.21)	-0.258 (-1.42)
Lived with only Father at Age 14 (Female)	0.826 (1.43)	-0.486 (-0.73)	0.461 (0.43)	-0.577 (-0.55)
North Central	0.082 (0.44)	-0.167 (-1.09)	0.499 (1.19)	0.040 (0.14)
South	0.365** (2.06)	-0.029 (-0.20)	0.984** (2.52)	0.375 (1.46)
North East	0.171 (0.86)	-0.010 (-0.06)	0.633 (1.47)	0.250 (0.86)
Catholic (Female)	-0.040 (-0.24)	-0.078 (-0.54)	0.696** (2.07)	-0.274 (-1.11)
Protestant (Female)	-0.128 (-0.83)	-0.026 (-0.19)	0.319 (1.00)	0.164 (0.75)
Attends Religious Services Often	-0.0264 (-0.21)	0.070 (0.64)	-0.238 (-0.97)	0.039 (0.22)
Never Attends Religious Services	0.170 (0.95)	-0.186 (-1.13)	0.555* (1.69)	-0.325 (-1.15)
Family Attitudes - Home	-0.151 (-0.87)	-0.123 (-0.81)	0.534 (1.78)	-0.222 (-0.88)
Family Attitudes - Traditional Roles	-0.034 (-0.27)	0.056 (0.51)	-0.254 (-1.00)	-0.052 (-0.29)

As noted above, the coefficient on the marriage tax variable is consistently insignificant for the early months. In particular, the coefficient on the marriage tax for the month of January (Table 18) is statistically insignificant at conventional levels. Since this is the variable we are primarily interested in, the model is simplified further to a univariate Logit model with two periods: December; and the other 11 months.[42] In this case, the coefficient on the marriage tax variable reflects the different effect that the marriage tax has on December weddings as compared to the average effect in the other months (Table 19, Column 1). The coefficient on the marriage tax remains significant and negative, and the magnitude is similar to the coefficient from the multinomial Logit model in the last section. As a first check for robustness we test the null hypothesis that the coefficients on male and female income are the same. The null hypothesis is rejected at conventional significance levels with a χ^2 (1) statistic of 19.33 and a significance level of 0.000 indicating that these variables should be included separately.[43] Since the theoretical reasons to include many of the control variables are not entirely persuasive, and noting that the coefficients on many control variables are statistically insignificant, to check robustness of results these statistically insignificant variables are dropped.

[42] Results for a univariate Probit model are similar. This is discussed further below.

[43] Similarly, for the reduced regression shown in Column (4), the null hypothesis that the two coefficients are equal is rejected with a χ^2 (1) statistic of 21.40. In the multinomial Logit model for January and December weddings shown in Table 19, Columns (3) and (4), the null hypothesis that the income coefficients for both January and December are equal is rejected at conventional levels with a χ^2 (2) statistic of 23.26.

Table 20: Univariate Logit Model Of The Effects of Marriage Taxes on December Weddings

	Logit	Logit	Logit	Logit
	(1) December	(2) December	(3) December	(4) December
Variable	**Coefficient (t - statistic)**	**Coefficient (t - statistic)**	**Coefficient (t - statistic)**	**Coefficient (t - statistic)**
Number of Observations	**2210**	**2238**	**2250**	**2263**
Constant	0.123 (0.04)	-0.111 (-0.04)	-2.125** (-3.15)	-1.665** (-3.32)
Male Partner's Income (1000's)	-0.034** (-3.81)	-0.033** (-3.77)	-0.033** (-3.84)	-0.034** (-3.93)
Female Partner's Income (1000's)	0.0344** (2.81)	0.036** (2.99)	0.035** (2.96)	0.037** (3.18)
Marriage Tax (1000's)	-0.184** (-1.96)	-0.185** (-2.02)	-0.183** (-1.99)	-0.192** (-2.09)
Year of Marriage	-0.028 (-0.65)	-0.027 (-0.65)		
Age at Marriage (Female Partner)	0.054 (1.23)	0.053 (1.27)	0.035 (1.20)	
Female Partner's Education	-0.078 (-1.54)	-0.066 (-1.37)	-0.076* (-1.66)	-0.063 (-1.47)
Hispanic (Female)	0.483 (1.40)	0.609* (1.83)	0.667** (2.06)	0.502 (1.61)
Black (Female)	-0.042 (-0.19)	-0.005 (-0.02)		
Mother's Education (Female)	-0.017 (-0.59)	-0.024 (-0.84)		
Military Dummy	0.518** (2.27)	0.558** (2.46)	0.553** (2.46)	0.563** (2.52)
Lived with Mother and Father at Age 14	-0.260 (-1.44)	-0.226 (-1.26)	-0.213 (-1.22)	
Lived with only Father at Age 14 (Female)	-0.597 (-0.57)	-0.575 (-0.55)		
North Central	0.028 (0.10)			
South	0.343 (1.34)	0.247 (1.43)	0.262 (1.57)	0.355** (2.22)
North East	0.232 (0.80)			
Catholic (Female)	-0.300 (-1.22)	-0.194 (-0.82)	-0.175 (-0.75)	
Protestant (Female)	0.154 (0.70)	0.218 (1.03)	0.197 (0.94)	
Attends Religious Services Often	0.049 (0.28)			
Never Attends Religious Services	-0.348 (-1.23)			
Family Attitudes - Home	-0.247 (-0.98			
Family Attitudes - Traditional Roles	-0.042 (-0.23)			
Pseudo R-Squared	**0.041**	**0.038**	**0.037**	**0.032**

Before dropping any variables, we test the null hypothesis that the coefficients on the attendance at religious services variables, the family attitudes variables, and the regional dummies for the North East and North Central are jointly zero. The regional coefficient on South is not dropped because it is statistically significant in some specifications. As noted earlier, a possible explanation for this is that winter weddings are more pleasant in the South where the weather is more clement. The χ^2 (6) statistic for this null hypothesis is 3.58, with a significance level of 0.734, and so the null hypothesis is accepted at conventional levels. In Column (2), these variables are dropped from the regression. The coefficient on the marriage tax variable remains significant and of similar magnitude. Some of the remaining coefficients are still statistically insignificant individually. The null hypothesis that the coefficients on the year the couple marries in, the woman's mother's educational achievement, the dummy variable indicating the woman is black, and the dummy variable indicating that she lived only with her father at age 14 are jointly zero is tested. The χ^2 (4) statistic is 1.46, which has a significance level of 0.83. In column (3), these variables are dropped. Once again, the coefficient on the marriage tax variable remains statistically significant at a 5% level, and of similar magnitude to the earlier regressions. The remaining variables that have not been significant in any regression at at least a 10% level (dummy variables indicating religious affiliation, a dummy variable indicating the girl lived with both parents at age 14, and the age of the female partner) are tested for joint significance. The χ^2 (4) statistic for these remaining variables is 6.53 with a significance level of 0.163, and so the null hypothesis that the coefficients are jointly zero is accepted at a 10% level. Likewise the null hypothesis that the coefficients on the two religious affiliation dummy variables is not rejected at a 10% level with a χ^2 (2) statistic of 3.49. These variables are then dropped to give the final regression shown in Column (4) of Table 19. Finally we test the joint hypothesis that the coefficients on all the excluded variables are jointly zero in the regression we started with in Column 1. The null hypothesis is not rejected with a χ^2 (14) statistic of 12.38 with a significance level of 0.576. In summary, the coefficient on the marriage tax variable appears robust to the exclusion of these dubious variables.

One common feature of all these models is that none is especially good at predicting December weddings. A pseudo R-squared terms suggested by McFadden (1974) is used to give some indication of the goodness of fit:

$$R^2 = 1 - \frac{\text{Log Liklihood of Unrestricted Model}}{\text{Log Likelihood of Restricted Model}}$$

where the restricted model is the model with only a constant term and the unrestricted model is the model estimated with the independent variables included.

These statistics, shown in the final row of the table, are small. Although not identical to "regular" R-squared terms, the pseudo R-squared term is bounded between zero and one. None of the regressions in Table 20 predict December weddings well. The model from Column (1) predicts two of the December weddings correctly, but predicts no December wedding incorrectly in 174 cases (see Table 20)

Table 21: Predictions of December Weddings from Model in Table 19, Column (1)

	Predicted		
Actual	**0**	**1**	**TOTAL**
0	2034	0	2034
1	174	2	176
TOTAL	2208	2	2210

Since we tested so many different hypotheses, changing the periods that the marriage tax was assumed to affect numerous times, it seems plausible that eventually something would end up being statistically significant due to Type I error.[44] To convince the reader that December does appear different from other months, Table 21 shows the coefficients on the marriage tax in similar Logit regressions for each month of the year (the regression is the one in Table 19, Column 1 with a different month as the dependent variable) . This also allows us to test whether the marriage tax affects wedding plans in other months. Since couples may be more willing to postpone (accelerate) weddings to avoid marriage taxes (receive marriage subsidies) when the delay (acceleration) is short, the marriage tax should affect the months closest to the end (beginning) of the year most significantly. The results are encouraging: the only month that the marriage tax appears to have a statistically significant effect on is December. One slightly less encouraging result is that the coefficient on the marriage tax for November is significant, at a lower 10% level, with a sign in the opposite direction to that expected from theory. However, given that we run 12 regressions false positives at the 10% level are certainly possible.

[44] Type I error are false rejections of true null hypotheses. In this case the false rejection of the null hypothesis that the coefficient on the marriage tax is zero.

Table 22: Coefficients on Marriage Taxes in Univariate Logit regressions for each Month of the Year

Month	*Coeff (t-statistic) on Marriage Tax Variable*	*Coeff (t-statistic) on Marriage Tax Variable*
January	0.105 (0.62)	0.087 (0.53)
February	0.007 (0.05)	-0.023 (-0.16)
March	-0.001 (-0.01)	0.005 (0.04)
April	0.104 (0.82)	0.029 (0.26)
May	0.010 (0.13)	0.020 (0.25)
June	0.000 (0.00)	0.003 (0.04)
July	-0.049 (-0.54	-0.058 (-0.65)
August	-0.074 (-0.97)	-0.055 (-0.72)
September	0.110 (1.08)	0.119 (1.21)
October	0.097 (0.99)	0.121 (1.27)
November	0.226* (1.72)	0.227* (1.77)
December	-0.184** (-1.96)	-0.192** (-2.09)

One general problem with fully parametric discrete choice models, such as Logit and Probit specifications is that the models impose over-identifying assumptions upon the parameters estimated. If the model is misspecified, in this case if the error terms do not follow a homoscedastic logistic distribution, the moments generated by the scores may not be valid, and this may lead to inconsistent estimates. Pagan and Vella (1989) suggest that given the fragility of estimates to the overidentifying assumptions, that testing them may give the reader greater confidence in the results presented. Therefore, in this section we test the model for various forms of misspecification, within the Pagan-Vella (1989) conditional moment framework. The tests are a "Reset"-like test and a test for heteroscedasticity.

The Reset test is similar to the traditional Reset test in the linear regression model.[45] In the context of discrete choice models, this test is based upon the fitted values, $x'\hat{\beta}$, and is intended to pick up either non-linearities or misspecification of the density function. The second set of tests, also in the

[45] See Godfrey (1988, p106-107) for a description of this test in the linear regression framework

Pagan-Vella (1989) conditional moment framework, test for heteroscedasticity. Rejection of the null hypothesis of homoscedasticity indicates that the second moments are not constant. This could be troubling in a maximum likelihood framework because, unlike the linear regression model, heteroscedasticity makes these maximum likelihood estimators inconsistent.

Table 23: Pagan-Vella Conditional Moment Tests.

	Pagan-Vella (1989) Moment Restriction Tests			
	Univariate Logit Model			
Reset-Type Tests	t-statistics	Probability	t-statistic	Probability
$(X'\beta)^2$	1.80	0.07	2.19	0.03
$(X'\beta)^2$ and $(X'\beta)^3$	$\chi^2(2) = 3.41$	0.18	$\chi^2(2) = 5.10$	0.07
$(X'\beta)^2$, $(X'\beta)^3$ and $(X'\beta)^4$	$\chi^2(3) = 4.04$	0.26	$\chi^2(3) = 5.29$	0.15
Heteroscedasticity				
Female Partner's Income	2.33	0.01	2.52	0.01
Male Partner's Income	-1.16	0.24	-1.41	0.16
Marriage Tax	-0.70	0.48	-0.86	0.39
Female Partner's Education	0.53	0.59	0.31	0.76
Hispanic (Female)	-0.71	0.47	-0.49	0.62
Military Dummy	0.35	0.73	0.64	0.52
South	0.77	0.44	1.00	0.32
Joint Test	$\chi^2(7) = 9.87$	0.20	$\chi^2(7) = 11.32$	0.12
Likelihood Ratio Test				
Female Partner's Income	-	-	$\chi^2(1) = 2.22$	0.14

The results for the univariate Logit model are satisfactory on most counts. The strongest evidence of misspecification is the heteroscedasticity test for the female partner's income. Otherwise no other test is failed at a 5% significance level, although the Reset-type test using $(X'\hat{\beta})^2$ only rejects the null hypothesis at a 10% level. A second test of heteroscedasticity for the female partner's income, testing for a form of multiplicative heteroscedasticity in the Probit model, rejects the null hypothesis of heteroscedasticity in that variable at conventional levels.[46] This may indicate some other form of misspecification rather than heteroscedasticity is to blame. Given the generally satisfactory performance of the model, and especially given that the test does not reject the null hypothesis of homoscedasticity in the joint test, this does not seem a major problem. The Probit specification does not perform as well. The rejection of the null hypothesis in the Reset-type tests may indicate a problem with the assumption of Gaussian errors. For this reason throughout the analysis the results presented use the Logit rather than

Probit specification. However, it should be noted that the results, in terms of significance and magnitude of coefficients, are similar.

Table 23 below shows the marginal effects and the elasticities of relevant variables. As noted above, the small elasticity on the marriage tax variable may be misleading because despite the large range of negative and positive values, the mean is close to zero. Partial derivatives and elasticities are calculated at the means of all variables.

Table 24: Partial Derivatives of Probability Functions and Elasticities at Means of All Variables.

Variable	*Partial Derivative*	*Mean of X*	*Elasticity.*
Constant	-0.112		-
Male Partner's Income (1000's)	-0.002	18.61	-0.047
Female Partner's Income (1000's)	0.002	9.75	0.025
Marriage Tax (1000's)	-0.013	.0120	-0.002
Female Partner's Education	-0.004	12.70	-0.06
Hispanic (Female)	0.034	0.049	-
Military Dummy	0.038	0.097	-
South	0.024	0.3915	-

Overall, this section indicates that marriage taxes have a relatively small, but statistically significant, effect on the probability of a December wedding. They do not seem to have a significant effect on weddings in other months at the end of the year and do not seem to have an effect on weddings in either January or other months early in the calendar year. This suggests that the marriage tax does not cause couples to merely juggle weddings between December and January by a few weeks. This may be because couples delay weddings until, or accelerate weddings from, later in the year also. Since there is no evidence that marriage taxes affect weddings in October or November, and given that the delays, or accelerations, appear to be for more than a few weeks, this might indicate that the primary effect is due to couples accelerating weddings from the next year. Otherwise, since couples seem willing to postpone December weddings for long periods of time, it is unclear why they would not be willing to postpone November or October weddings. This kind of effect could be because it is more costly to postpone rather than accelerate wedding plans.

In table 24, we study the hypothesis that the observed effect is due to couples accelerating weddings plans to receive subsidies rather than to couples postponing weddings to avoid penalties. The marriage tax variables is divided into a marriage subsidy and marriage penalty. The marriage subsidy variable is zero for couples facing penalties and is **positive** for couples receiving subsidies. Note, that

[46] Harvey (1976).

this is different from marriage subsidies in the marriage tax variable. For the marriage tax variable marriage subsidies were less than zero and marriage penalties were greater than zero. Likewise the marriage penalty variable is zero for couples receiving subsidies and is positive for couples paying penalties. The first regression (Table 24, Col 1) includes both the marriage subsidy and marriage penalty variables. The coefficient on the marriage subsidy variable is positive but statistically insignificant. A positive sign would be consistent with the hypothesis that high marriage subsidies increase the couple's probability of a December wedding. Likewise the statistically insignificant negative sign on the marriage penalty would be consistent with the hypothesis that couples facing penalties postpone their December wedding plans to avoid the tax.[47] However, neither variable is statistically significant. Further, the point estimates are very close in absolute value and we can not reject the null hypothesis that they are the same (in absolute value).

Imposing this null hypothesis would reduce the model to the model shown in Table 19, Column (4). Columns (2) and (3) show the effects of dropping one of the two subsidy and penalty variables from the regression while keeping the other. The marriage subsidy variable is statistically significant at a lower value in Table 24, Column (2) than the marriage tax variable is in Table 19, Column (4). Because of this, and because we can not reject the null hypothesis that the two coefficients are the same, we conclude that the results indicate that marriage subsidies and penalties both affect the probability of December weddings. These results indicate that couples facing marriage penalties postpone December weddings, and also that couples receiving marriage subsidies accelerate plans to December.

Table 25: Univariate Logit Model for Separate Effects of Marriage Taxes and Subsidies

	Logit	Logit	Logit
	(1) December	(2) December	(3) December
Variable	**Coefficient (t-stat)**	**Coefficient (t-stat)**	**Coefficient (t-stat)**
Number of Observations	2350	2350	2350
Constant	-1.748** (-3.50)	-1.728** (-3.46)	-1.709** (-3.43)
Male Partner's Income (1000s)	-0.033** (-3.16)	-0.038** (-4.11)	-0.027** (-2.87)
Female Partner's Income (1000s)	0.037** (2.94)	0.031** (3.00)	0.038** (3.02)
Marriage Subsidy	0.189 (1.38)	0.233* (1.87)	

[47] Recall that the marriage subsidy variable was coded so that marriage subsidies are greater than zero (and marriage penalties are zero), while the marriage penalty variable is coded so that marriage penalties are positive (and marriage subsidies are zero).

Marriage Penalty	-0.163 (-0.77)		-0.277 (-1.40)
Female Partner's Education	-0.062 (-1.45)	-0.060 (-1.40)	-0.065 (-1.52)
Hispanic Dummy	0.487 (1.56)	0.475 (1.53)	0.492 (1.58)
Military Dummy	0.616** (2.80)	0.618** (2.81)	0.615** (2.80)
South	0.346** (2.17)	0.352** (2.21)	0.337** (2.12)
Pseudo R-Squared	0.031	0.030	0.029

5.2 Aggregate U.S. Data

In this subsection we study whether the patterns found using individual NLSY data are also visible using aggregate data. Sjoquist and Walker (1995) uses data from 1947 through 1987 and finds that the number of weddings in November and December divided by the number of weddings in March and April of the following year is negatively correlated with the marriage tax. The paper uses weddings in March and April, rather than January and February, because it argues that January and February weddings are rare. However, it notes that the results are sensitive to the months used.

In the previous subsection, using individual data from the National Longitudinal Survey of Youth, we found that couples who wed in December have lower average marriage taxes than couples marrying at other times of the year. This is consistent with either couples with high marriage taxes postponing December weddings to avoid the tax, or with couples accelerating marriage schedules to marry in December to gain a subsidy. There is no evidence that couples who wed early in the year, including couples who get married in March or April, have higher average marriage taxes than other couples.

In this subsection we reexamine the aggregate data, using a longer period 1947 and 1993, to see if this pattern is visible in the aggregate data also.[48] The marriage tax variable is computed in the same way as in earlier sections using aggregate data. In the last subsection we found that few variables had a significant effect on the marriage month: female and male income, a military dummy, and a dummy for residence in the South were the exceptions to this rule. Hence, in this section, as in Sjoquist and Walker (1995), we do not include any other control variables except a constant and a time trend. Regressions including these control variables are shown in an appendix. Including other variables does not affect the

[48] In this section , dividing the data by age group is not practical because month of marriage data is only available by age for 30 years.

results in this section, except that the coefficient on the marriage tax variable is statistically insignificant when the dependent variable is similar to the dependent variable in Sjoquist and Walker (1995).[49]

[49] These independent variables are the independent variables used in the previous section that looks at aggregate marriage and divorce rates. However, although they may plausibly affect these rates, it is not clear they would affect month of marriage decisions.

Table 26: Averages of Seasonal Wedding Variables

Series	*Mean*	*Std Error*	*Minimum*	*Maximum*
Marriage Tax	-$153.40	23.85	$654.81	$253.85
December Weddings	8.11	0.49	7.18	9.26
January Weddings	5.70	0.80	4.38	7.35
First Quarter Weddings	18.25	1.22	16.34	21.58
Fourth Quarter Weddings	24.25	0.60	23.32	25.79
Sjoquist and Walker (1995)	1.15	0.08	1.0250	1.3194

Table 24 shows the means of the marriage tax variable and the dependent variables in the sample. The month and quarter variables show the number of weddings in that period as a share of the total weddings in that year. As noted previously, January is an especially unpopular month for weddings. Less than 6% of weddings occur in January. In fact, the entire first quarter of the year is unpopular. The average percent of weddings is only a little over 6%. The fourth quarter is more popular. Nearly a quarter of all weddings occur during these three months. Figure 7 shows the trends in the first and fourth quarter weddings over time. It is clear that January weddings have never been popular, and that over time they have become less so. December weddings have tended to be more popular, and there is not a noticeable trend in the data. However, the mean in the period after the mid 1970s does appear to be lower than the mean in the 1950s and 1960s.

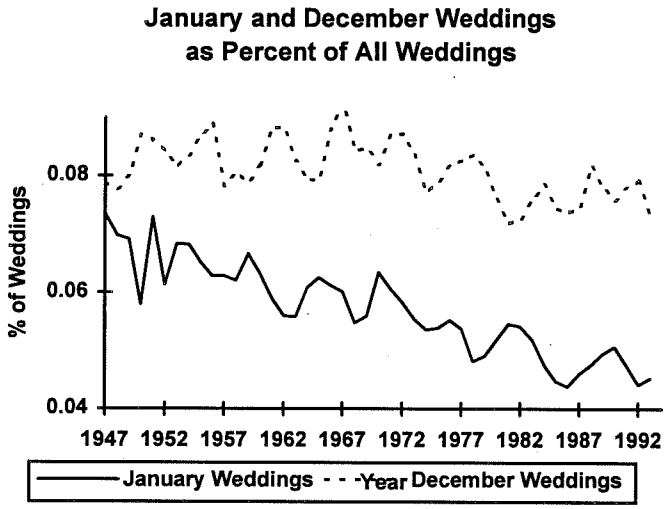

Figure 7: January and December Weddings

Table 25 shows the regression of the marriage tax variable, and a time trend, on the four time period variables and the ratio variable used in Sjoquist and Walker (1995). The time trend is highly statistically significant, except for December weddings. Removing the insignificant trend from this regression does not affect the statistical significance of the marriage tax variable. The Durbin Watson statistics generally do not reject the null hypothesis of no serial correlation, except for the December weddings variable where the hypothesis is rejected, and the first quarter wedding variable where it falls between the upper and lower bounds. Because of these inconclusive results, a Newey-West (1987) covariance matrix with 6 lags is used. In practice, the results are not sensitive to using different lag-

lengths for the covariance matrix, including using the standard OLS covariance matrix. Although OLS is inefficient in the presence of serial correlation if the precise form of serial correlation is known, in this case, since theory does not predict the exact form, it may be preferable to use a robust estimation process rather than assuming the errors follow an AR(1) or other process.

Table 27: Effects of Marriage Taxes on Month Of Marriage Using Aggregate U.S. Data.

	OLS with Newey West Covariance Matrix (6 Lags)				
Dependent Variable (% of all Weddings)	December Wedding	January Wedding	First Quarter Wedding	Fourth Quarter Wedding	Sjoquist and Walker (1995)
No. of Observations	47	47	47	47	47
Durbin-Watson Stat	1.084	1.734	1.543	2.174	1.743
	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)
Constant	7.9877** (32.79)	7.0162** (36.43)	20.3235** (22.39)	23.4422** (87.72)	1.0837** (24.32)
Marriage Tax (1000s)	-0.8449** (-2.67)	0.1514 (0.55)	0.6646 (0.60)	-1.8554** (-4.30)	-0.2073** (-3.88)
Year	-0.0004 (-0.05)	-0.0560** (-8.56)	-0.0856** (-2.67)	0.0226** (2.41)	0.0016 (1.06)
R^2	0.324	0.823	0.658	0.345	0.407

The coefficients on the marriage tax variable are statistically significant and are negative for the December and fourth quarter wedding dependent variables. This is consistent with the hypothesis that high marriage penalties discourage end of the year marriages as couples postpone weddings until the next tax year, or that marriage subsidies encourage couples to accelerate marriage plans to receive the subsidy. This is slightly different than the results using individual data, where only December weddings were affected by the marriage tax. Likewise, the coefficient on the Sjoquist and Walker (1995) variable is statistically significant and negative. The coefficients on the marriage tax variable is not statistically significant for January or first quarter weddings. Together, these results indicate that people either postpone end of the year marriages for longer than just a few months, or that couples who accelerate wedding plans do so from other months of the year also. These results, as noted above, are robust to the inclusion of other control variables, and to the inclusion of a squared time trend. (See Table 26 below and Appendix Table 2).

Table 28: Effects of Marriage Taxes on Month Of Marriage Including Time Squared Using Aggregate U.S. Data

	OLS with Newey West Covariance Matrix (6 Lags)

Dependent Variable (% of all Weddings)	December Wedding	January Wedding	First Quarter Wedding	Fourth Quarter Wedding	Sjoquist and Walker (1995)
No. of Observations	47	47	47	47	47
Durbin-Watson Stat.	1.304	1.736	1.864	2.238	2.519
	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)
Constant	7.6366** (46.16)	7.0372** (37.10)	20.9590** (50.96)	23.6201** (151.78)	1.0154** (38.39)
Marriage Tax (1000s)	-0.8542** (-3.04)	0.1520 (0.59)	0.6815 (1.09)	-1.8507** (-5.77)	-0.2091** (-4.62)
Year	0.0458** (3.83)	-0.0588** (-4.87)	-0.1693** (-5.84)	-0.0008 (-0.08)	0.01060** (7.39)
Year Squared	-0.0010** (-3.83)	0.0001 (0.26)	0.0018** (2.74)	0.0005** (2.10)	-0.0002** (-6.51)
R^2	0.439	0.829	0.719	0.364	0.589

Although the coefficients on the marriage tax variables are statistically significant for both December and fourth quarter weddings, the elasticities are quite small. Table 27 presents point estimates of the elasticities and their confidence intervals.

Table 29: Elasticities Of December And Fourth Quarter Weddings With Respect To The Marriage Tax. (Calculated At The Means Of All Variables)

	Elasticity	*10 % Confidence Interval*
December Weddings	-0.016	(-0.026,-0.006)
Fourth Quarter Weddings	-0.012	(-0.016,-0.007)

Results in this subsection are remarkably similar to the results in the previous subsection using individual data from the NLSY. In both the individual and aggregate data there is a negative correlation between marriage taxes and the likelihood of December weddings. This could be because couples postpone December weddings to avoid marriage penalties or because they accelerate wedding plans to receive marriage subsidies. Similarly, there is no evidence in either the aggregate or the individual data is there evidence that marriage taxes affect weddings in any month at the beginning of the year. This might be because couples accelerate wedding plans from later in the year also, or because couples postpone weddings for longer periods, perhaps waiting for the more popular summer months. The main difference between the two sets of results is that the individual data shows little evidence that weddings in October and November are affected by marriage taxes, while the aggregate data did show a statistically

significant effect.[50] One final similarity is that although the effects on December weddings using both individual and aggregate data are statistically significant, the magnitude of the effect is modest.

6. Conclusion.

The main findings in the paper are:

1. Using aggregate data from the United States for women aged 25 through 34, the marriage tax is significantly negatively correlated with the number of women who are currently married and significantly positively correlated with the number of ever-married women who are divorced and the divorce rate. These results are consistent with the hypothesis that the high marriage taxes encourage divorce, and possibly that they discourage marriage.
2. For women aged between 35 and 44, the marriage tax is only significantly correlated with the divorce rate. Although the correlations with the number of women who are married, and the number of ever-married women who are currently divorced are in the directions predicted by theory, the correlations are statistically insignificant.
3. For women aged between 45 and 64, the marriage tax is not statistically significantly correlated with any of the marriage or divorce variables.
4. For all groups of women, the elasticities of the marriage and divorce variables with respect to the marriage tax are quite small. This is consistent with the assertion that, even among the youngest group of women, most couples' decisions are not affected by marriage taxes.
5. As noted above, the youngest group of women appears to be the most sensitive to marriage taxes. The point estimates of the coefficients are larger in absolute value, and are more likely to be statistically significant. If children are a primary motivation for marriage, this might be because women in this age group are more likely to be close to the margin with respect to marriage decisions. Likewise, they may believe that their remarriage possibilities are greater after divorce than for older women.
6. Using individual data from the National Longitudinal Survey of Youth, we find that couples marrying in December tend to have lower marriage taxes than couples who marry in other months. This is consistent with the hypothesis that either couples with marriage penalties postpone their weddings to avoid the marriage tax for that calendar year or that couples with marriage subsidies accelerate their wedding plans to receive the subsidy for an additional year. Additional results treating marriage penalties and subsidies separately confirm that both these mechansims are in effect.

[50] Marriage taxes also have a statistically significant negative correlation with October and November weddings, when December weddings are omitted.

We find no evidence that couples who marry in January, or any other time early in the year, have higher marriage taxes than other couples, nor that couples who marry in months other than December at the end of the year have lower marriage taxes than other couples.

7. Using aggregate U.S. data, we confirm that high marriage taxes appear to discourage December weddings and that marriage taxes do not appear to affect marriages in the early part of the year. However, the aggregate data indicates that high marriage taxes also appear to discourage October and November weddings. Since marriage taxes appear to affect December weddings, and possibly other fourth quarter weddings, but not first quarter weddings, this indicates either that couples who postpone December weddings postpone them for more than just a few months, or than couples who accelerate plans do so from later in the year also.

In the aggregate study of marriage and divorce rates, it is plausible that causality might run in the opposite direction to the direction posited in the theoretical section. The decline in marriage, and the increase in divorce, might views on the appropriateness of subsidizing marriage and divorce. For example, if the political power of unmarried persons has increased as the number of unmarried persons has increased, then politicians might change make the tax code less favorable towards marriage. However, this might not be a great concern. Although the marriage tax has played an important part in some tax debates, it has also changes in response to law changes, such as schedule adjustment, that occurr without considering the marriage tax to a large degree. Rosen (1987, p 567) discussing the Tax Reform Act of 1986 writes "The pubic debate surrounding the Tax Reform Act of 1986 has paid little attention to the marriage tax..." Dealing with concerns about endogeneity might be a fruitful area for future research.

As noted in the introduction, Alm and Whittington (1995b) and Sjoqusit and Walker (1995), using aggregate marriage tax data for all women over 15, find that marriage taxes do not affect aggregate marriage rates. Similarly, we find that the marriage tax is insignificantly correlated with marriage rates for all three age groups. Further, we find that for women aged between 25 and 34 that the percent of women who are currently married is negatively correlated with the marriage tax, also consistent with the finding for women of all ages in Alm and Whittington (1995a,1995b). One plausible explanation for this is that divorce is more strongly affected by marriage taxes than marriage decisions. Although this is consistent with the statistically significant correlation between the marriage tax and divorce rates for women aged 25 through 34 and women aged 35 through 44, this result might be slightly puzzling. Divorced couples are presumably generally not planning on living together after the divorce, while never married couples would be able to, and frequently do, live together without getting married (see figure 1). Thus, never married couples are still able to form a joint household while not paying a marriage tax.

Because of this one might expect that marriage decisions would be more likely to be affected by marriage taxes than divorce decisions. However, this does not seem to be the case: in fact all results in this paper would be consistent with the hypothesis that marriage taxes encourage couples to divorce, but only affect marriage decisions by encouraging couples to delay end of the year weddings until the next tax year. A possible explanation might be that although couples are more constrained following a divorce, they might have more information on tax effects. After having been both single and married they are presumably more aware of the tax consequences of marriage and also might receive advice regarding taxes from the lawyers involved in the proceedings.

Appendix 1: Effects of Marriage Tax, Income, and Other Control Variables on Divorced Women as Percent of All Women.

Dependent Variable	**Divorced Women Per 100 Women**		
Mean of Dependent Variable	5.82	7.76	6.42
Age Group	25 to 34	35 to 44	45 to 64
Estimation Method	**OLS with Newey West Covariance Matrix (6 Lags)**		
Number of Observations	45	45	45
Durbin Watson Statistic	1.40	1.19	1.98
Constant	-5.5424 (-0.15)	-88.95** (-1.97)	12.3010* (1.69)
Marriage Tax (1000s)	3.1262** (2.23)	0.6779 (1.07)	0.6261 (1.25)
Income of Male Partner (1000s)	-0.0276 (-0.26)	-0.1797** (-2.08)	-0.1561** (-3.86)
Income of Female Partner (1000s)	-0.3999* (-1.91)	0.0341 (0.22)	0.0397 (0.56)
Percent Catholic	-41.69 (-1.40)	-72.98** (-3.04)	7.6022 (1.14)
Percent Immigrant	-0.1290* (-1.70)	-0.2926 (-1.56)	0.0101 (0.29)
Percent White	2.0628 (0.05)	125.50** (2.16)	-9.2848 (-1.22)
Ratio of Males to Females	16.63** (2.66)	-4.8408 (-0.52)	0.0474 (0.35)
Unemployment Rate	0.0470 (0.57)	0.0886 (0.89)	-0.0879** (-1.99)
Time	0.3601** (1.69)	0.4263** (3.32)	0.0356 (0.64)
Time Squared	-0.0023 (-1.23)	0.0034 (1.27)	0.0054** (5.87)
R-Squared	0.986	0.986	0.996

Appendix II: Effect of the Marriage Tax and Other Control Variables on Month of Marriage.

	OLS with Newey West Covariance Matrix (6 Lags)				
Dependent Variable (% of all Weddings)	December Wedding	January Wedding	First Quarter Wedding	Fourth Quarter Wedding	Sjoquist and Walker (1995)
No. of Observations	45	45	45	45	45
Durbin-Watson Stat.	1.574	1.71	2.205	2.388	2.767
	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)	Coefficient (t-stat)
Constant	2.3950 (0.49)	1.4337 (0.19)	16.9580 (1.17)	18.4486 (1.82)	0.8994 (0.99)
Marriage Tax (1000s)	-2.8741** (-5.51)	0.1146 (0.15)	3.0002** (2.42)	-4.6908** (-3.56)	-0.1694 (-1.12)
Male Partner's Income (1000s)	0.4169** (6.63)	-0.0283 (-0.21)	-0.1790 (-0.79)	0.1382 (0.99)	0.0014 (0.07)
Female Partner's Income (1000s)	0.3921** (2.54)	-0.0886 (-0.27)	-0.5466 (-1.05)	0.2981 (0.82)	-0.0260 (-0.86)
Percent of Population Catholic	-4.0833 (-0.53)	0.6440** (0.05)	-11.8158 (-0.62)	-9.4317 (-0.95)	1.2978 (1.43)
Percent of Population Immigrants	0.1334** (4.17)	-0.0043 (-0.07)	0.3545** (5.12)	0.0276 (0.58)	-0.0077 (-1.02)
Percent of Population White	-2.7668 (-1.08)	-2.2032 (-0.59)	0.1139 (0.02)	4.4741 (0.87)	0.4959 (0.92)
Ratio of Males to Females	2.0735 (0.49)	7.2501 (1.15)	8.8561 (0.82)	-0.9908 (-0.10)	-0.5248 (-0.61)
Unemployment Rate	0.1869** (5.45)	-0.0223 (-0.28)	-0.2824** (-2.34)	0.1334 (1.43)	-0.0026 (-0.16)
Year	-0.1233** (-2.80)	-0.0424 (-0.48)	0.0068 (0.06)	0.0179 (0.17)	0.0083 (0.87)
R^2	0.649	0.819	0.735	0.423	0.636

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