Divorce and the business cycle: a cross-country analysis

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Abstract   In this paper, we examine the role of the business cycle in divorce. To do so, we use a panel of 29 European countries covering the period from 1991 to 2012. We find the unemployment rate negatively affects the divorce rate, pointing to a pro-cyclical evolution of the divorce rate, even after controlling for socio-economic variables and unobservable characteristics that can vary by country, and/or over time. Results indicate that a one-percentage-point increase in the unemployment rate involves almost 0.025 fewer divorces per thousand inhabitants. The impact is small, representing around 1.2 % of the average divorce rate in Europe during the period considered. Supplementary analysis, developed to explore a possible non-linear pattern, confirms a negative relationship between unemployment and divorce in European countries, with the inverse relationship being more pronounced in those countries with higher divorce rates.

Keywords   Divorce · Unemployment · Business cycle

JEL Classification   C14 · C23 · J12

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1 Introduction

Since 2007, European countries have been in the throes of an economic crisis, with the destruction of jobs reaching levels not seen in many decades. Although there is some heterogeneity across Europe with respect to the severity of the crisis, most European countries have had quite low GDP growth rates since 2008; these rates were even negative in some cases. This low growth was maintained until 2014 (World Development Indicators, World Bank). Several researchers have suggested that this low growth has had socio-demographic consequences and significant costs. In contrast to other countries, such as the US, where GDP growth recovered earlier, reaching rates of approximately 2 since 2010 (World Development Indicators, World Bank), the long period of recession observed in Europe can be a good framework for studying the social effects of the economic crisis. Even the media paid attention to the impact of these economic problems on a variety of factors, such as marital dissolution, in some European countries. For example, *the New York Times* highlighted the negative impact of Spain's 'Great Recession' on the probability of divorce.[1] This observation is by no means an isolated case, and we have undertaken to explore whether variations in the business cycle do effect marital dissolution decisions.[2]

We are not the first researchers to study the relationship between fluctuations in the business cycle and divorce. However, most of the (somewhat sparse) economic literature examining the relationship between the business cycle and divorce has focused on the US (Amato and Beattie 2011; Baghestani and Malcolm 2014; Hellerstein and Morrill 2011; Schaller 2013). Fewer studies have investigated this issue in other countries, but some examples include the papers published by Jensen and Smith (1990) for Denmark, Fischer and Liefbroer (2006) for the Netherlands, and Ariizumi et al. (2015) for Canada. In our case, we add to the literature by examining this issue for a panel of 29 European countries.

For a theoretical overview of this topic, we initially focus on Gary Becker's earlier work, in which he suggested that married individuals separate when the expected utility in the situation of divorce, or even in a potential remarriage situation, is greater than the expected utility from remaining married (Becker et al. 1977). In that framework, male job losses reduce the gains derived from marriage, thus increasing the probability of divorce. Then, since the empirical evidence points to a greater negative effect of the economic crisis on male employment than on female employment (Hoynes et al. 2012), we would expect a positive relationship between unemployment rates and divorce rates. Nevertheless, when marriage is considered to be insurance against economic problems, it should be expected that

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[1] "*Hard Times in Spain Force Feuding Couples to Delay Divorce,*" The New York Times, http://www.nytimes.com/2012/12/18/world/europe/hard-times-in-spain-force-feuding-couples-to-delay-divorce.html?pagewanted=all&_r=1&.

[2] In the literature, it is possible to find several potential determinants of divorce (e.g., unilateral divorce reforms (Friedberg 1998; Wolfers 2006), Child Custody and Child Support laws (González-Val and Marcén 2012a), price stability (Nunley 2010) and culture (Furtado et al. 2013), among others).

the greater the unemployment rate, the lower the divorce rate (Shore 2009; Stevenson and Wolfers 2007). These studies propose opposite effects, as outlined by Ariizumi et al. (2015). Using a theoretical model, Ariizumi et al. (2015) explained that the probability of divorce could increase or decrease when unemployment rates rises. The sign of the effect depends on the balance of the impacts of the economic crisis on the gains derived from marriage and on the quality of those individuals without partners with whom divorcees may potentially match.

Other possible theoretical alternatives could explain the impact of the business cycle on divorce; for example, Amato and Beattie (2011) explored three perspectives: the psychosocial stress perspective, the cost-of-divorce perspective, and the hybrid perspective. The first perspective suggests that the loss of a job produces psychosocial stress, which can affect divorce decisions. According to those authors, the effect should be greater when the variables are lagged, as the stress of decreasing employment opportunities takes time to affect marital dissolution. The second alternative, the cost-of-divorce perspective, points to an inverse relationship between unemployment and divorce because divorce can be a costly process and a job loss situation generates economic constraints. In contrast to that observed in the US, a priori, this perspective could be less relevant due to the greater generosity of the welfare systems in most European countries (Alesina et al. 2001), since this can reduce the effects of economic downturns on households. The last perspective combines the other two perspectives; in this case, the unemployment rate should be negatively associated with the divorce rate when both rates are measured in the same year, as divorce costs would drive contemporary divorces, and positively associated with the divorce rate when the divorce rate is measured in subsequent years, as psychosocial stress increases over time. As noted, these theoretical perspectives do not indicate an a priori clear relationship between business cycle variations and divorce.

Few papers have developed empirical work to investigate which, if any, of these alternative explanations is dominant. The initial work on this issue concluded that divorce rates behave in a pro-cyclical manner (Ogburn and Thomas 1922; Stouffer and Spencer 1936; Kirk 1960). Similar results were obtained in more recent studies using state-level or individual-level data for the US (Baghestani and Malcolm 2014; Hellerstein and Morrill 2011; Amato and Beattie 2011; Hellerstein et al. 2013; Schaller 2013). There is one exception: South (1985) found small positive effects of unemployment on the divorce rate using national-level data for the US. For other countries, Fischer and Liefbroer (2006) showed a negative effect of consumer confidence on divorce rates in the Netherlands, and in the case of Denmark, Jensen and Smith (1990), used panel data for married couples to conclude that unemployment is a relevant factor in marital instability. Their findings point to an immediate positive effect of male unemployment on divorce. No impact of unemployment on divorce could be found in the analysis of the Canadian case (Ariizumi et al. 2015). Previous empirical results are thus mixed.

In our work, we utilize European data on divorce rates from 1991 to 2012, which were measured at the country level. Divorce is defined as the final legal dissolution of marriage as authorized by the laws of each country. In Europe, as in the states of

the US, no common divorce law exists across countries, although since the 1970s, most European countries have passed divorce law reforms that make these laws more homogenous (González and Viitanen 2009; González-Val and Marcén 2012b; Furtado et al. 2013). However, some of these laws are much more complex and restrictive than the laws that regulate divorce issues across the US, which can increase divorce costs and make divorce quite difficult under the economic constraints that an unemployment situation can generate. The differences from the US legislation are remarkable; for example, there are large differences in the separation period requirements for obtaining a divorce when there is no agreement between the spouses. In the United Kingdom, a five-year separation period is needed for the spouse who wants a divorce if his/her spouse does not consent to that divorce. Under these circumstances, divorce decisions are more difficult than in other countries, such as the US, where in most states, unilateral divorce is not so restrictive (Friedberg 1998).

Following prior studies, we use information about national unemployment rates during the same period to measure variations in the business cycle. Although from a theoretical point of view, the relationship between unemployment and divorce is not clear, our results suggest that the divorce rate and the unemployment rate are negatively associated, even after including controls for unobservable characteristics that can vary at the country level and/or over time and controls for other characteristics that are measured at the country level, such as cultural differences, differences in the generosity of cash benefits or even the participation of women in the labor force. The results are also unchanged when we use different sub-samples that consider the political, institutional and economic changes that occurred in some of the countries included in this work and the differences in divorce law legislation. All of our results point to a robust pro-cyclical behavior of divorce in our sample of European countries.

Because couples may react by putting off their marital decisions if there are changes in labor market conditions, there can be a lag in the impact of the unemployment rate on divorce, as suggested by Schaller (2013) and Amato and Beattie (2011). To address this issue, we include lagged unemployment rates in our analysis. Although the duration of the lag is not clear, we consider lags from 1 to 2 years, as there can be a lag between the divorce decision and the finalization of the divorce process. The results show that only the contemporaneous unemployment rate has an effect on divorce for our sample of European countries.

Later in this paper, we present a novel contribution to the existing literature by examining the possible non-linear response of divorce rates to fluctuations in the business cycle. We use this approach because the influence of certain country characteristics, such as the unemployment rate, may not be the same across the distribution of divorce rates. To explore this issue, we use non-parametric methods and quantile regressions. The descriptive results obtained with the non-parametric tools suggest that the decrease in divorce rates is greater when the unemployment rate is between 15 and 25 %, but the response is still pro-cyclical. Moreover, the quantile regression analysis points to a non-linear response of divorce rates to changes in unemployment rates, with a greater negative impact on divorce rates in those countries with higher divorce rates.

The remainder of the paper is organized as follows. Section 2 presents the data used. In Sect. 3, we describe the methodology and our main results. Section 4 presents the lag specifications. The non-linear analysis is conducted in Sects. 5, and 6 concludes.

2 Data

The divorce rate data covers 29 European countries for the period 1991–2012 and is publicly available from the UN Demographic Yearbooks and Eurostat.[3] The divorce rate is calculated as the ratio of the number of divorces during the year per 1000 inhabitants (population data were obtained from The World Bank). This rate is the standard measure of the evolution of divorce that is provided by all National Statistical Offices and International Organizations. Much of the recent literature uses divorces per thousand of population as the main dependent variable (see Friedberg 1998; Wolfers 2006; González and Viitanen 2009, among many others). However, we recognize that the rates may be affected by the marital status structure of the populations to which they relate. Divorce rates may be low either because marriage rates are low or because marriages are less likely to end in divorce (Furtado et al. 2013). To examine this issue, we could have utilized total divorce rates, which are defined as the annual number of divorces per 1000 married inhabitants, but this analysis would have been less reliable due to the scarcity of data on the married population, which is only available when each census is collected, usually every 10 years (Furtado et al. 2013).[4] Thus, we favor the use of the crude divorce rate with a longer series.

To measure business cycle fluctuations, we use unemployment rates for the same period. Unemployment refers to the share of the labor force that is without work but is available for and seeking employment. This is a common indicator of economic conditions that is highly publicized and frequently used, which picks up not only the effects of individual job losses but also the variations in economic uncertainty. This aggregate variable can be useful in analyzing divorce behavior, as it is less likely to be endogenous to divorce decisions than other income or employment measures, such as own wages (Schaller 2013). The unemployment rate is defined as the percentage of unemployed individuals in the labor force (see The World Bank;

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[3] Due to problems with the availability of data on the divorce rate, we could not include in the analysis the following European countries: Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kosovo, Liechtenstein, Malta, Moldova, Monaco, Montenegro, Russia, San Marino, Serbia, Turkey, and Ukraine. The FYR of Macedonia was also excluded from the analysis, following the suggestions of two anonymous referees, as Macedonia can be considered to be an outlier in this analysis. The unemployment rate of Macedonia is considerably higher (more than twice) than that of the other European countries, with a rate near 30 % in all periods considered, and the divorce rate is half of that in the other countries. In any case, we also repeated the analysis including the FYR of Macedonia, and the results did not change substantially.

[4] Although there may be some concerns about the use of the crude divorce rate, it is worth noting that other papers that contain information about both the crude divorce rate and the total divorce rate did not find differences in their results (see González-Val and Marcén 2012a and Marcén 2015). Those authors showed that both rates behave in the same manner.

World Development Indicators). This rate includes changes in both labor demand and labor supply. There are also some concerns about the use of this variable, as it can understate the magnitude of a recession by failing to incorporate discouraged workers and because it can be a lagged indicator of economic recession. However, as Schaller (2013) pointed out, despite these weaknesses, the unemployment rate is the best available proxy to capture changes in the labor market conditions of married couples.

Table 1 shows the average divorce and unemployment rates by country over the sample period and a list of the 29 European countries included here, ordered from low to high average unemployment rates. A great deal of variation can be observed, although for those Northern/Western European countries with low unemployment, the divorce rates are high, and for those countries located in Southern and Eastern Europe with quite high unemployment rates, the divorce rates are low. This pattern may indicate a possible negative relationship between unemployment and divorce rates, although it is not maintained in all cases, such as those countries that belonged to the Former USSR (Latvia, Lithuania and Estonia), which have both high divorce rates and high unemployment rates. One possible explanation for those high average divorce rates is that couples can easily obtain a divorce under the USSR divorce law legislation and the subsequent reforms passed in each of these countries. As indicated in the literature, in the analysis of some European countries (González and Viitanen 2009; González-Val and Marcén 2012b) and also in the case of the US (González-Val and Marcén 2012a), more liberal divorce laws are associated with greater levels of divorce. Of course, having high average divorce and unemployment rates does not mean that a change in the unemployment rate will not have any effect on the divorce rate, but the existence of more liberal divorce laws, as mentioned above, can decrease divorce costs, making divorce more accessible to unemployed individuals. We revisit this issue below. Although more accepting attitudes towards divorce are usually associated with more liberal divorce laws and greater divorce rates, it is arguable that cultural differences can impact divorce decisions, as outlined by Furtado et al. (2013). In Table 1, in most of the countries with a higher percentage of Catholic individuals (less accepting of divorce) [Italy, Ireland, Poland, and Spain, among others (data from the CIA World Factbook)], the divorce rate is lower, with some exceptions (for instance, Belgium). Thus, it is hard to explain the differences in the average divorce rates and the potential relationship of divorce rates with the unemployment rate.

By showing the temporal evolution of the average aggregate divorce and unemployment rates, it is easier to discern the movement of the rates (see Fig. 1).[5] A quick glance at the unemployment and divorce rate series appears to suggest the existence of a pro-cyclical response of divorce to the business cycle, at least at the aggregate level. In the subsequent section, we provide more accurate evidence of the relationship between unemployment and divorce rates.

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[5] The Ireland divorce rate was excluded from that figure because divorce was not allowed in that country until the 1990s. The Family Law Act that regulates divorce was passed in 1996, although the act was not in force until 1997. The rest of the countries introduced divorce many years earlier. All of the analysis presented in this work was repeated without Ireland, and the results did not change.

Table 1 Average divorce and unemployment rates by country

Country	Crude divorce rate (1991–2012)	Unemployment rate (1991–2012)
Luxembourg	2.17	3.48
Switzerland	2.37	3.57
Iceland	1.82	3.99
Norway	2.26	4.02
Austria	2.28	4.12
Netherlands	2.06	4.6
Czech Republic	2.98	6.13
Denmark	2.64	6.13
Slovenia	1.1	6.62
United Kingdom	2.57	6.93
Portugal	1.92	7.01
Romania	1.57	7.12
Sweden	2.39	7.39
Ireland[a]	0.66	7.46
Belgium	2.71	8
Germany	2.25	8.19
Hungary	2.38	8.63
Estonia	3.22	9.25
Italy	0.7	9.5
France	2.02	10
Finland	2.59	10.05
Greece	1	10.67
Croatia	1.03	12.12
Latvia	3.05	12.6
Lithuania	3.3	12.9
Poland	1.3	13.23
Bulgaria	1.43	13.4
Slovakia	1.92	14.07
Spain	1.4	16.61
Europe	2.05	8.55

Sources: World Development Indicators (The World Bank), Eurostat and United Nations Demographic Yearbooks

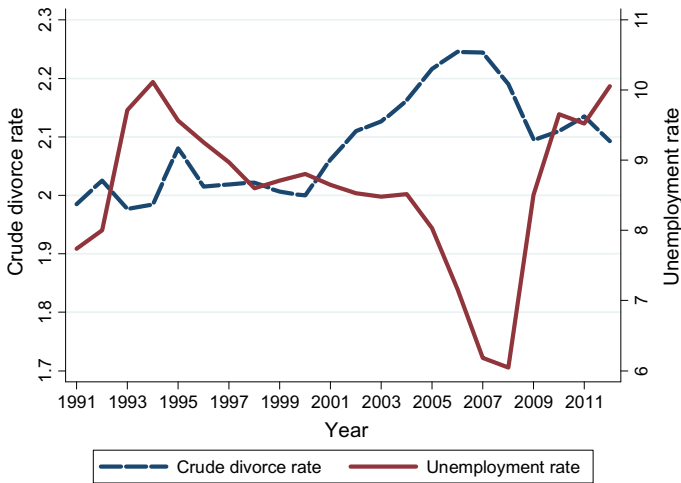[a] Ireland data from 1997 to 2012

3 Methodology and results

3.1 Methodology

We estimate the following equation:

$$DR_{it} = \alpha + \beta Unemp_{it} + \Pi' T_{it} + \phi \eta_i + \varepsilon_{it}, \tag{1}$$

Fig. 1 Average divorce and unemployment rates in Europe. *Sources* World Development Indicators (The World Bank), Eurostat and United Nations Demographic Yearbooks

where DR_{it} is the crude divorce rate of country i in year t and $Unemp_{it}$ is the unemployment rate of country i in the year t. η_i is a vector of country fixed effects ($\sum_{i=1}^{n-1} Country_i$) that picks up the impact of unobserved characteristics that vary at the country level. T_{it} is a matrix of time variables that incorporates: time fixed effects ($\sum_{t=1}^{t-1} Year_t$), country-specific linear time trends ($\sum_{i=1}^{n-1} Country_i \cdot Time_t$), and quadratic country-specific time trends ($\sum_{i=1}^{n-1} Country_i \cdot Time_t^2$) that allow us to capture the effect of unobserved characteristics that vary over time. ε_{it} is the error term. This framework exploits variations in unemployment behavior over time and across countries, as Amato and Beattie (2011) and Schaller (2013) did for US states. The strategy used to identify the relationship between unemployment and divorce rates is based on the exogeneity of variations in country unemployment rates, although there may be some concerns about this issue. For instance, women are likely to change their participation in the labor market if their marital status varies, which could drive changes in unemployment rates. We revisit this issue below following Schaller (2013). As we explained above, from a theoretical point of view, whether or not divorce rates respond in a pro-cyclical manner remains unclear. Therefore, the sign of the β coefficient could be positive (counter-cyclical behavior) or negative (pro-cyclical behavior).

3.2 Baseline results

Table 2 shows the regression results for the model presented in Eq. (1), with all of the regressions weighted by country population.[6] Our results indicate that a one-percentage-point increase in the unemployment rate is related to 0.025 fewer divorces per thousand individuals (on average), see column (1).[7] As reported by Schaller (2013) for the US, this impact appears to be minor, representing 1.2 % of the average European divorce rate during the period considered. Our findings are maintained if the dependent variable is measured in logarithm [see column (5)].

One potential problem with our estimates can appear if the variations in the unemployment rates are driven by variations in marriage and divorce rates, generating concerns about exogeneity. As suggested above, this scenario could happen through changes in the female labor supply, which can affect the unemployment rate.[8] For example, if more women remain single or if divorced women do not re-marry, then more women may be participating in the labor market (Fernández and Wong 2014a, 2014b). However, as Schaller (2013) explained, whether decreases or increases in women's participation in the labor market correspond with variations in the overall unemployment rate remains unclear. In addition, as shown in the literature, the increase in divorce rates accounts for a very small portion of the increase in female employment rates (Eckstein and Lifshitz 2011). In any case, to tackle this issue, we repeated the analysis using the male unemployment rate because men are less likely to vary their participation in the labor market due to changes in their marital status (see a similar analysis in Schaller 2013). That variable is defined as the percentage of men in the labor force who are without work but available for and seeking employment (Source: World Bank). The results are quite similar (columns (2) and (6) in Table 2). We detect an inverse relationship between male unemployment and divorce.[9] Even the magnitude of the impact of unemployment on divorce is the same as that seen in column (1).[10]

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[6] Robust standard errors clustered by country. All specifications include country fixed effects, year fixed effects, and country-specific linear and quadratic time trends. We repeated all of the analysis with/without all these controls, with/without population weights and with/without clustering the standard errors, and the results did not vary.

[7] In the case of Ireland, data on divorce is only available since 1997 because divorce was not allowed before that date. As mentioned above, our findings do not change when Ireland is excluded from the sample.

[8] It is also arguable that if the number of divorced individuals increases, the demand for housing could also increase when divorcees do not move in with a new partner. In this setting, a rise in the number of divorced individuals could drive changes in unemployment rates through an increase in the number of workers in the building sector. However, changes in the building sector take time because it is not easy to build a new house or building in a few days (projects, licenses are hard to obtain, etc.); thus, an impact of the divorce rate on the contemporaneous unemployment rate would be unlikely. It would be more likely to detect changes in the renting of houses, which normally demands fewer workers than the construction sector. From those arguments, it would be unlikely to observe variations in the contemporaneous unemployment rate caused by changes in the divorce rates, mitigating previous concerns.

[9] We have tested the robustness of all our results to the inclusion of the male unemployment rate and our results are not affected.

[10] We re-ran all of the analysis excluding each country, one at a time, and excluding those countries that exhibit the highest and the lowest unemployment and divorce rates. The results did not change substantially.

Table 2 Divorce rate models, OLS estimates

	Dep. variable: crude divorce rate (CDR)				Dep. variable: log (CDR)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Unemployment rate	−0.025**			−0.028**	−0.014***		
	(0.009)			(0.011)	(0.005)		
Male unemployment rate		−0.025**				−0.013***	
		(0.009)				(0.005)	
GDP per capita (ln scale)			0.645	−0.272			0.368
			(0.469)	(0.565)			(0.274)
R^2	0.960	0.960	0.958	0.961	0.971	0.971	0.969
Observations	632	632	601	601	632	632	601

Robust standard errors clustered by country. All regressions are weighted by country population. All specifications include country fixed effects, year fixed effects, and country-specific linear and quadratic time trends. Ireland data from 1997 to 2012. There is no information of the GDP per capita for all the period considered in the case of Croatia, Estonia, Latvia, Lithuania, Slovakia, and Slovenia

Significant at the *** 1 % level, ** 5 % level, * 10 % level

3.3 Robustness checks

It is arguable that not only the shock of the labor market conditions but also the evolution of the aggregate income influences divorce decisions. To tackle this issue, we use country GDP per capita in logarithm, calculated in US dollars at 2005 constant prices (data source: World Bank, World Development Indicators), as a proxy for household income.[11] These estimates are displayed in column (3) of Table 2. The coefficient that captures the effect of GDP per capita is not statistically significant. The same non-statistically significant coefficient, though with a negative sign, is detected even when we add the unemployment rate variable in column (4). With respect to the effect of the unemployment rate, we observe no changes: the divorce rate is negatively associated with the unemployment rate. Column (7) displays the estimates after measuring the dependent variable in logarithm, and the results are similar.

Additionally, one can surmise that not only the evolution of the business cycle but also the differences in the responsiveness of the married couples to that evolution is important, depending on whether those couples live in poor or rich countries. Costly divorces can be less accessible for married couples living in poor countries than those living in rich countries. If this scenario happens, the response of the divorce rate to the unemployment rate can differ between poor and rich countries. To provide even more evidence that those differences in the level of income at the country level are not driving our results, we repeated the analysis by

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[11] No data were available for the whole period in the cases of Croatia, Estonia, Latvia, Lithuania, Slovakia, and Slovenia. For consistency, we repeated the analysis without those countries. The results did not vary.

excluding the two countries that are considered to be upper-middle income countries by the World Bank (Bulgaria and Romania). The results are presented in column (1) of Table 3. Our findings do not change after the exclusion of those observations because the coefficients that capture the effect of the overall unemployment or the impact of male unemployment are negative and statistically significant. In addition, even the change in the magnitude of the effect is very small.

Another concern with the sample considered in this study could be the inclusion of countries that obtained their independence in the early 1990s. Seven of the twenty-nine countries are in this situation (Source: The World Factbook of the CIA). This situation could be problematic if our estimates confound the effect of this political and institutional environment on divorce with a relationship between divorce and unemployment. For example, those countries that belonged to the Former USSR (Estonia, Latvia and Lithuania) had to approve their own divorce legislation. In some cases, this process took a lot of time; some of the new laws were not passed until 2000. Surely, this process increased uncertainty about the possible grounds for obtaining a divorce, affecting the divorce decisions of individuals for reasons unrelated to the changes in other potential determinants of the evolution of the divorce rate. To address this issue, we repeated the analysis excluding those seven countries (Croatia, Czech Republic, Estonia, Latvia, Lithuania, Slovakia and Slovenia), and the results were unchanged (see column (2) of Table 3). Then, including or excluding those countries does not appear to affect the estimated relationship between unemployment and divorce.

We have also added controls for other political, institutional, and economic changes that occurred during the period considered in this study, as our estimates might capture the effect of those changes in addition to or instead of the impact of business cycle fluctuations. One of the major changes that occurred in some European countries is their incorporation into the European Union as member states. Twelve of the included countries were members prior to the start of our study period. Thirteen of the twenty-nine countries became member states of the European Union during that period (Source: European Union webpage). We incorporate this factor into our analysis by using a dummy variable that takes the value "1" from the year in which a state became a member of the European Union and the value "0" otherwise. The results are shown in Table 3, column (3). The estimated coefficient of the effect of being a EU member is not statistically significant. With respect to the relationship between the unemployment rate and the divorce rate, no differences were observed. The use of the same currency was another relevant change that occurred in Europe since 1999. Fifteen countries from our sample are members of the European Union and use the Euro (source: European Central Bank webpage). To control for this change, we add a dummy variable that takes the value of "1" from the year in which a state became a member of the European Union that uses the Euro and the value "0" otherwise. The results are presented in column (4) of Table 3. As in the previous case, the coefficient capturing the effect of the use of the same currency is not statistically significant, whereas the divorce rate appears to respond in a pro-cyclical manner to variations in the business cycle. Both dummies are included in the same specification in column (5), and our conclusions do not vary.

Table 3 Divorce rate models, considering political and institutional changes

Sample	Without upper-middle-income countries	Without countries obtaining their independence	All countries		
Dep. variable: CDR	(1)	(2)	(3)	(4)	(5)
Unemployment rate	−0.025**	−0.026**	−0.025**	−0.027**	−0.027**
	(0.010)	(0.011)	(0.009)	(0.010)	(0.010)
EU member			0.124		0.128
			(0.104)		(0.102)
Adopted Euro				−0.094	−0.098
				(0.095)	(0.094)
R^2	0.961	0.96	0.96	0.96	0.96
Observations	588	478	632	632	632

Dependent variable: Crude divorce rate. Robust standard errors clustered by country. All regressions are weighted by country population. All specifications include country fixed effects, year fixed effects, and country-specific linear and quadratic time trends. Ireland data from 1997 to 2012

Significant at the *** 1 % level, ** 5 % level, * 10 % level

Table 4 Divorce rate models: with FLFP and religion

Sample Dep. variable: CDR	All countries (1)	With catholic countries (2)	Without catholic countries (3)
Unemployment rate	−0.025***	−0.018*	−0.024**
	(0.009)	(0.010)	(0.010)
FLFP	0.013		
	(0.017)		
R^2	0.960	0.956	0.965
Observations	632	368	264

Robust standard errors clustered by country. All regressions are weighted by country population. All specifications include country fixed effects, year fixed effects, and country-specific linear and quadratic time trends. Ireland data from 1997 to 2012. Countries are classified as Catholic if in that country the majority of individuals are Catholics following the classification of the World Factbook of the CIA

Significant at the *** 1 % level, ** 5 % level, * 10 % level

Female labor force participation (FLFP) is also included in column (1) of Table 4 as a control. This variable is measured as the percentage of the female population over age 15 years that is economically active (data source: World Development Indicators). We add this variable because it is possible to hold that changes in divorce rates are driven by the participation of women in the labor force (Allen 1998; Nunley and Zietz 2008). If a woman is inactive, her husband's job loss could lead to greater economic problems than in the case that she is economically active, increasing the difficulties of pursuing a costly divorce.[12]

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[12] We recognize that changes in these variables may drive unemployment and divorce rates. Although this issue can be problematic, it is comforting that adding or deleting all of these variables does not affect our conclusions concerning the relationship between divorce and unemployment rates.

Cultural differences can also affect divorce decisions. As stated by Furtado et al. (2013), beliefs about the morality of divorce are passed on through religion. The Catholic Church teaches that marriages cannot be dissolved and even ostracizes divorced individuals, while more liberal Protestant denominations support divorce laws (Bahr and Chadwick 1985). Thus, the response of married couples to an unemployment situation can differ if the spouses are Catholic. In our sample, 17 of 29 countries can be classified as having the Catholic religion as the main religion of the majority of the population (Source: The World Factbook, CIA). To explore this issue, we repeat the analysis by separating the sample between Catholic and non-Catholic countries. The estimates of this specification are displayed in columns (2) and (3) of Table 4. The results pertaining to our variable of interest (the unemployment rate) do not vary. Overall, our estimates always point to a pro-cyclical response of divorce rates.

In all of our results, the response of the divorce rate to variations in the unemployment rate is small, which is quite similar to observations in the US (Schaller 2013). However, this outcome is not expected if one takes into consideration the generosity of the welfare systems of some of the European countries incorporated in this analysis (Alesina et al. 2001). This generosity could reduce the effects of economic problems on households, making divorce more accessible. To provide even more additional evidence in favor of the negative relationship between divorce and unemployment, we repeated the analysis in Table 5 by including a control for the cash benefits received by unemployed individuals. Cash benefits are measured as public unemployment spending to compensate for unemployment. This factor includes redundancy payments from public funds, as well as the payment of pensions to beneficiaries before they reach the standard pensionable age, if these payments are made because the beneficiaries are out of work or for other labor market policy reasons (OECD dataset).[13] Cash benefits are calculated as a percentage of the GDP (column (1) in Table 5) and per head in constant 2005 US dollars [column (2)]. We also analyze whether countries with more generous cash benefits are more or less responsive by interacting a dummy variable with the unemployment rate. That dummy takes the value of "1" when the cash benefits for unemployed, measured in percentage of the GDP, of country i are greater than the average cash benefits in year t and the value "0" otherwise. Results are reported in column (3). We observe a similar response for those countries with more and less generous cash benefits. In both cases, there is an inverse relationship between unemployment and divorce. However, the impact is greater (in absolute value) in those countries with more cash benefits for unemployed which is not surprising due to the strong correlation that exists between the unemployment rate and cash benefits, which can bias these estimates; however, even with this problem, our results concerning the relationship between unemployment and divorce do not vary.

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[13] Observations are not available for the whole sample. For this reason, we repeated the analysis with only that sample (column (4) of Table 5), and our results are the same.

Table 5 Divorce rate models: adding cash benefits

Dep. variable: CDR	(1)	(2)	(3)	(4)
Unemployment rate (z)	−0.023**	−0.023**	−0.015*	−0.024**
	(0.011)	(0.011)	(0.008)	(0.011)
Unemployment × cash benefits greater than the average (y)			−0.013	
			(0.009)	
Cash benefits greater than the average			0.105	
			(0.098)	
% Cash benefits	−0.016			
	(0.057)			
Cash benefits per head		−0.009		
		(0.030)		
F test (z + y = 0) *p* value			0.0024	
R^2	0.964	0.964	0.964	0.964
Observations	480	480	480	480

Robust standard errors clustered by country. All regressions are weighted by country population. All specifications include country fixed effects, year fixed effects, and country-specific linear and quadratic time trends. Ireland data from 1997 to 2012. Data on Public Cash Benefits for unemployed individuals is obtained from the OECD dataset. Column (1) includes the cash benefits measured in percentage of the GDP. In columns (2), cash benefits are calculated per head, at constant prices, in 2005 US dollars

Significant at the *** 1 % level, ** 5 % level, * 10 % level

3.4 Divorce laws

To this point, we have examined the relationship between unemployment and divorce without taking into account how couples can obtain a divorce. Divorce legislation differs across Europe. However, since the 1970s, several reforms have occurred throughout European countries, making divorce laws much more homogeneous by including the irretrievable breakdown ground, as shown in Tables 6 and 7. After a careful examination of all of the laws regulating divorce issues, we have summarized all of the grounds for divorce that are included in European legislation in Table 6, including the major reforms that were passed since 1991. We divide these grounds into three categories: the Fault, Mutual Consent, and Irretrievable Breakdown/Separation grounds. In Europe, it is possible to obtain a divorce by fault (domestic violence, etc.), by agreement between the spouses (with/without separation periods requirements), and by an irretrievable breakdown of the marriage (this also admits mutual consent in some countries). The last ground, the irretrievable breakdown of the marriage, includes a separation period as proof of the marital breakdown in many cases. For other countries, separation is considered to be a separate ground for divorce, although in our summary, we included both irretrievable breakdown and separation in the same ground. Several countries, such as Poland, Slovakia and Slovenia, among others, do not require specific separation periods in the irretrievable breakdown ground. In those countries, the judges decide whether or not the marriage is broken by analyzing each case individually.

Table 6 Divorce legislation: grounds for divorce

Grounds for divorce				
Country	Fault	Mutual consent	Irretrievable breakdown/ separation	Divorce with the opposition of one of the spouses
Austria	Pre-1991	Pre-1991 (6 months MB)	Pre-1991 (3–6 years MB)	Pre-1991 (6 years)
Belgium	Pre-1991; 2007 (SF)	Pre-1991	Pre-1991 (5 years S); 2000 (2 years S); 2007 (6 months S)	Pre-1991 (5 years); 2000 (2 years); 2007 (1 year)
Bulgaria	Pre-1991 (R)	Pre-1991	Pre-1991	Pre-1991 (8 years)
Croatia	No	Pre-1991	Pre-1991 (1 year S)	Pre-1991 (1 year)
Czech Republic	Pre-1991 (SF)	No	Pre-1991 (MC: 1 year MB/ 6 months S)	1998 (3 years)
Denmark	Pre-1991	No	Pre-1991 (MC: 6 months S; 2 years S)	Pre-1991 (2 years)
Estonia (NL)	No	1994	1994; 2009 (2 years S)	2009 (2 years)
Finland	No	No	Pre-1991 (2 years S and no reconsideration period)	Pre-1991 (6 months reconsideration period)
France	Pre-1991	Pre-1991	Pre-1991 (6 years S); 2004 (2 years S)	Pre-1991 (6 years S); 2004 (2 years S)
Germany	Pre-1991 (R)	No	Pre-1991 (MC: 1 year S; 3 years S)	Pre-1991 (3 years)
Greece	Pre-1991 (IB)	Pre-1991	Pre-1991 (4 years S); 2008 (2 years S)	Pre-1991 (4 years); 2008 (2 years)
Hungary	No	No	Pre-1991 (MC: 3 years S)	Pre-1991 (at the discretion of the court)
Iceland	Pre-1991	Pre-1991 (1 year S)	Pre-1991 (3 years S); 1993 (2 years S)	Pre-1991 (3 years); 1993 (2 years)
Ireland	No	No	1996 (4 years S of the last 5 years)	1996 (4 years S of the last 5 years)
Italy	No	No	Pre-1991 (3 years legal separation)	Pre-1991 (3 years legal separation)
Latvia (NL)	No	1993	1993 (3 years S)	1993 (3 years)
Lithuania (NL)	Pre-1991	2000	2000 (1 year S)	Pre-1991 (1 year)
Luxembourg	Pre-1991	Pre-1991	Pre-1991 (3 years S)	Pre-1991 (3 years)
Netherlands	No	No	Pre-1991 (MC: (0); court decision); 2002 (2 years S no MC)	Pre-1991 (at the discretion of the court); 2002 (2 years)
Norway	Pre-1991	Pre-1991	Pre-1991 (2 years S)	1991 (2 years)
Poland	Pre-1991 (SF)	No	Pre-1991	Pre-1991 (at the discretion of the court)

Table 6 continued

Grounds for divorce				
Country	Fault	Mutual consent	Irretrievable breakdown/ separation	Divorce with the opposition of one of the spouses
Portugal	Pre-1991; 2008 No	Pre-1991 (1 year S)	Pre-1991 (3 years S); 2008 (1 year S)	Pre-1991 (3 years); 2008 (1 year)
Romania	Pre-1991 (IB)	Pre-1991	Pre-1991	Pre-1991 (at the discretion of the court); 2009 (2 years)
Slovakia	Pre-1991 (IB)	No	Pre-1991	Pre-1991 (at the discretion of the court)
Slovenia	No	Pre-1991	Pre-1991	Pre-1991 (at the discretion of the court)
Spain	Pre-1991	Pre-1991 (2 years S); 2005 (0)	Pre-1991 (5 years S); 2005 (No)	Pre-1991 (5 years); 2005 (0 years)
Sweden	No	No	Pre-1991 (No)	Pre-1991 (6 months reconsideration period)
Switzerland	Pre-1991	2000	Pre-1991;2000 (4 years S); 2002 (2 years S)	2000 (4 years); 2002 (2 years)
United Kingdom	Pre-1991 (IB)	No	Pre-1991 (MC: 2 years S; 5 years S)	Pre-1991 (5 years)

This information is obtained from each national legislation, González and Viitanen (2009), González-Val and Marcén (2012b), the Commission on European Family Law, the Council of Europe, the European Judicial Network in civil and commercial matters (http://ec.europa.eu/civiljustice), the European e-Justice Portal-Family Matters (https://e-justice.europa.eu)

SF serious faults; *R* at request; *IB* irretrievable breakdown; *MC* with spouse agreement; *MB* marital breakdown (no need of living apart); *S* de facto separation (living apart); *NL* national legislation (in previous years Russian legislation)

Under this framework, it is possible to suggest that the response of married individuals to unemployment can differ depending on how that couple can obtain a divorce. Some of the separation period requirements may discourage married couples from divorcing because of economic downturns if they are required to live apart for 2 or 3 years, as in the cases of the United Kingdom and Hungary, respectively, even by mutual consent. To avoid this problem, we re-ran our analysis while selecting those countries that allowed divorce under mutual consent with a separation period of 1 year or less.[14] Column (1) of Table 8 shows the estimated coefficients. Once again, the coefficient that captures the impact of unemployment on divorce is negative and statistically significant, and even the magnitude of the effect changes very little. Thus, adding or deleting observations from the countries where divorce is more difficult under mutual consent does not modify our findings.

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[14] We have repeated the estimates by including/excluding those countries that introduced reforms related to the separation period during the period considered, and the results are maintained.

Table 7 Divorce legislation: divorce process, spousal maintenance and joint custody

Country	Judicial process (need court order) JP/ Administrative process AP/Notary NP	Spousal maintenance Principle of guilt; limitation	Parental responsibilities Joint custody/Joint Parenthood Reforms
Austria	Pre-1991, JP	Yes, (1999) even for the guilty; 3 years	2001
Belgium	Pre-1991, JP	Yes; 2007 not exceed the marriage duration	1995, 2006
Bulgaria	Pre-1991, JP	Yes; 3 years	–
Croatia	Pre-1991, JP	No; (1998) 1 year	2003
Czech Republic	Pre-1991, JP	Yes; 3 years	1998
Denmark	Pre-1991, JP and AP	No; 10 years–3 years (Pre-1991) depending marriage duration	2007
Estonia (NL)	Pre-1991, JP and AP	No; depending on circumstances	2009
Finland	Pre-1991, JP	No, depending on circumstances	–
France	Pre-1991, JP	Yes; depend on the grounds: IB 8 years (2004)	1993, 2002
Germany	Pre-1991, JP	No; 2 years	1997
Greece	Pre-1991, JP	No; 3 years	–
Hungary	Pre-1991, JP	Yes; 5 years	1995
Iceland	Pre-1991, JP	Yes; depending on circumstances	1992, 2006
Ireland	Pre-1991, JP	Yes; depending on circumstances	1997
Italy	Pre-1991, JP	No; depending on circumstances	2006
Latvia (NL)	2011 JP, AP and NP	Yes; depending on circumstances	–
Lithuania (NL)	2000 only JP	Yes, No support for guilty spouse; 3 years	–
Luxembourg	Pre-1991, JP	Yes, No support for guilty spouse; depending on circumstances	–
Netherlands	Pre-1991 JP; 2001 JP and AP	Yes; 12 years	1998, 2002, 2009
Norway	Pre-1991 AP and only few cases JP	Yes; 3 years	–
Poland	Pre-1991, JP	Yes, guilty spouse 5 years	–
Portugal	Pre-1991, JP and AP	Yes, guilty spouse in few cases; depending on circumstances	1995
Romania	Pre-1991, JP; 2010 JP, AP and NP	Yes, guilty spouse 1 year	2006
Slovakia	Pre-1991, JP	No; (2005) 5 years	2010
Slovenia	Pre-1991, JP	No; depending on circumstances	2004
Spain	Pre-1991, JP	No; depending on circumstances	2005
Sweden	Pre-1991, JP	No; depending on circumstances	1998
Switzerland	Pre-1991, JP	Yes (Pre-1991), No (1998); depending on circumstances	2000

Table 7 continued

Country	Judicial process (need court order) JP/ Administrative process AP/Notary NP	Spousal maintenance Principle of guilt; limitation	Parental responsibilities Joint custody/Joint Parenthood Reforms
United Kingdom	Pre-1991, JP	No; depending on circumstances, 3 years in Scotland	1989

This information is obtained from each national legislation, the Commission on European Family Law, the Council of Europe, European Judicial Network in civil and commercial matters (http://ec.europa.eu/civiljustice), the European e-Justice Portal-Family Matters (https://e-justice.europa.eu)

NL national legislation (in previous years Russian legislation)

We provide additional evidence by adding an interaction between the unemployment rate and a dummy variable that takes the value "1" when married couples living in country *i* cannot obtain a divorce by mutual consent with a separation or marital breakdown requirement of 1 year or less in year *t*. As can be observed in column (2), our estimates show that the effect of unemployment, albeit negative and statistically significant, is lower (in absolute value) in those countries where the divorce laws are more restrictive, that is, those in which divorce cannot be granted by mutual consent or the marital breakdown requirement is greater than 1 year.

When married couples do not agree, the divorce process is much more difficult and costly. In such cases, the separation requirement varies (for example, 8 years in Bulgaria, as determined by the Supreme Court of that country, to 0 years in Spain (no need for separation) since the approval of divorce law reform in 2005). We included the category "Divorce with the opposition of one of the spouses" with the separation period requirements in Table 6. This category is not a specific ground for divorce, but several divorce regulations include this category in their family laws. The rest of the regulations do not include this category, but the judges decide whether or not an individual can obtain a divorce with the opposition of his/her spouse. As stated before, separation period requirements may discourage married couples from divorcing. Focusing on those countries in which the separation period is greater than 1 year, we observe that for those countries, the response of the divorce rate to the unemployment rate is still pro-cyclical (see column (3) in Table 8). The magnitude of the effect decreases (in absolute value), pointing to a lower impact of the business cycle on divorce when divorce is less accessible without mutual consent.[15] As before, we also study this issue by including an interaction between the unemployment rate and a dummy variable. In this case, that dummy variable takes the value "1" when divorce can easily be granted without the opposition of one of the spouses in country *i* in year *t* and the value "0" otherwise. Again, our results indicate that the impact of the unemployment rate on divorce is lower (in absolute value) when divorce laws are more restrictive divorce law

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[15] We take into account the divorce law reforms that occurred during the period considered to calculate our estimates.

Table 8 Divorce rate models, considering divorce laws

Sample	Countries with MC	All countries	Countries Without Unilateral Divorce (UD)	All countries	Countries with court decision	Countries with principle of guilt	Countries with child custody reforms
Dep. variable: CDR	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Unemployment rate (z)	−0.024**	−0.029**	−0.016**	−0.016**	−0.025**	−0.018**	−0.037***
	(0.009)	(0.012)	(0.007)	(0.007)	(0.010)	(0.008)	(0.009)
Unemp. rate × dummy without Mutual Consent		0.014					
		(0.012)					
Dummy without Mutual Consent (MC) (y)		−1.531***					
		(0.078)					
Unemp. rate × Dummy With UD (y)				−0.025			
				(0.020)			
Dummy UD				1.255***			
				(0.343)			
F test (z + y = 0) p value		0.0001		0.0212			
R^2	0.942	0.974	0.976	0.972	0.962	0.942	0.960
Observations	469	632	528	632	530	368	456

Column (1) includes those countries were couples can easily divorce by mutual consent with a separation or marital breakdown requirement of 1 year or less. Column (3) excludes those countries where divorce can easily be granted without the opposition of one of the spouses (unilateral divorce, UD). Column (5) only includes those countries where divorce needs a court decision. Column (6) includes those countries where the principle of guilt is relevant to obtain or to include a limitation in the spousal maintenance. Column (7) includes those countries with reforms on child custody. Robust standard errors clustered by country. All regressions are weighted by country population. All specifications include country fixed effects, year fixed effects, and country-specific linear and quadratic time trends

Significant at the *** 1 % level, ** 5 % level, * 10 % level

pointing to a less relevance role of business cycle fluctuations in divorce decisions [see column (4)].

Not only the grounds for divorce but also divorce processes and some issues related to the aftermath of divorce (spousal maintenance and joint custody) were addressed in this work (see Table 7). As mentioned previously, no common law regulates the divorce process across Europe. In 22 of the 29 included countries, married couples need a court order to divorce, which can make divorce more costly. Although a non-judicial process can grant divorce in some countries, it is required the mutual consent of married couples (in most cases, couples with children cannot choose the administrative process). To provide more convincing evidence to mitigate the possible concerns that any of these regulations is driving our results, the specification was estimated using a sample of countries that excludes those countries that do not require a court order to get a divorce. The results are reported in column (5) in Table 8. Similarly, we repeated the analysis with those countries that incorporate the principle of guilt in their legislation to establish any limitation of spousal maintenance [see column (6)]. Lastly, we also chose a sample of countries that introduced reforms pertaining to the custody of children (joint parenthood or joint physical custody) [column (7)]. A negative relationship between unemployment and divorce was obtained in all cases, regardless of the sample of countries and the associated reforms.[16] Our findings point again to a pro-cyclical response of the divorce rate to business cycle variations.

4 Lag specification

Thus far, we have examined the contemporary effect of unemployment rates on divorce rates. Nevertheless, we mentioned above that the economic constraints generated by job loss could lead couples to postpone their divorce decisions because they cannot afford to pursue a costly divorce. These couples are forced to support themselves together. As times passes, the cumulative psychosocial stress increases (for example, because of the increased level of friction between individuals, who in many cases, 'cannot stand each other'). In such cases, some couples may decide to divorce in spite of their economic problems. As Amato and Beattie (2011) explained, in this setting, we would expect a negative effect of the contemporaneous unemployment rate on divorce and a positive impact of lagged unemployment rates.

To explore this topic, we add the lagged unemployment rates to Eq. (1). As Schaller (2013) and Amato and Beattie (2011) remarked, the duration of the lag is not clear. Following prior literature, we add lags from 1 to 2 years because there can be a lag between the divorce decision and the date of the divorce, depending, for example, on the separation period requirements.[17] The estimated coefficients are reported in Table 9. In column (1), we only observe an inverse relationship between

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[16] The magnitude of the effect varies a little, especially in the case of joint custody reform, but this result should be interpreted with caution because we are considering all reforms pertaining to joint custody, not only those related to joint physical custody.

[17] This analysis was repeated including more lags. We obtained the same results.

the contemporaneous unemployment rate and the divorce rate. The coefficients that pick up the impact of the lagged unemployment rates are not statistically significant, as in the case of the prior literature (Schaller 2013 and Amato and Beattie 2011). The cumulative total effect of unemployment on divorce is -0.035, with an F-stat for joint significance of 3.73 ($p > \text{F} = 0.063$). Once again, we find a negative association between the unemployment and divorce rates.

With an argument concerning divorce costs that is similar to that used to justify the use of lagged unemployment rates, it is possible to suppose that the impact of variations in household income (without implying a job loss) due to business cycle fluctuations can also be lagged. Here, we also use as a proxy the GDP per capita. The estimates after including that variable and its lags are reported in column (2) of Table 9. The estimated coefficients capturing the impact of the contemporaneous GDP per capita and its lags are not statistically significant (see column 2). Indeed, this does not change when the unemployment rate variable and its lags are incorporated in column (3). Respecting the estimates of the unemployment rate and its lags, we observe similar results in columns (1) and (3); there is a negative association between the contemporaneous unemployment rate and the divorce rate. Therefore, using European data, we find no evidence in favor of the psychological approach, which is in line with the work of Amato and Beattie (2011) and Schaller (2013), who used US data.

5 Non-linear analysis

In this section, we use an alternative approach. The results presented above are derived from linear models; however, one can surmise that variables respond in a non-linear manner. In our case, a portion of the variation in divorce rates may reflect the fact that the influence of certain country characteristics, particularly the unemployment rate, is not uniform across the distribution of this variable. To model these possible heterogeneous effects of the unemployment rate on the divorce rates, we use non-parametric tools and quantile regressions. While non-parametric tools give us descriptive information about the empirical distribution of the variables, quantile regressions allow us to make inferences about the non-linear relationship between divorce and unemployment.

Eeckhout (2004) and Ioannides and Overman (2004) highlighted the advantages of non-parametric methods over the standard parametric approach (e.g., a correlation index). Basically, non-parametric tools do not impose a structure on the underlying relationships, which may be non-linear and may change over time. First, we study how the distribution of divorce rates is related to the distribution of unemployment rates (Ioannides and Overman 2004). Figure A1 (Online Appendix) shows the stochastic kernel estimation of the distribution of crude divorce rates, which is conditional on the distribution of unemployment rates on the same date, for a pool of 632 observations from our sample of 29 European countries over the period from 1991 to 2012. To facilitate interpretation, the contour plot is also shown. If both distributions were independent, the contour plot would show the estimated density around a vertical or horizontal straight line. Nevertheless,

Table 9 Divorce rate models, lag specification

Dep. variable: CDR	(1)	(2)	(3)
Unemployment rate	−0.031***		−0.033***
	(0.008)		(0.008)
Unemployment rate t-1	−0.004		−0.005
	(0.012)		(0.016)
Unemployment rate t-2	0.0003		−0.004
	(0.007)		(0.009)
GDP per capita (ln scale)		0.664	0.120
		(0.701)	(0.544)
GDP per capita t-1 (ln scale)		0.004	−0.525
		(0.409)	(0.454)
GDP per capita t-2 (ln scale)		−0.130	−0.415
		(0.629)	(0.809)
R^2	0.959	0.955	0.960
Observations	576	545	545

Robust standard errors clustered by country. All regressions are weighted by country population. All specifications include country fixed effects, year fixed effects, and country-specific linear and quadratic time trends

Significant at the *** 1 % level, ** 5 % level, * 10 % level

although the estimated density is rather concentrated, the plot reveals a negative relationship between the two distributions: the lower the unemployment rates, the higher the divorce rates. Second, we conduct a non-parametric estimation of the effects of unemployment on divorce rates. To achieve this estimation, we estimate the non-linear relationship between the unemployment and divorce rates using local polynomial smoothing for the pool of 632 observations from 1991 to 2012.[18] Figure A2 (Online Appendix) shows the results, including the 95 % confidence intervals. This graph complements Figure A1. The negative relationship is clear; as the unemployment rates increase, the divorce rates decrease. This result confirms the estimated effect that was obtained in Sect. 3. Furthermore, Figure A2 shows a non-linear effect: the decline in the divorce rate is greater, the higher the unemployment rate. The graph shows a slight negative relationship for unemployment rates below 15 %, and then the divorce rate suddenly decreases when the unemployment rate is between 15 and 25 %.

To model the possible heterogeneous effects of unemployment on the divorce rate, we also estimate quantile regressions (Koenker and Bassett 1978). The quantile regression version of the linear model shown in Eq. (1) can be written as

$$DR_{it} = \alpha(\tau) + \beta(\tau)Unemp_{it} + \Pi'(\tau)T_{it} + \phi(\tau)\eta_i + \zeta_{it}. \quad (2)$$

Note that the estimated parameters are τ-dependent in this case, where τ is the corresponding quantile of the divorce rate. Thus, quantile regressions provide a richer characterization of the data, allowing us to consider the impact of the unemployment rate on the entire distribution of *DR* and not merely its conditional

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[18] The local polynomial provides a smoother fit for the divorce rate to a polynomial form of the unemployment rate, via locally-weighted least squares. We used the *lpolyci* command in STATA with the following options: local mean smoothing, a Gaussian kernel function to calculate the locally-weighted polynomial regression, and a bandwidth determined by Silverman's rule-of-thumb.
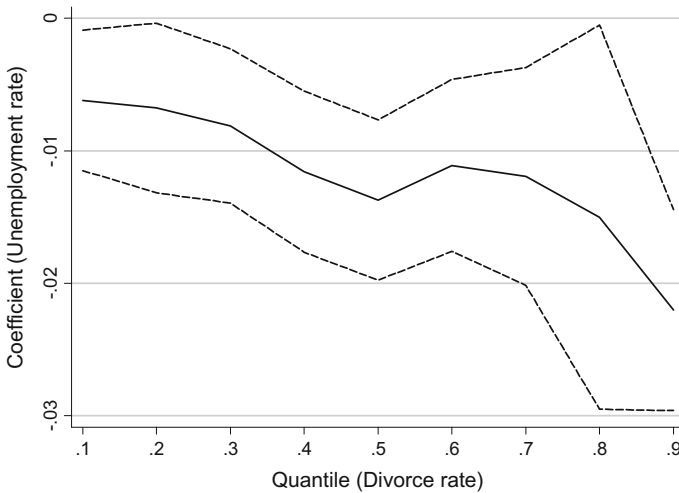
Fig. 2 Quantile regression estimates: Divorce rate versus unemployment. Endogenous variable: Crude divorce rate. Estimates weighted by country population. The model includes the unemployment rate, country fixed effects, year fixed effects, and country-specific linear and quadratic time trends

mean. Quantile regressions take into account unobserved heterogeneity and allow for heteroskedasticity among the disturbances, non-normal errors, and are more robust to outliers than standard OLS regressions.[19]

Figure 2 shows the quantile regression results for the divorce rate model of Eq. 2. The graph displays the estimates of the coefficient and the 95 % confidence intervals for the unemployment rate across the nine quantiles considered (ranges from 0.1 to 0.9). The model includes all of the controls (country fixed effects, country-specific linear and quadratic time trends, and year fixed effects), and our estimates are weighted by country population. As in the previous estimates, we find a significant negative impact of unemployment on divorce in all of the quantiles, although the effect is clearly non-linear: the higher the quantile, the greater the impact of unemployment on divorce rates. In particular, the quantile estimates show that the effect of unemployment is 3.5 times higher (in absolute value) in the top quantile (0.9) than in the bottom quantile (0.1), as the coefficient decreases from −0.006 to −0.022, pointing to a higher effect of unemployment on divorce in those countries with higher divorce rates.

6 Conclusion

The aim of this paper is to provide evidence on the impact of business cycles on divorce rates. From a theoretical point of view, the relationship is not clear. The effects vary depending on the benefits (e.g., the view of marriage as insurance) or costs (e.g., psychological stress) that staying married can generate for a couple who

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[19] Moreover, quantile regressions are invariant to monotonic transformations of the dependent variable, such as logarithms.

has decided to divorce. The effects can also depend on the specific costs of divorce and on the possibilities outside marriage (i.e., remarriage and/or being able to maintain the same standard of living). The empirical evidence for these issues is quite scarce, mainly focused on the United States, and oftentimes exhibit conflicting results.

Our analysis covers 29 European countries from 1991 to 2012. In this framework, as is common in the literature, we examine the relationship between the business cycle and divorce by using the unemployment rate as the main proxy for the evolution of economic conditions. Our findings suggest that divorce rates respond in a pro-cyclical way to variations in the business cycle, since we find empirical evidence of a significant negative association between unemployment rates and divorce rates. This is consistent with most of the recent works using US aggregate data. Our results are quite robust to the introduction of controls, which allow us to capture the impact of unobservable factors, such as country and year fixed effects in addition to country-specific linear and quadratic trends. Also, our results are invariant to controls for other characteristics measured at the country level, such as cultural differences, differences in the generosity of the cash benefits, or even the participation of women in the labor force. Results are also unchanged when we use different sub-samples considering the political, institutional, and economic changes that occurred during the period considered as well as the differences in the divorce law legislation although our results suggest that the role of the business cycle in divorce is less relevant under more restrictive divorce laws. Therefore, it appears that the economic constraints generated by the loss of a job can make resorting to a costly divorce less likely; but, it is also possible that the economic uncertainty generated by recession and high unemployment rates also discourages divorce decisions.

We should note that the magnitude of the effect is quite small, since a one-percentage-point increase in the unemployment rate is associated with 0.025 fewer divorces per thousand inhabitants, representing 1.2 % of the average European divorce rate during the period considered. Although the effects of unemployment on divorce are not expected to be identical between Europe and the US due to all the differences described in this work, the small impact observed in the case of the US (see Schaller 2013) is also detected in our work. In the same line, the timing analysis points to a small negative effect of the contemporaneous unemployment rate on the divorce rate. Results do not vary when we change the definition of the unemployment rate to consider only the male unemployment rate, in order to avoid endogeneity concerns, because male labor-market participation is less likely to change when the marital status varies.

Our findings suggest that severe economic recessions that correspond to higher unemployment rates can dissuade couples from seeking a divorce. But, even if this occurs, the response of divorce to unemployment variations can follow a non-linear pattern. Divorce decisions under the same level of unemployment can be less likely within a country with less accepting attitudes towards divorce, which correspond with low divorce rates and lower social approval of job losses, than in a country that is more accepting of divorce having high divorce rates. Our analysis makes use of non-parametric tools and quantile regressions to re-examine the relationship

between unemployment and divorce rates. Again, the results show a negative relationship between unemployment and divorce rates in European countries. The non-linear pattern indicates that the inverse relationship is more pronounced in those countries with higher divorce rates.

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