

Online Appendix

Business Cycles and Divorce: Evidence from Microdata Judith K. Hellerstein, Melinda S. Morrill, Ben Zou

A. Data Description

We utilize the Marital History Topical Module of the Survey of Income and Program Participation (SIPP), which was conducted in Wave 2. The data are from survey years 1993, 1996, 2001, 2004, and 2008, which have reasonably consistent definitions of the key variables. The marriage data are retrospective. In a given survey year, the respondent is asked about her most recent, first, and second marriages.¹

We rely on retrospective marital history of female respondents as they have been shown to have better recall of marriage histories than men. For example, Martin (2006) documents that the female respondent retrospective marital histories in the 1996 and 2001 SIPP match closely with other commonly used data sets. Like this study, Martin limits his sample to exclude men, citing the fact that men report fewer marital dissolutions than women, particularly at very long (more than fifteen years) and short (less than three years) durations. To verify the differences in the quality of the retrospective information, Appendix Figure A.1 shows the number of divorces per 1,000 married respondents per year as reported by men and by women in the 1993-2008 pooled SIPP samples. We observe many fewer divorces reported by men than women across all years.

[Appendix Figure A.1]

In order to create our main regression sample, we restrict to marriages that are either still intact or that ended in divorce. We excluded any marriage that ended in widowhood.² In order to match the information in the SIPP to state-level data on unemployment rates in a given

¹ Thus, we do not have complete histories for those with four or more marriages.

² Note that we would not observe a marriage if the woman had died before the survey year, so in effect this only excludes marriages where the man predeceased his wife.

year, for each woman in the sample, we calculate her state of residence in each year of marriage by using information in the Migration History Topical Module, also conducted in Wave 2.³

We pool the marriage information gathered retrospectively from each cross-sectional survey and expand the sample into marriage-by-year observations. Consistent with much previous work using retrospective marital histories (e.g., Sweeney and Phillips, 2004) that tries to ameliorate recall bias, we impose both right and left censoring on our marriage-year observations. First, we impose right censoring so that we keep only marriage-year observations where the couple has been in the marriage for up to 20 years. Then, we left-censor the data to restrict the sample to marriage-year observations where the respondents are contributing retrospective information about whether or not their marriage ended in divorce for years that are no more than 20 years prior to the survey date. In practice, these two restrictions together mean that women respondents in the 1993 (1996, 2001, 2004, 2008) SIPP panel report information about their marriages that began no earlier than 1973 (1976, 1981, 1984, 1988), and contribute marriage-year observations on those marriages for years only as far back as 1973 (1976, 1981, 1984, 1988). Restricting the retrospective history helps mitigate potential recall bias for marriages that ended long before the survey year, which is especially important to us given that we are trying to pin down the timing between the existing economic conditions in the year a marriage ends. Finally, we restrict the sample to begin from 1976, the first year that the state-level unemployment is available from the Local Area Unemployment Statistics (LAUS) of the Bureau of Labor Statistics.

³ We observe a woman's current home state of residence. If she moved from another state, we also observe her previous state of residence and the year she moved into the state (although not the year she moved into her previous state or the state she moved from). We assume that a woman did not have any additional cross-state migration prior to her previous state of residence, because we do not observe any migrations prior to the most recent move. We drop from the sample those marriages where the woman does not have a valid current state of residence (or if the woman was living abroad), which constitutes approximately 1 percent of the sample.

Table A.1 provides a summary of our main regression sample, corresponding to the regression results we report in the paper in Table 1. The first two columns of Table A.1 report statistics on each of the marriages in the data. There are 72,623 marriages, with close to 16 percent ending in divorce prior to censoring (i.e., before the 20th year of marriage or the time of the survey). Seventy-eight percent of the women in the sample are white and 26 percent have at least a college degree. The average age of the women at marriage was 26 years, and about three-quarters of marriages in the sample were first marriages. As shown in the last two columns of Table A.1, when these data are expanded to a panel of marriage-year observations, there are 666,695 marriage-year observations. A couple's risk of divorcing in a given year is 1.80 percent, close to the implied probability from Vital Statistics data on all married women.⁴

[Appendix Table A.1]

We also report the divorce rate in our data for different subsets of the total sample as distinguished by the wife's educational attainment, the wife's race/ethnicity, the duration of the marriage, marriage order for the wife, and the wife's age at marriage. Of course there are other potentially important demographic characteristics that may be related to the risk of marital dissolution, and more importantly, may lead to heterogeneous responses of marital dissolution to economic shocks. These include the couple's work history and any disability onset. The retrospective nature of the SIPP data does not allow us to construct precise enough measures of either of these characteristics, particularly since recall of the exact timing might be difficult for women many years later when major life events happen in close temporal proximity. Similarly, although we can observe the year of first birth from the Fertility Supplement, we do not know

⁴ Wilcox and Marquart (2011) report that between 1975-2005 in the Vital Statistics, there are on average 20.1 divorces per 1,000 married women annually.

whether a child was present in the household in any given year. We therefore cannot explore heterogeneity by the presence of children.⁵

The sample restrictions we use accord with other studies that use retrospective marital histories in the SIPP, but they do not provide us with a sample of marriages in each year that mimic the national universe of married women in that year. In addition, even when using sample weights the SIPP is only designed to be nationally representative in the survey year, so it is not clear a-priori that the sample of marriages we construct retrospectively is representative.⁶ To show how representative our sample of marriages is, we compare the marriage-year observations to nationally representative samples from the Census Public Use Microdata Sample (PUMS) and the American Community Survey (ACS) in proximate years. The PUMS and ACS samples we use consist of all currently married women who are either the head of household or the wife of the head of the household. In Appendix Table A.2 we report summary statistics as available in the datasets. In general, even our restricted (and unweighted) sample is close to nationally representative samples of married women along geographic and racial/ethnic dimensions. However, notice that the SIPP sample is considerably younger than the sample of married women from the PUMS and ACS. There are two reasons for this. First, because our data are retrospective, we naturally exclude women who are deceased at the time of the survey, but were alive in some of the marriage-years we use for estimation. So, for example, a woman who is age 60 in 1976 should be in a nationally representative sample for 1976. But if she dies at age 70 in 1986, she will not be surveyed in any of the SIPP surveys we use, and so her marriage information from 1976 is not in our data. Second, we restrict the sample on the basis of recall and marriage duration. We do this to ensure the quality of the retrospective data and to be

⁵ The choice to have children is endogenous, so it is not obvious that one would want to control for the presence of children in the model.

⁶ In the paper we report results from unweighted regressions, but the results are robust to using SIPP sample weights where each marriage-year is weighted by the woman's weight in the survey year.

consistent with prior literature using individual-level data to model divorce. However, this naturally weights the sample to include only the earlier years of marriage where women are younger.

[Appendix Table A.2]

B. Additional Regression Results

In the first column of Appendix Table B.1, we report the full set of regression results from the regression whose main result is given in Table 1, Column (2) of the paper. The second column of Appendix Table B.1 reports the full set of results from the same specification, but without the restrictions on recall (20 years from survey date) and marriage duration (marriages in their first 20 years) that we use in the main regression sample. For this unrestricted sample, the point estimate indicates that divorce is pro-cyclical, but less so than for the restricted sample, which is not surprising since the unrestricted sample contains marriages that have already lasted more than 20 years, and thus are very stable.⁷

[Appendix Table B.1]

In Appendix Table B.2 we report expanded results from Table 2 of the paper. Each column of Table 2 begins with the base specification of Table 1, Column (2) and then adds a set of interaction terms between the state-level unemployment rate and various demographic characteristics. Appendix Table B.2 reports point estimates of the sum of the coefficient on the unemployment rate itself in each specification, plus the point estimate on the interaction between the unemployment rate and the relevant demographic group dummy. The associated standard error is reported in parenthesis and allows for significance testing of the cyclicity of

⁷ These estimates may also suffer from recall bias, since we are relying on information from a long time ago. In addition, we only observe the current and previous state of residence, so the state of residence more than 20 years ago is less likely to be accurate, potentially leading to measurement error-induced biases.

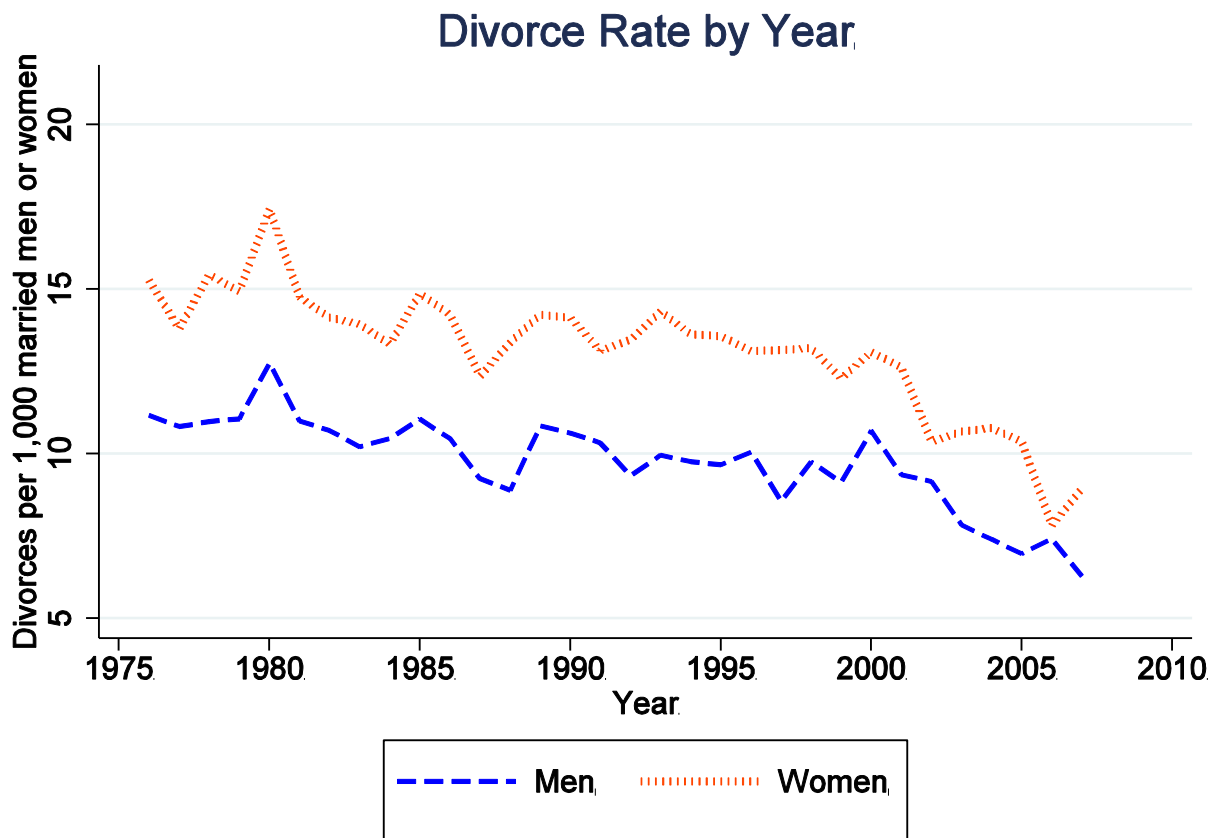
divorce for the associated demographic group. The interpretation of the results is given in the text of the paper.

[Appendix Table B.2]

References

- Martin, Steven P., (2006), "Trends in Marital Dissolution by Women's Education in the United States," *Demographic Research*, 15(20): 537-560.
- Sweeney and Phillips, (2004), "Understanding Racial Differences in Marital Disruptions: Recent Trends and Explanations," *Journal of Marriage and Family*, 66(3): 639-650.
- Wilcox, W. Bradford, and Elizabeth Marquardt, (2011), "When Baby Makes Three," *The State of Our Unions: Marriage in America 2011*, National Marriage Project and the Center for Marriage and Families.

Appendix Figure A.1: A Comparison of the Retrospective Marital Histories from Male and Female Respondents



Notes: The samples are from pooled cross-sections from the 1993, 1996, 2001, 2004, and 2008 SIPP Panels, Wave 2, Marital History Supplement. No restrictions are placed on the duration or the time period of recall.

Appendix Table A.1: Sample Descriptive Statistics

	Marriages 1976-2007		Marriage-Year Observations	
	Mean (SD) or Percent	Percent divorcing Prior to Censoring	Percent of Sample	Percent divorcing in the Current Period
	(1a)	(1b)	(2a)	(2b)
Full Sample		16.07		1.80
Wife's Race:				
Non-Hispanic White [^]	77.99	16.63	79.22	1.84
Non-Hispanic Black	7.93	18.74	7.58	2.16
Hispanic	8.80	11.08	8.32	1.31
Other	5.28	11.99	4.88	1.44
Wife's Education:				
No College Degree [^]	73.64	17.44	73.35	1.96
College Degree	26.22	12.13	26.53	1.33
Wife's Age at Marriage:				
Age 16-19	18.50	22.80	17.38	2.62
Age 20-24	37.62	16.36	38.09	1.78
Age 25-34 [^]	30.35	13.88	31.19	1.56
Age 35-44	8.95	11.89	9.11	1.43
Age 45+	1.28	6.98	1.05	0.92
Wife's 1 st Marriage [^]	76.79	15.36	75.73	1.69
Wife's 2 nd Marriage	18.83	18.85	20.10	2.14
Wife's 3 rd Marriage	3.51	16.08	3.44	2.01
Wife's 4 th Marriage	0.86	18.31	0.73	2.59
Total Years of Marriage in Sample	9.21 (5.59)			
1 st or 2 nd Year of Marriage			12.99	1.22
3 rd or 4 th Year of Marriage			12.45	2.55
5 th to 7 th Year of Marriage			16.92	2.38
8 th to 10 th Year of Marriage [^]			15.01	1.89
11 th + Year of Marriage			42.62	1.48
Sample Size	72,623		666,695	

Notes: The sample is from pooled cross-sections from the 1993, 1996, 2001, 2004, and 2008 SIPP Panels, Wave 2, Marital History Supplement. Columns (1a) and (1b) are the sample of all marriages that began within 20 years of the survey date, while Column (2a) and (2b) are the marriage x year observations from the marriages sample. Categories denoted with a “^” are the reference categories in Appendix Table B.1 and B.2.

Appendix Table A.2: Representativeness of the Sample

Variable	1980 PUMS	1976-1985 SIPP	1990 PUMS	1986-1995 SIPP	2000 PUMS	1996-2007 SIPP	2010 ACS
% College	12.49%	21.28%	17.38%	25.72%	22.89%	31.66%	32.1%
% Black	6.95%	7.95%	5.86%	7.52%	6.53%	7.39%	6.78%
% White	85.71%	81.21%	83.92%	79.87%	78.82%	76.76%	73.69%
% Hispanic	5.15%	7.56%	6.67%	8.02%	9.66%	9.35%	12.12%
% Other	2.19%	3.27%	3.55%	4.59%	4.99%	6.51%	7.49%
Current Age	43.41	31.83	45.15	34.41	47.03	37.24	49.22
% Northeast	21.01%	19.59%	20.51%	17.98%	19.00%	16.61%	17.71%
% South	33.77%	35.19%	34.83%	35.19%	35.70%	35.87%	36.92%
% Midwest	26.51%	26.10%	24.56%	26.10%	23.71%	25.28%	22.80%
% West	18.70%	20.73	20.11%	20.73%	21.59%	22.23%	22.56%

Note: PUMS 1980, 1990, 2000 from 5% sample of the population (Census). Family weights are used in the PUMS and ACS samples, but not in the SIPP samples. The SIPP samples are those used in the regression analysis and in Appendix Table A.1.

Appendix Table B.1: Baseline Individual-Level Results

	Table 1, Column (2)	No restrictions on duration or recall
	(1)	(2)
Unemployment Rate	-0.0342* (0.0141)	-0.0252** (0.0073)
2 nd Marriage	0.0105** (0.0007)	0.0112** (0.0007)
3 rd Marriage	0.0114** (0.0011)	0.0118** (0.0009)
4 th + Marriage	0.0182** (0.0028)	0.0211** (0.0028)
Age 16-19 at Marriage	0.0134** (0.0006)	0.0060** (0.0003)
Age 20-24 at Marriage	0.0052** (0.0005)	0.0021** (0.0003)
Age 35-44 at Marriage	-0.0070** (0.0007)	-0.0051** (0.0006)
Age 45+ at Marriage	-0.0125** (0.0009)	-0.0095** (0.0008)
Non-Hispanic Black	0.0048** (0.0010)	0.0052** (0.0006)
Hispanic	-0.0072** (0.0016)	-0.0026* (0.0011)
Other Race	-0.0025** (0.0007)	-0.0003 (0.0007)
College Degree	-0.0036** (0.0005)	-0.0004 (0.0003)
State & Year FE	X	X
N	666,695	1,226,751
Mean Divorce Rate	0.018	0.0134
Mean URate	0.061	0.062

Notes: Estimated coefficients on the state-level unemployment rate and individual demographic characteristics. The dependent variable is whether the couple divorced in the current year. See Table 1 of the paper for more information. Standard errors are in parentheses, + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table B.2: Main Effects from Table 2, Heterogeneity by Demographic Characteristics

	Race	Marriage Order	Education	Age at Marriage	Duration
	(1)	(2)	(3)	(4)	(5)
Non-Hispanic Black	-0.0628 (0.0427)				
Hispanic	-0.0334 (0.0567)				
Other Race	0.0529 (0.0351)				
2 nd Marriage		0.0301 (0.0302)			
3 rd Marriage		0.0449 (0.0375)			
4 th and Higher Marriage		-0.1276 (0.1318)			
College Degree			0.0384+ (0.0203)		
Age 16-19 at Marriage				-0.0918** (0.0222)	
Age 20-24 at Marriage				-0.0315 (0.0201)	
Age 35-44 at Marriage				-0.0086 (0.0248)	
Age 45+ at Marriage				0.0127 (0.0439)	
1 st or 2 nd Year of Marriage					0.0494+ (0.0277)
3 rd or 4 th Year of Marriage					-0.0270 (0.0311)
5 th or 7 th Year of Marriage					-0.0596* (0.0238)
11 th + Year of Marriage					-0.0362* (0.0178)

Note: The estimates presented here are sums of the main effect of the unemployment rate and the interaction terms between the unemployment rate and the relevant demographic characteristic, as reported in Table 2 of the paper. The omitted groups are non-Hispanic white, wife's first marriage, wife age 25-24 at marriage, and 8th to 10th year of marriage. Standard errors are in parentheses, + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.