Working Paper No. 13-12

Divorce Spillover Effects:
The Effects of Marriage Participation on Future Divorce Rates

Sheena Murray
University of Colorado at Boulder

Novemb(ohr)TJ ETBT1 0 0 1 3523ET71 2 4Pivorce0e20e2e Rvemb(ohr)5BDC BT1 0 0 7

Divorce can be viewed as a corrective mechanism in a market characterized by imperfect information. Individuals commonly match and marry with incomplete or incorrect assessments of their mates. The information gathered during the course of a marriage can change an individual's assessment of both their current match, as well their extramarital options. This process of continual marital re-assessment has led participants in the American marriage market to be described as having "permanent availability" (Farber, 1964).

Spousal alternatives, the number of options one has outside of marriage, can affect one's assessment of the quality of their current marital match. Survey data provides anecdotal evidence that spousal alternatives can affect marriage survival rates, as approximately 30% of divorces are preceded by extra-marital affairs (South and Lloyd, 1995 p29). However, even if one does not have a specific partner in mind, the perception of a high probability of remarriage may be sufficient to influence marital dissolution by affecting the net expected benefit of divorce and, consequently, remarriage. Survey data have shown that married persons who perceive a high likelihood of remarrying, should they divorce, are more likely than others to dissolve their marriages, holding marital satisfaction constant (White and Booth, 1991; Udry, 1981).

A significant insight from the theoretical literature on spousal alternatives is the plausible existence of a feedback mechanism that causes marriage market the cost to divorce; this makes the impacts from the catalyst (the divorce law change) and the secondary feedback (the spillover effect) difficult to untangle.

This paper provides a comparative-static test of the positive feedback-mechanism, discussed by Chiappori and Weiss (2007), that exists between the current and the future divorce rate. In this paper I use a difference-in-differences approach to test how changes in the number of available singles in a marriage market affect the divorce rate of those whose incentives to divorce are otherwise unchanged. I exploit fluctuations in the number of marriage-market participants created in the previous years' divorces in neighboring states, and measure these effects on the divorce rate in one's own state.

I isolate neighboring state's divorcees as a proxy for the change in local marriage-market participants. Neighboring state divorce rates represent a reasonably exogenous source of change to the participation in the local marriage market. Changes

II. Conceptual Framework & Mechanisms

Although divorce spillover effects have never been directly tested, many papers have looked at matching mechanisms, such as meeting opportunities and participation rates, in the marriage market and how changes in these mechanisms can affect divorce rates. This literature informs my research, as it is through these matching mechanisms that a spillover effect would function. Therefore, understanding these mechanisms will help in specifying the correct regression equations and provides support for a causal finding.

In the following sections, I provide a cursory review of the existing research on marriage market matching and divorce rates. In sections 2A and 2B, I discuss how matching mechanisms affect divorce rates specifically. In 2C however, I address general matching of single participants and theories of returns to scale in matching markets.

2.A Remarriage Options and Divorce

Empirically, two key papers have looked at the effect one's own perceptions of remarriage prospects has on divorce rates. Udry (1981) used longitudinal-data on approximately 1,600 married couples spanning from 1974-1979; in the survey each person was asked to assess their ability to re-marry if frome0.958493( )-44.0408(t)5.(

border, I will be able to examine how the effect of increased divorcees varies pending on the neighboring state's population. It is likely that larger effects would be found when the neighboring state's population is larger than one's own state, such that increased divorcees represent a significant increase in the stock of singles, but not so populous in comparison to one's own state that new divorcees would be hardly noticeable.

Although it has been shown that marital alternatives matter, that increasing returns to scale may be present in marriage markets, and that lower search costs positively impact divorce rates, none of the previous literature has examined how changes in the number of pr fi3324(n)-0.957164(i)5.1(p)9.93324(r7.83811( )2523 52 0 intervals, until year 10, when a 10+ year dummy is used, with the omitted category as any time prior to law passage (Wolfers, 2006).

3.A Observational Unit

Due to the geographical nature of the observations, I present both a specific example and general description to provide a better understanding of how the panel data set is constructed. To create each observation, I first determine the closest neighboring state to each county, and the distance to that neighboring state from the county centroid. Figure 1 shows a specific example, as well as the steps in creating observations using the state of South Carolina. As can be seen in Figure 1_A, South Carolina has two neighboring states, North Carolina and Georgia.

Upon determining each county's closest neighboring state I aggregate the sample into groups of counties within a state that share the same neighbor state and label these groupings "County Neighbor Groups" (CNGs). Figure 1_B shows this step, with all counties in South Carolina sectioned into either a Georgia CNG or a North Carolina CNG. Then, within a given CNG, I further identify two key groups, a CNG's border counties and the interior counties. I define a border county as a county that is within 30 miles of the state border or a county that is in a Census Bureau defined interstate Labor Market Areas with the neighboring state of interest. [4]

I define an interior county as one that is not in an interstate LMA and the centroid of which is between 50 and 300 miles from the border. Any county that does not qualify as a border or interior county (in other words, those that are not in an interstate LMA and whose county centroid is between 30 and 50 miles of the border, or over 300 miles from the border) are excluded from the final sample[5]. Counties that

[4] LMAs are constructed and defined by the Census Bureau using commuter-flow data to model areas that have high levels of daily social interactions and community integration (Tobert and Killian, 1987) Since LMAs are constructed using commuter-flow data, I choose to include counties that are more than 30 miles from the border, but whose commuter-flow data show heavy integration with the neighboring state. 96% of counties within 26 miles of the border are considered to be contiguous border counties. Nearest neighbor state is defined as the state, from all surrounding states, which has the minimum distance from the county center to the borderline in miles. This data was utilized in McKinnish (2005) and was generously provided by the author.

[5] For Robustness checks using other mileage cut offs see forthcoming appendix section.

Figure 1

Steps to Dividing North Carolina into County Neighbor Group Bins

Panel A

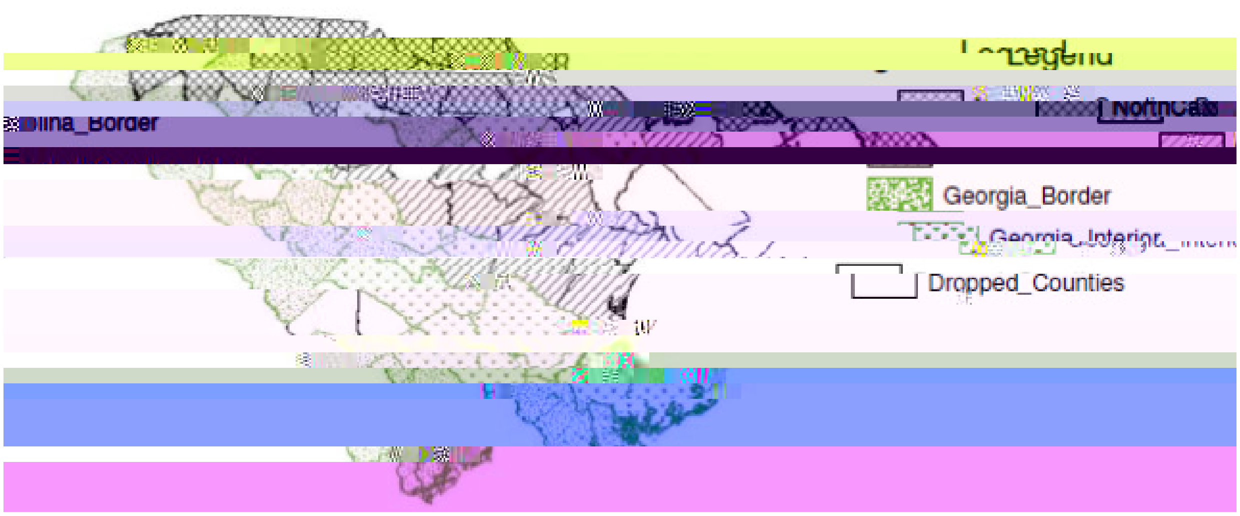
Map of Southern United States

Panel B - Define County Neighboring Groups

Determine the closest neighboring state for ... interior

Panel C - Define County Neighbor Group Bins

Separate CNGs into two bins each - border and interior.



have a centroid between 30 and 50 miles are omitted because they could be considered partially treated[6]. Counties which are more than 300 miles from their neighboring state are omitted as they are considered too far from the border to be a valid counterfactual for the border region.

Lastly, I aggregate the county-level data to the border / interior CNG level. Doing so provides me with two observations for each CNG in each year. In my analysis, observations are border and interior CNG groups, with variables constructed as population-weighted means taken over the constituent counties in each area.[7] My unit of observation is the CNG border or CNG interior, otherwise referred to as CNG bins. In the specific example of South Carolina, four bins exist in the utilized sample, and can be seen in Figure 1_C, North Carolina's interior and border CNG, and Georgia's interior and border CNG. For a more complex example, see the appendix Figure 1, for a CNG sorted map of Alabama with four neighboring states.

3B. Sample Limits & Descriptive Statistics

Certain states had to be removed from the country-wide sample because they do not have both the necessary interior and exterior counties to construct both bins of a CNG, as I have described above. An example of this would be New Jersey, where all the counties in the state are considered to be "border counties" and there is no interior average that[iio] can be taken. Additional states dropped from the analysis due to a lack of any "interior" counties are: Connecticut, Delaware, Maryland, New Hampshire, Rhode Island, and Washington DC.

To measure the social integration across the border, I use the average population density of each CNG border region. In the sample of all border CNG counties, the median population density in border regions is 73 and the mean population density is 230 people per square mile.[8] In regions with extremely low

[6] Ideally, I would allow contiguous counties, whose centroid is between 30 and 50 miles to be included in the border observations (at least as a robustness check to the current specification). Howeverulreq.06907(e)-2.64358(r)-3.5012(t)0.356603(o)-7.002

populations, observations where either state's border-CNG had a population density in the lowest fifth-percentile of the population-density distribution were dropped. This is based on the rationale that interactions across state lines are likely negligible and the opportunities to perceive an increase in divorcees would be minimal to the neighboring region. Coincidentally, the fifth percentile of the population-density distribution is approximately five people per square-mile. The resulting sample, then, is all CNGs with both an accompanying border and interior region and a population density above five people per square-mile in the border region. The final sample contains a total of 192 CNG bins, with 96 border and 96 interior bins. Of the 3,113 counties in the continental United States, 1,906 counties remain in the sample defined above. Of those 1,906 counties, there are 1061 counties residing on the border of states and 845 counties classified as interior.[9]

The following discussion uses the terms "own state, [illegible]

On average, there are approximately 11 counties in a CNG border bin and nine counties in a CNG interior bin. The mean mileage from the county centroid to the border is 37 miles for border regions, while the median distance is 30 miles. For interior regions, the mean distance to the border is 82 miles and the median distance is approximately 75 miles. Although the total population is higher in the interior regions, the mean population per square-mile is driven up by highly-populous regions on the border. As a result, the mean population per square mile is approximately 10% higher on the border, despite the fact that the median population density is higher in the interior. The urban density, as defined by the percentage of the counties that reside in an Standard Metropolitan Statistical Areas (SMSA) in 1980, are similar in terms of medians, but the mean percentage of urban counties is approx depth in the empirical section, and is the same for both border and interior observations, as it is the neighboring state's border regions' divorce rate that is the treatment for both interior and border observations.

IV Empirical Strategy & Results

In what follows, I use difference-in-differences and triple-difference strategies to identify the effects of a neighboring state's divorce rates on resident state's divorce rates. I exploit variation in the neighbor state's divorce rates and test for their impact on the divorce rates of the resident state's border counties. All else equal, these border counties should be disproportionally affected by the neighbor state's divorcee

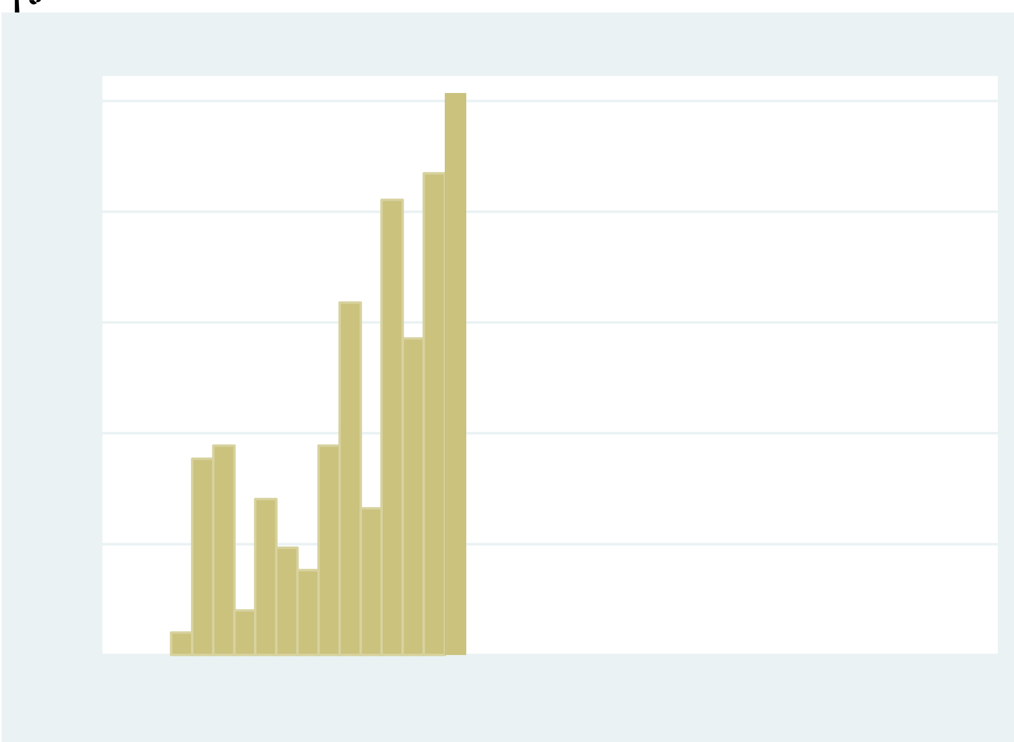
One of the arguments for assuming increasing returns to scale in marriage markets is the diminishing chance of "wasted" opportunities when more singles are in the market. As other papers have noted, divorce rates tend to increase when search costs diminish (McKinnish, 2005; Svarer, 2007). Population density affects search costs of finding a mate through transportation and the level of frictions (or difficulty in finding matches) in a less dense marriage-market. Therefore, in more densely populated areas the impact of an increase in the neighboring state's divorcee-stock should be more visible to participants due to increased daily interactions between the participants. If the lagged spike in resident divorce rates are driven by sticky laws and not increased marriage- market participation then the population in border regions should not affect the estimates found.

The stock of available singles, or the population level, can affect the rate of matching and consequently the magnitude of the spillover effect. An interaction variable which can capture this relationship must be constructed from the data. Although I do not have an explicit measure of the stock of singles, I have population measures to use as a proxy. In order to model a market with IRTS when there are minimal participants and decreasing returns to scale when there exist many participants, the regression equation will require a triple-difference, in order to allow for these heterogeneous effects to depend on relative population levels. The theory suggests IRTS when there exist few people in the market and DRTS when there are many. Therefore, it is likely that the largest effects will be found when the neighboring state's border-region is more populous than one’s own state, but also not so populous that the addition of the divorcees would not be noticeable or considered a significant change in the stock of available marital-market participants.

4.A. Construction of Population Level Treatment Variable

I create a ratio, ***CNGratio,*** using the size of the population of each state's border ti4Ce6P250r82(b)-0.958493(e)-2 border areas and can assess the ratio of the populations in the linked border region. For example, in 1980, South Carolina's border with Georgia consisted of approximately 480,000 residents in the state of South Carolina and 783,000 in Georgia's. Therefore, of the linked border region, Georgia would be considered the more populous of the linked CNGs. By interacting ***CNGratio*** with divorce rates I am able to map the percent divorced in the neighbor-state to the stock of divorcees per population in the linked CNG border areas; thereby creating a dosage level. Due to the perfect matching required by the sample specification, such that every state has an interior, border, and a neighbor, the distribution is symmetrical. Figure two shows the distribution of ***CNGratio*** where 25% has a ***CNGratio*** of .34 or below and the symmetry in the sample results in the top 25% of the sample has a CNG ratio of .66 or above.

Figure 2



effects, year dummies and linear state-time trends. State-time trends are included to help control for the large social and secular changes to divorce that occurred during my sample period of 1969-1988. Additionally, in robustness and specification checks I include the o

As a single individual would be more prone to search for a new partner in the region's most populous area, one would expect that a more populous neighbor-state would have a larger effect on the resident-state divorce rates than a neighbor-state that is relatively less populous then the resident-state. However, as discussed in the theory, if the neighboring state is excessively populous in comparison to the resident state, then an increase in divorcees in the neighbor state will likely have minimal effect in resident state divorce rates. Consequently, the relationship would not be linear between population and divorce effects, but most likely vary pending on the relative populations of the region.

4.C Triple Difference. Regression Equation

recognizable to own-state residents would be higher than if the neighboring-state border-population was small relative to own state. The interaction of th divorce rate by 0.16% more than if neighbor-state border population constitutes less than 40% of the linked border region.

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]				
	[illegible]	[illegible]				
[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]	[illegible]		
			[illegible]	[illegible]		
[illegible]					[illegible]	[illegible]
					[illegible]	[illegible]
[illegible]					[illegible]	[illegible]
					[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

In columns 5 and 6, the third category or 60% and above dummy is separated into two categories, 60%-78%, and the top-tenth percentile of the CNGratio distribution, 78% to 100%. As can be seen in the resulting columns, the effects of a neighbor-state divorce rate vary greatly with population ratios. The findings indicate that when a neighbor-state is less populous then the resident state that there is a minimal effect of neighbor-state divorce rates on resident-state border-region divorce rates. However, the effects become positive (although still close to zero) if the two border regions have the same approximate population. The effect size increases substantially to a highly significant and positive +0.24 when the neighbor-state is larger than resident

the final coefficient, estimated, for th

border region, there is a minimal to

Figure 3 graphs the net effect, or the

range of CNGratio.

Figure 3

New participants appear to

marriage market when the neighbo

populous. When the neighbor state

increase in the neighbor-state divorc

Given the average border divorce ra

1,000. This increase in the average d

an approximate addition of 64 divor

strongly rejects a liner interaction spe

Conclusion

In this paper, I provide a comparative statics test of the theoretical prediction that an increase in divorces will further lead to more divorces due to a feedback mechanism existing between the expected remarriage rate and the realized divorce rate. Using an original approach and county level data I am able to

MORTENSEN, D. T. (1988): "Matching - Finding a Partner for Life or Otherwise," ***American Journal of Sociology***, 94, S215-S240.

MOULTON, B. R. (1990): "An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Unit," ***The Review of Economics and Statistics***, 72, 4.

SHIMER, R. (2000): "Assortative Matching and Search," Econometrica: The Econometric Society, 343-369.

SIEGERS, J., M. R. ROSENZWEIG, and O. STARK (1999): "Handbook of Population and Family Economics," ***European Journal of Population-Revue Europeenne De Demographie***, 15, 305-307.

SOUTH, S. J., and K. M. LLOYD (1995): "Spousal Alternatives and Marital Dissolution," ***American Sociological Review***, 60, 21-35.

SVARER, M. (2007): "Working Late," ***Journal of Human Resources***, XLII, 582-595.

TOLBERT, C. A. (1987): "Labor Market Areas for the United States," Washington DC: Department of Agricu

Appendix – Figure 1

4. C. Test for Variation in Data

A key concern for the above methodology is the plausible exogenous variation that exists in the key variable of interest, the neighboring state's divorce rate. To ensure there remains variation in the neighboring state divorce rate that cannot be explained by the variables already controlled for in the primary specification I regress the neighboring state divorce rate on the remainder of the primary specification presented in equation 2:

eq 3. **ln** ! "# $ **2**%% <, & '
=> ?@> $ **2**%% , & ' ' => ?@> $ **2**% , ( ) * % , & '
- , & + - , & , ( ) * % %

a 1

a 7

Despite the theoretical predictions of varying returns to scale pending on population levels, which indicate that a non-linear specification is most appropriate,

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]
[illegible]	[illegible]	[illegible]		