Climate and Marriage in the Netherlands, 1871-1937

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Julia A. Jennings, University at Albany, SUNY
Clark L. Gray, University of North Carolina-Chapel Hill

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Abstract

Marriage patterns in pre-industrial Northwest Europe are commonly thought to be driven by social and economic factors, such as neo-local residence norms and the need to save before marriage. Recent studies have emphasized local variation over broad regional similarity in marriage patterns. Unaddressed in this literature is the potential role of environmental factors such as a climate variability, which can place significant constraints on demographic behavior in low-resource settings. Using longitudinal individual-level demographic data from the Historical Sample of the Netherlands (HSN) and climate and economic data from 1871-1937, we examine the effects of climate variability on marriage. Findings of event history models of marriage timing contradict expectations that positive climate conditions are associated with increased marriage. We find that negative climate conditions increase marriage, but that these effects are explained by rye prices. Climate conditions are most important for rural residents, who are closely tied to the agricultural economy and therefore more sensitive to the economic effects of climate variation.

Background

Marriage, economy, and climate

A set of long-standing hypotheses posits that preindustrial Northwest Europe featured a marriage pattern that distinguished it from other populations. Malthus (orig. 1830; 1985) noted the presence of the preventive check of delayed marriage among Europeans and praised their prudential behavior. The European marriage pattern (EMP) was stated more formally by Hajnal (1982). Populations that follow the EMP were characterized by strong norms concerning the establishment of an independent household at the time of marriage (neolocal residence), relatively late average age at first marriage (mid to late 20s) for both men and women, high proportions (up to 10 percent or more) of the population who remain unmarried for their entire lives, and high proportions of nuclear family households. With an extended period of singlehood between adolescence and marriage, many young adults worked as life-cycle servants to accumulate the resources necessary for marriage, a trait sometimes referred to as the economic niche hypothesis (Engelen and Wolf 2005).

The EMP is often cited in work that seeks to explain differences between Northwest Europe and other regions, including the rise of modern economic growth (Voigtlander and Voth 2006). This marriage pattern has become one distinguishing trait identified in hypotheses about the distinctive nature of this region and its early industrialization. However, recent work has questioned whether Northwest Europe could be characterized by a single marriage pattern at all. The components of the EMP identified by Hajnal do not appear to co-vary systematically with each other or with indicators of economic development and there is variety in patterns of marriage and household formation even within the traditional EMP zone (Dennison and Ogilvie 2014). Local institutional, economic, and social contexts contribute to variation in marriage patterns. Other work has questioned the existence of the economic niche hypothesis portion of Hajnal's description of the EMP (Hendrickx 2005; Klep 2005).

Studies using individual-level demographic data and time series of economic indicators find small effects and mixed results concerning the relationship between marriage timing and short-term economic stress in the Eurasian context (Lundh, et al. 2014). Put another way, comparative research indicates that contrary to the predictions of Malthus and Hajnal, marriage is not an effective way to smooth consumption in the short-run. Given the growing rejection of the niche hypothesis and increasing evidence for local variation in marriage and household formation in Northwest Europe, some researchers suggest returning to a model of marriage that focuses on the power of parents and the choices of children (Klep 2005). Thus, a competing model of marriage would rely less upon understanding marriage decisions in terms of the nuptiality valve or preventive check, and more upon analyzing marriage in terms of the availability of mates, feasibility of marriage, and desirability of marriage (Dixon 1971).

To date, no studies have examined the role of climate variability on the timing of marriage in 19th century Europe. Local climate conditions affect living standards, which may, in turn, delay or encourage marriage and contribute to regional variation in marriage patterns. Climate has been liked to economic crises in the past (Zhang et al. 2011), and the most direct links between climate and economic conditions is through agriculture, although there is evidence of economic effect of climate in other economic sectors (Dell et al. 2012; Dell et al. 2014). Grain prices are correlated with climate conditions, although the strength of this relationship weakens as global markets develop (Holopanien et al. 2012). Grain prices, when used as proxies for short-term economic stress, have been shown to affect a variety of demographic outcomes (Allen et al. 2005; Bengtsson et al. 2004; Lundh et al. 2014; Tsuya et al. 2010). Riverine and coastal (storm surge) flooding may disrupt economic activity and decrease agricultural output. With low-lying geography, the Netherlands was vulnerable to both types of flooding (de Kraker 2006; de Moel et al. 2011), but the country also experienced drought over the past 100 years (Beersma and Buishand 2004).

Predictions that draw on Malthusian understandings of the relationship between population and the economy and the tenets of the EMP posit couples delay marriages during times of economic downturn and that the chances of marriage increases during times of economic expansion. This issue is of particular interest given the constraints that increasing climate variability has been shown to place on demographic behavior in contemporary low-resource settings (Grace and Nagle 2013; Mueller et al. 2014), and the belief that these effects were stronger in the past. However, these Malthusian considerations only account for the feasibility of marriage. Using a different theoretical framework of marriage, we might alternately expect that the desirability of marriage may be affected by climate conditions, as climate can influence broader economic conditions, even outside of the agricultural sector (Dell et al. 2012; Dell et al. 2014; Hsiang and Solow 2010; Zivin and Neidell 2014), and thus alter the relative attractiveness of marriage versus participation in wage labor or life-cycle service. To address these issues, we combine historical climate and economic data with a unique dataset capturing the life events of about 37,000 individuals in the Netherlands spanning the period 1865-1937. This will allow the estimation of a discrete-time event history model of marriage as influenced by climatic, social, and economic variables. In the 19th and 20th century Netherlands, demographic outcomes, including mortality (Ekamper et al. 2009, 2010) and migration (Jennings and Gray 2015), respond to climate conditions, so we anticipate a potential marriage response, although given weak and mixed results in other European settings (Lundh et al. 2014), it is difficult to predict the strength or direction of the association.

Setting: Marriage in late 19th and early 20th century Netherlands

The nineteenth century Netherlands experienced a period of economic expansion, driven by agricultural improvement and land reclamation (Van Zanden 1994). The agricultural crisis of 1878-1895 slowed agricultural growth, but later spurred modernization efforts in agriculture including the development of dairy production and export crops (Bieleman 2010). By the mid-late-nineteenth century, industrialization and modern economic growth had begun in the Netherlands, although agriculture remained the largest economic sector throughout the study period (de Vries and van de Woude 1997; Wintle 2000; Van Zanden and Van Riel 2004). With industrialization came an increase in urbanization, and rural labor became less important, especially for women, who were drawn to domestic work in cities (Bras 2003; Kok 1997). These urban women tended to marry later, while rural men also waited to marry, consistent with the desire to save earnings before marriage (Engelen and Kok 2003). Marriage practices in the Netherlands were consistent with the EMP. The proportion never married fluctuated around 9-16 percent for men and 13-16 percent for women (Engelen and Kok 2003). While high, these figures are not uncommon in Northwest Europe at the time (Dennison and Ogilvie 2014). As in much of Europe, average age at marriage was late, but trends in marriage age reflected economic changes. After 1860, the average at marriage, which hovered around 27 for women, and a few years higher for men, began to fall as the standard of living increased (Van Poppel 1992; Van Zanden and Van Riel 2004). The decline in age at marriage tracks with falling unemployment and increasing real wages. There was diversity in marriage age by socioeconomic status, with the children of higher status individuals marrying at younger ages, and these distinctions remained even after marriage age began to decline in the 1860s (Van Poppel and Nelissen 1999). In addition to occupation and social class, religion was an important determinant of marriage age, with Catholics marrying later than Protestants (Engelen and Kok 2003). This trend of declining marriage age for most social groups is consistent with the finding that life courses became more standardized over time in the Netherlands (Bras et al. 2010).

Marriage was highly seasonal, and May was the most population month for weddings (Van Poppel 1995). This pattern reflected hiring practices, as agricultural employers preferred to hire in May, and to a lesser extent, in November. There was a corresponding peak in migration in May, likely related to both hiring practices and marriage customs. However, the seasonal clustering of weddings weakened over time, as the importance of rural employment declined. Marriage appeared to be tied to migration as well, as migration away from municipality of birth was associated with earlier marriage (Engelen and Kok 2003). There is additional evidence of economic determinants of marriage in Netherlands, although it predates the study period. In the 18th Centurythe price of rye and marriage were negatively correlated in two Dutch villages, suggesting that the relative attractiveness of labor, especially as a servant in husbandry, increased during times of high prices (Schellekens 1991).

Data

The Historical Sample of the Netherlands

The Historical Sample of the Netherlands (HSN)[1] combines information from birth, death, and marriage records with census returns and population registers to reconstruct the life history of a sample of individuals. The HSN is a random sample (0.25-0.75%, depending on birth cohort) of all people born in the Netherlands between 1812 and 1922 (Mandemakers 2000, 2002). 78,105 individuals, identified in birth records, are included in the database. To date, 37,137 life courses have been reconstructed from this sample of births. In addition to the timing of vital events, civil records provide information about individuals and their families, including age, occupation, literacy (can sign or not), place of birth, and marital status of individuals, as well as information on their spouse, parents, and witnesses. Thus, the reconstructed life courses include both static (birth date) and dynamic (marital status, occupation, place of residence) information.

Population registers, begun in the Netherlands in 1850, are continuous records of households (and by the 1930s, individuals) and are a rich source of data on individuals and their households. Continuous updating of population registers allows for more precise dating of events, such as entry and exit from a household, which improves data analysis, including the estimation of event-history models, which must be interval-censored in the case of other sources of household-level information, such as linked decennial censuses. Continuous population registers also provide more information about the changing nature of household composition, making it possible to know whether an individual exited the household because of death, marriage, or migration, while with other record types, these distinctions can be inferred in only some cases. The population registers and civil records included in the HSN provide time-varying information on covariates relevant to the study of marriage including occupation, religious affiliation, household composition, and family characteristics. To construct the person-year

[1]Historical Sample of the Netherlands (HSN) Data Set Life Courses Release 2010.01.

dataset, time-varying information from population registers is combined with marriage records to capture the timing of marriage, as well as changing individual- and household-level variables.

Climate Data

In order to situate marriage decisions in their environmental and economic contexts, time-varying data on temperature, precipitation, flooding, grain prices, and economic activity were derived from several sources. During the study period, monthly station data on precipitation from four locations (De Bilt, Den Helder, Groningen, and Hoofddorp) are available from the Royal Netherlands Meteorological Institute (KNMI 2013). We aggregate these location-specific measures into total annual rainfall (dL/year). The same source also provides daily temperature data from five locations (De Bilt/Utrecht[2], Den Helder, Groningen, Maastricht, and Vlissingen). These temperature values are adjusted for hour of measurement using the method developed by Ekamper et al. (2009, 2010). We aggregate these adjusted, location-specific values to produce mean annual temperature (°C). Individuals were assigned temperature and precipitation values from the closest weather station to their municipality of residence.[3] Once linked with the person-year data from the HSN, a subsample of 262,793 person-years remains. Figure 1 displays the time series of precipitation, temperature, and marriage.

A subsample of our population is at risk of riverine or ocean flooding. To measure exposure to riverine flooding, we extracted daily data on water levels from river stations that covered at least part of the study period, collected by the Dutch Ministry of Infrastructure and the Environment (Rijkswaterstaat 2013). We aggregated this data to the annual scale by calculating the maximum water level in each year (m above Amsterdam baseline). This measure captures both flooding and persistent low flows due to upstream drought. Individuals were linked to stations located in the same municipality of residence, excluding stations with less that 10 years of water level data or linked to less than 50 person-years of marriage data. The remaining 47 stations used in the analysis creates a subsample of 13,966 person-years for which riverine flooding is observed for at least a 3-year period. To measure exposure to coastal flooding for the sample, we generate an indicator variable for residence in a province affected by coastal flooding during a 1906 storm surge and a 1916 Zuiderzee flood (Delta Works Online Foundation 2014; de

[2] The station was located in Utrecht until 1897, after which it was moved to nearby De Bilt.

[3] The mean distance from municipality of residence to rainfall station was 48 km. The mean distance to temperature station was 44 km. The main results are robust to the exclusion of municipalities more than 50 km from either type of station.

Kraker 2006). We also extract annual data over the study period at the national scale on the price of rye and the size of the agricultural economy to test whether climate effects are mediated by agriculture (Smits et al. 2000).

Analysis

Person-year Dataset

We leverage the longitudinal nature of the HSN dataset to create a person-year file for all individuals, including those who never marry, to investigate the influence of climate variation on marriage. The dataset includes time-varying and time-constant variables at the individual, household, municipality, and national levels (Table 1). To avoid endogeneity with the marriage decision, non-climate predictors are lagged by one year. Following preliminary analyses described below, climate variables were averaged over a three-year period (t to t-2) to allow the potential for various time lags. This practice is consistent with previous studies of the association between climate variables and demographic behavior (Gray and Mueller 2012). Individuals age 15 to 39 are considered to be at risk for marriage. Individuals who are no longer at risk of marriage, such as those who have aged out, died, are lost to follow-up, or have moved to a different system of registration,[4] are right-censored. The years 1865-1870 are dropped from the model because fewer than 10 marriages occurred each year. After exclusions for age and number of cases, 24,351 individuals (248,773 person-years of observation; 13,510 person-years for riverine flooding models) comprise the analytical dataset.

Marriage events are taken from marriage certificates. The analysis includes both first marriages and remarriages. The timing of marriage is determined by the date listed in the marriage certificate. While it is possible to infer marriages from updates to the population register, marriage certificates are preferred because they provide more precise timing of the event. Individuals re-enter the risk set for marriage after the death of a spouse or divorce. 13,101 marriages are included in the dataset. Approximately 15% of the sample does not marry by age 39. Mean age at marriage is 26 for males and 24 for females in this sample.

Statistical Models

The data are analyzed using a series of multivariate discrete-time event history models. This model is appropriate to examine the likelihood of an event, in this case marriage, when time

[4]When individuals are transferred to a system of registration that does not include the information necessary for the construction of household variables, such as personal rather than household cards, they are right-censored.

is measured in discrete units, in this case years (Allison 1984). The odds ratios can be interpreted as the multiplicative effects of a one-unit increase in the predictor variable on the odds of marriage relative to no marriage. To account for the approximate scale of the measurement of the environmental variables, models including precipitation, temperature, and coastal flooding are corrected for clustering at the province scale, whereas models including riverine flooding are clustered at the municipality scale (Huber 1981). To account for time-invariant spatial variation (such as in baseline climate), all models include province-level fixed effects, i.e., an indicator variable for each province. All models also include a nonlinear (quadratic) time trend to account for gradual changes in the national context over time. We extend this model by testing alternative specifications of the climate variables and estimating separate models for sociodemographic groups of interest.

Models for timing of second and higher order births are also estimated using a similar modeling strategy. There were no significant effects of climate on fertility (appendix in preparation). First births were excluded because of correlation with the timing of first marriage.

Results

Results are presented in Tables 2-4. The risk of marriage decreases with the 3-year average temperature (Model 1), but not rainfall or coastal flooding, suggesting that people choose not to marry during warm, productive years. Marriage also increases with riverine, but not coastal, flooding, indicating again that negative conditions are associated with higher chances of marriage. Alternate climate specifications (Table 3) show that temperature remains a significant predictor of marriage without controlling for coastal flooding (Model 3). The association between marriage and temperature is robust to a non-linear (quartile) specification (Model 4). Models with multiple lags demonstrate that the effects of temperature and rainfall on marriage extend beyond a single year, lending support to the use of a 3-year lag in the main model. The effect of temperature on marriage is no longer significant after controlling for the price of rye, the most important staple grain (Model 6). This suggests that the effects of climate are explained by accompanying changes in agricultural prices.

Among sub-populations, temperature has a significant effect on the marriage of men, but not women (Models 7-8, Table 4). This may be related to the declining importance of women's work in rural areas. Temperature is also associated with the marriage timing of older individuals (Models 9-10) and rural, but not urban dwellers (Models 14-15). Finally, the association between climate and marriage is stronger in the later period (1901-1937) than in the earlier period (1871-1900) (Models 17-18), suggesting that the link between climate variation and marriage does not decline over time as the Netherlands modernized and urbanized.

The results for control variables (Table 2) make sense in the context of the 19th century Netherlands. Individuals in their late 20s are most likely to marry, as are urban dwellers. Residents of female-headed households are more likely to marry than those of male-headed households are, perhaps because most female-headed households in this population formed after the death of the male head, which left behind a widowed head of household. Catholics are less likely to marry than Protestants, reflecting the later average age at marriage among Catholics. Professionals are less likely to marry than blue-collar workers, perhaps the result of delaying marriage for educational or career reasons.

Discussion

Negative climate conditions, in this case low temperature and riverine flooding, increase the risk of marriage in the late 19th and early 20th century Netherlands. However, these climate effects are no longer significant after controlling for the price of rye. Thus, the effects of climate are explained by the corresponding change in agricultural prices. These findings do not provide strong support for expectations drawn from hypotheses concerning the EMP or Malthusian preventive checks, which predict that marriage should increase with favorable economic conditions. However, recent work on marriage responses to economic conditions find weak or mixed support, so these results are consistent with patterns observed in other areas of Eurasia (Lundh et al. 2014). Perhaps climate variation is one among many factors that drive local variation in marriage patterns within the EMP zone.

Instead, interpretations of these results drawn from a theoretical framework of marriage that focuses on the availability of mates, feasibility of marriage, and desirability of marriage (Dixon 1971) may provide better insight on the association between marriage timing and climate variation. In particular, the desirability of marriage relative to remaining in the labor force or in life-cycle service might be affected by climate factors. During times of favorable climate conditions, individuals may choose to focus on employment activities, especially in the agricultural sector, while during poor years, reduced labor demands may free up time to marry. Indeed, marriage in the Netherlands was highly seasonal, reflecting both hiring practices and social expectations (Van Poppel 1995). Results of models estimated for sub-populations support this interpretation. Climate variables are stronger predictors of marriage among men, who are more likely to work in agriculture than women in this period, and rural dwellers, who are more closely tied to the agricultural economy.

Future Directions

Future modeling efforts will investigate whether the effect of rye price varies by place of residence, as rural producers benefit from high grain prices, while high prices may place downward pressure on the living standards of urban consumers. In addition, there is a likely tie between marriage behavior and migration behavior. The distance between the birthplaces of spouses increases during this period (Ekamper, van Poppel, and Mandemakers 2011). A study of migration responses to climate variation using the HSN data shows that migration, especially long-distance international migration, decreases with unfavorable climate conditions (Jennings and Gray 2015). With fewer people leaving the country during times of negative climate conditions, we are more likely to observe marriages. New models will disaggregate marriages associated with a move or not.

Figures and Tables

Table 1. Descriptive statistics for the person-year dataset.

Variable	Unit	Level	Time-varying	Mean	SD	Min	Max	Notes
Outcome								
Marriage	0/1	Indiv	Yes	0.05	0.22	0	1	Transition from unmarried in year *t* to married in year *t+1*
Climate variables								
Temperature	C°	Station	Yes	9.2	0.5	7.6	10.9	Mean daily temperature over previous 3 years
Rainfall	dm	Station	Yes	7.6	0.7	5.4	9.3	Mean annual rainfall over previous 3 years
Coastal flooding	0/1	Province	Yes	0.06	0.23	0.0	1.0	Presence of coastal flooding in previous 3 years
Riverine flooding	m	Muni	Yes	13.8	14.0	0.6	52.6	Maximum flood height over previous 3 years
Control variables								
Female	0/1	Indiv	No	0.47	0.50	0	1	Reference is male
Age 20-24	0/1	Indiv	Yes	0.29	0.46	0	1	Reference is age 15-19
Age 25-29	0/1	Indiv	Yes	0.15	0.36	0	1	Reference is age 15-19
Age 30-34	0/1	Indiv	Yes	0.08	0.28	0	1	Reference is age 15-19
Age 35-39	0/1	Indiv	Yes	0.06	0.23	0	1	Reference is age 15-19
Child of head	0/1	Indiv	Yes	0.73	0.45	0	1	Reference is household head or spouse
Other relation	0/1	Indiv	Yes	0.06	0.24	0	1	Reference is household head or spouse
Place of birth	0/1	Indiv	Yes	0.69	0.46	0	1	Resident in municipality of birth
Catholic	0/1	Indiv	Yes	0.35	0.48	0	1	Reference is Protestant
Other religion	0/1	Indiv	Yes	0.06	0.24	0	1	Reference is Protestant
Female head	0/1	HH	Yes	0.15	0.36	0	1	Reference is male head
Age of head	years	HH	Yes	50.5	12.7	1	100	
Adult males	#	HH	Yes	2.43	1.52	0	21	Males age 15+ in household
Adult females	#	HH	Yes	2.33	1.40	0	21	Females ages 15+ in household
Minors	#	HH	Yes	1.37	1.81	0	12	Males and females ages 0-14 in household
Professional	0/1	HH	Yes	0.06	0.23	0	1	Occupation of head, reference is blue collar
White collar	0/1	HH	Yes	0.17	0.37	0	1	Occupation of head, reference is blue collar
Farm	0/1	HH	Yes	0.20	0.40	0	1	Occupation of head, reference is blue collar
Urban	0/1	Muni	Yes	0.38	0.48	0	1	Reference is rural
Rye price	fl./hl	Nation	Yes	8.7	4.0	4.8	26.4	Mean December price of rye over previous 3 years
Agricultural GDP	100 mill. fl.	Nation	Yes	4.1	1.0	2.8	6.3	Mean agricultural GDP over previous 3 years
Year	NA	Nation	Yes	1911	16	1871	1938	

N = 248,773 person-years (13,510 for riverine flooding)
1/0 indicates a dichotomous variable; # indicates a count variable.
Indiv = Individual, HH = Household, Muni=Municipality, Nation=National
Control variables also include indicators for the province of residence and for missing values of the predictors, not shown.

Table 2. Results from the event history model of marriage (odds ratios and significance tests).

Predictor	Marriage			
	Model 1		**Model 2**	
Temperature	0.93	**	-	
Rainfall	1.01		-	
Coastal flooding	0.96		-	
Riverine flooding	-		1.11	*
Female	1.22	***	1.37	***
Age 20-24	8.11	***	8.38	***
Age 25-29	11.29	***	13.86	***
Age 30-34	5.92	***	5.99	***
Age 35-39	3.10	***	4.48	***
Child of head	1.27	***	1.68	*
Other relation	1.79	***	1.88	*
Place of birth	1.00		0.95	
Catholic	0.84	***	0.80	*
Other religion	0.89	+	0.83	
Female head	1.27	***	1.07	
Age of head	0.97	***	0.99	
(Age of head)^2	1.00	***	1.00	
Adult males	1.01		1.00	
Adult females	0.95	***	0.91	***
Minors	0.91	***	0.92	**
Professional	0.70	***	0.66	*
White collar	1.02		0.75	*
Farm	0.93		0.89	
Urban	1.19	***	0.46	***
Year	2.16	*	7.02	**
(Year)^2	1.00	*	1.00	**
Joint test	**15.1**	**	**3.9**	*
Person-years	248,773		13,510	

Province and missing indicators included but not shown. The joint test is a Wald test of the climate variables.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3. Results from the event history model with alternative climate specifications (odds ratios and significance tests).

Model	Predictor	Marriage	
3	Temperature	0.94	**
	Rainfall	1.01	
	Joint test	**11.5**	**
4	Temperature, second quartile	0.97	
	Temperature, third quartile	0.93	*
	Temperature, fourth quartile	0.93	***
	Rainfall, second quartile	0.98	
	Rainfall, third quartile	1.02	
	Rainfall, fourth quartile	0.99	
	Joint test	**30.9**	***
5	Temperature, t	1.00	
	Temperature, t-1	0.98	
	Temperature, t-2	0.95	***
	Temperature, t-3	1.01	
	Temperature, t-4	0.98	
	Rainfall, t	1.01	
	Rainfall, t-1	1.00	
	Rainfall, t-2	1.01	
	Rainfall, t-3	1.01	
	Rainfall, t-4	1.02	*
	Joint test	**7816.5**	***
6	Temperature	0.99	
	Rainfall	1.02	
	Rye price	1.02	***
	Agricultural GDP	0.98	
	Joint test	**130.2**	***

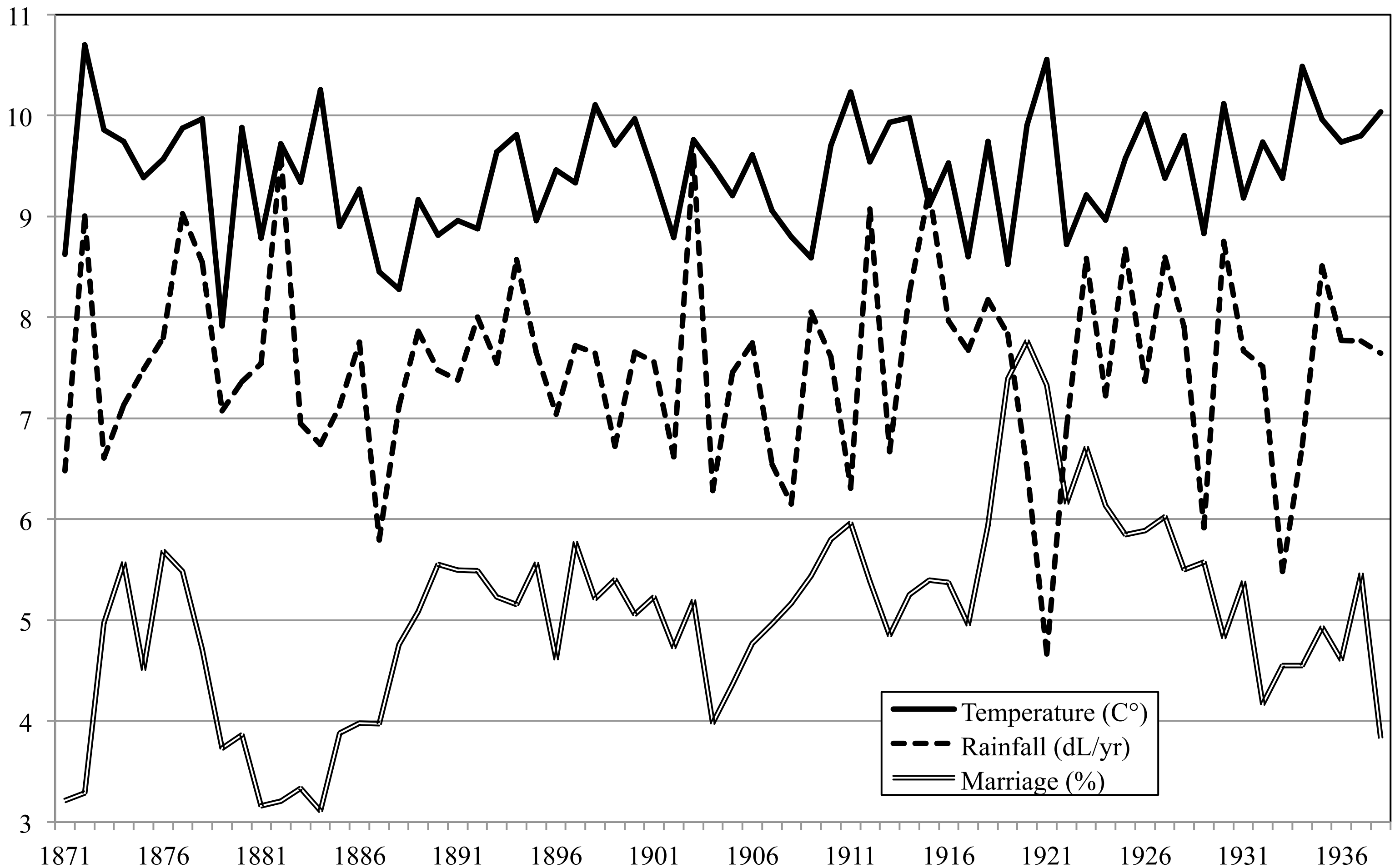
Models also include control variables, provincial indicators and missing indicators, not shown.
The joint test is a Wald test of the climate variables.
In quartile specifications, the first quartile is the reference category.
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4. Results from the event history model for various subpopulations (odds ratios and significance tests).

Model	Subpopulation	Temperature		Rainfall	Joint test	
7	Women	0.95		1.01	**5.5**	+
8	Men	0.92	*	1.01	**6.6**	*
9	Age <25	0.98		1.00	**0.3**	
10	Age ≥ 25	0.88	***	1.02	**15.6**	***
11	Blue collar	0.94	*	1.00	**5.2**	+
12	Other occupations	0.94	*	1.02	**6.4**	*
13	Urban	0.92	*	1.01	**7.0**	*
14	Rural	0.95	**	1.01	**11.0**	**
15	Western region	0.95	*	1.02	**109.3**	***
16	Other regions	0.92	**	0.98	**18.5**	***
17	Years 1871-1900	1.01		1.05	**0.9**	
18	Years 1901-1937	0.90	***	0.99	**11.3**	**

Models also include control variables, provincial indicators and missing indicators, not shown.
The joint test is a Wald test of the climate variables.
In quartile specifications, the first quartile is the reference category.
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 1. Marriage, temperature and rainfall in the Netherlands, 1871-1938.



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