

The Effects of War on Marriage Rates

Mathias Frenz

A Senior Thesis submitted in partial fulfillment
of the requirements for graduation
in the Honors Program
Liberty University
Spring 2023

Acceptance of Senior Honors Thesis

This Senior Honors Thesis is accepted in partial fulfillment of the requirements for graduation from the Honors Program of Liberty University.

Timothy Van Voorhis, Ph.D.
Thesis Chair

Daniel Joseph, Ph.D.
Committee Member

David Schweitzer, Ph.D.
Assistant Honors Director

Date

Abstract

The effect of war on marriage rates is proposed as a topic of interest. A model is chosen and the justification for that model is given. An analysis of the data for the US and the UK is given. Qualitative and quantitative comparisons are then made between the two countries. This is followed by a conclusion and suggestions for further study.

The Effects of War on Marriage Rates

War has many detrimental effects on a country. Of course, a war involves much more than just military involvement. That it does damage to the economic and social stability of a country is undoubted. It is suggested that marriage is one of those societal activities that war affects to a large degree. The larger the war the greater the impact is expected to be, as a greater proportion of the population will be involved in or affected by the war. Of particular interest is how the marriage rates in the United States and the United Kingdom were affected by the various wars fought by these two countries. These two countries are examined to determine if the marriage rates in each were affected by war, and, if that effect is different to ask the question as to why that might be the case. The primary purpose of this endeavor is to find if war has a significant impact on the marriage rates of said countries; if the effect is determined to be statistically significant, why that would be the case will be posited. The question of why, however, lies outside the scope of a statistical model as it is most likely related to the societal, economic, and religious nature of the people of the country of interest. Two approaches will be taken to compare the effects that war has on the two countries. First the models themselves will be compared. This would include comparing p -values and R^2 values. The second point of comparison will be comparing the effects of the individual wars fought by both countries. To better examine how war affects marriage rates the wars used in the final analysis will be chosen based on Akaike Information Criteria (AIC). The data for both the US and the UK is only considered starting with the year 1870, as this is when data for each of the involved countries becomes available. The source of the data comes primarily from the official government

statistics of both countries. Some gap data was filled with data from the UN, as well as independent researchers.

Justification for the Model Chosen

When deciding upon the best model to use, several considerations were made. First several different types of models were researched to see which would fit the best. One of the models that was considered was the negative binomial, but that was ultimately not chosen because it deals more with data where “overdispersion in an otherwise Poisson model is thought to take the form of a gamma shape or distribution” (Hilbe, 2011, p. 2). There was no reason to assume an underlying Poisson distribution in the first place. Another form of regression that was considered was quantile regression. This form of regression seems to be used for large data samples in which multiple observations are taken at each point (Koenker, 2005). In the current study, there is only one marriage rate associated with each country at each measurement point. To use quantile regression then, would require many more countries to give enough of a data spread to make quantile regression meaningful. This would be useful only if there were multiple wars that multiple countries fought. The number of wars for which this is true is minimal. A linear model ultimately fits with the data and purpose the best. There is a response variable (marriage rates) and several indicator variables whose significance is to be tested. Predicting future values of the response variable is not generally within the scope of a regression model. Rather it is a test to see whether the indicator variables are related to the response variable. This would fall under the category of a retrospective study. As such there are several potential concerns as mentioned by Montgomery et. al. (2021):

- Missing relevant data

- Quality of data
- Wrong kind of data
- Misuse of data by analyst
- Insufficient notes accompanying the data

These concerns can all be answered sufficiently to continue with the current enterprise. As will be seen, the amount of missing data is insignificant and turns out to not be a problem. The quality of the data is not a concern as, for the most part, it comes from official government censuses that are regarded as reasonably reliable. The other data is of historical note and easily verifiable from a historical consensus. The data fits exactly with the purposes of this enterprise, and no qualms exist for using it in such a way. The notes accompanying the data included everything that they were expected to include, and there was no reason to anticipate a recording of unusual phenomena associated with the data. Linear regression allows for more flexible model building than other regression methods and fits with the type of data collected better. For these reasons a linear model was ultimately chosen.

To build this model the statistical programming language R is used. This language was designed with statistical analysis in mind; as such it fits very well with the purposes of the current enterprise. RStudio was used as a GUI. Essentially, RStudio is a skin applied to the basic R to make it easier to use and nicer to look at. As a statistical programming language, R has a built in linear model building function. This linear model building function was used to conduct the analysis. Marriage rate was used as the response variable. Time was used as a continuous variable, while each war was an indicator variable of two levels. One level for the beginning and end of the war and another for the duration. For the US, Roe v Wade was used as an additional

indicator variable. Roe v Wade was a significant cultural event that had a significant impact on how marriage was treated by the culture at large. Combined with the already existent ruling by the Supreme Court legalizing contraceptives, there is good reason to believe the impact to be significant. R's graphing capabilities were also used to allow for some visual analysis, as well as conducting residual analysis. This graphing capability allows for an intuitive analysis of the data which, for the most part, turns out to fit the analysis fairly well.

US Analysis

The data for the United States was particularly difficult to find. The data that was eventually used was a collection of data from the CDC's National Center for Health Statistics (NCHS). The population numbers were crosschecked with data from Gapminder and population estimates from the UN. This crosschecking was only necessary because the data from the NCHS was compiled by another party not related to the CDC. The data was consistent with both the Gapminder project and the UN population estimates. However, this led to the data being rather inflexible since the data was for the US rather than for each individual state. This turned out to be unfortunate, since if this wasn't the case quantile regression on the US would have become feasible thus providing further insights. Another curiosity of the data was that there were three two-year gaps within the data: 1982-1983, 1995-1996, and 2013-2014. An explanation for these gaps was not provided. Based on Allison's (2002) work, this is ignorable and of little consequence to the final result. Ultimately, the data gathered was sufficient for the purpose intended.

Notes on the Marriage Rates

The data ranges from the years 1872-2019. In 1872 the marriage rate was 9.00 per thousand people per year. The average marriage rate for the entire dataset is 9.53. The maximum rate is 16.2, occurring in 1946; the second highest rate is 13.8 occurring in 1947. The minimum rate is 6.1, occurring in 2019. The average during WWII was 11.86, though this didn't include the years after the war ended.

Wars Chosen

Originally it was intended to separate the official wars and conflicts, conflicts being undeclared wars for all practical purposes. Upon examination of the subject, it was found that no country has officially declared war since World War II (Prakash, 2008). Clearly, there have been many culturally significant wars since then. Both the Vietnam and the Korean wars had significant cultural impact. For this reason, "declared wars" was deemed an unnecessary and unhelpful distinction. Based on this, a list of conflicts and wars was made from which the model would select the most significant. After using an Akaike Information Criteria (AIC) method of selection three wars were selected: Afghanistan, WWII, and the Vietnam War. In addition to wars, it should be noted that time, the Great Depression, and the time where Roe v Wade was law were additional regressors, all three of which were considered significant and so included in the final model. They were included to minimize the chance of wars being included for being significant when it was one of the other effects influencing the marriage rates. At this point some background on the AIC-selected wars will be given in chronological order.

World War II (1941-1945)

The first war selected chronologically is WWII. The US was involved in a two front war, in the Pacific against the Japanese Empire, and in Europe against the Third Reich. In this war the US mobilized over sixteen-million troops (Axelrod, 2007).

The Vietnam War (1955-1975)

The second war selected chronologically is the Vietnam War. At its highest point, the number of American troops deployed was 536,000 (Axelrod, 2007). There was some drafting involved in this war but not nearly as much as in WWII. This was a time of significant cultural upheaval in the US. The war led to a great deal of civil unrest and anti-war protests. The National Guard was sent to restore order at Kent State University leading to what is known as the “Kent State Massacre”; this in turn led to a crisis as described by Axelrod (2007):

The “Kent State Massacre” proved to be a watershed event in the anti-war movement.

The shootings touched off the largest strike in American history, as more than 100 college campuses closed for the remainder of the school week after the incident. An estimated 5 million American students joined the strike. By mid-May some 500 colleges and universities had closed, and by the end of the month, more than 900 had shut their doors. (pg. 43)

This description is consistent with significant cultural upheaval. The effects of the Vietnam war are clearly of cultural significance, and so it is understandable it was significant.

The Afghanistan War (2001-2021)

The last war selected was the Afghanistan war. This war was sparked by the attack on the World Trade Center by terrorists on 9/11/2001. The US then invaded Afghanistan as the leader of the terrorist group that made the attack was living there. Though the government of

Afghanistan was overthrown and one friendly to the West was installed in 2005, the war in Afghanistan continued to some extent until recently. While the number of Americans directly involved may have been less than previous wars, it was still a significant cultural moment.

Significance

Using the model with each of these three wars, the Great Depression, time, and Roe as regressors the adjusted R^2 was 0.5302. Considering that the subject is dependent on human behavior, this is a not an unexpected adjusted R^2 result. Human behavior tends to have a higher variability than natural phenomena and other things that are commonly measured. It was not expected that the marriage rate would be perfectly predicted by war. Of the variables, the duration of WWII and the start/end of the Vietnam war were the least significant, while the duration of the Afghanistan war and the time variable were the most significant.

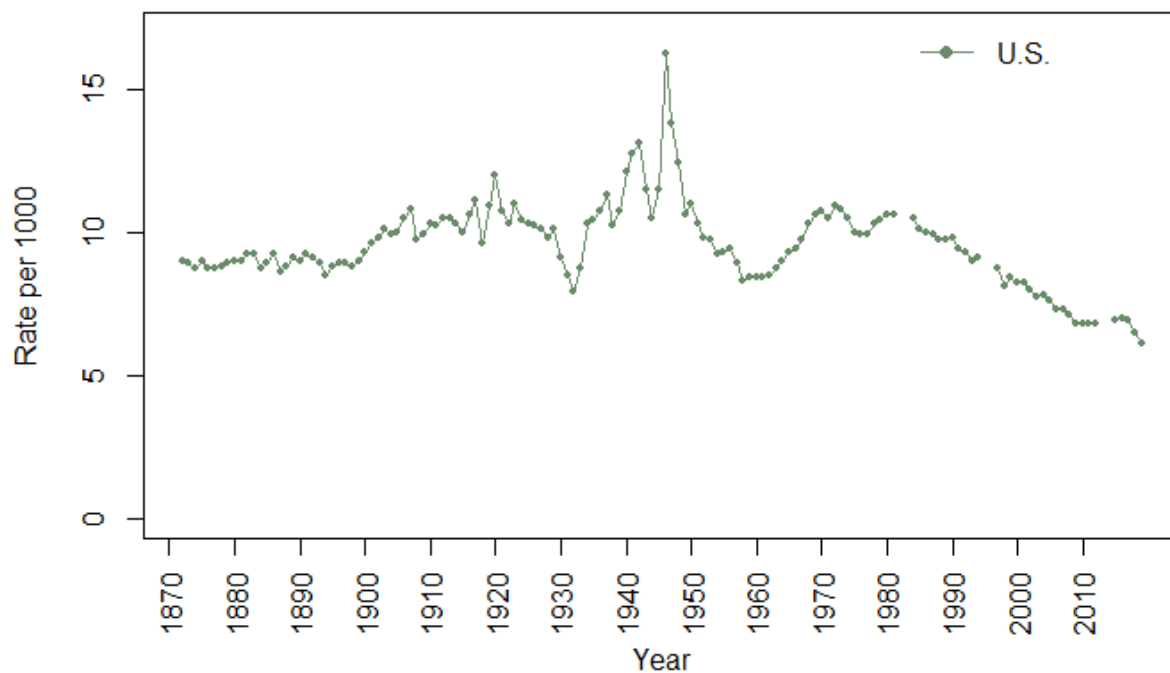
p - values

Time, Roe, the duration of the Vietnam War, and the start/end and duration of the Afghanistan War were very statistically significant with p -values less than 4×10^{-5} . The WWII p -values were 0.07 for the duration and 0.04 for the start/end. This may be rather surprising considering how the graph looks in Figure 1. One reason that could explain its lack of significance, and for that matter WWI not being included at all, is that at that point in time the marriage rate was already very volatile and does not follow a consistent pattern. The rate jumps at the beginning and end of American involvement in the war while being relatively normal in the interim. The most likely reason for the elimination of WWI is that the increase at the beginning and end of the war was much smaller, making it of insufficient significance to be included in the US model. The start/end of the Vietnam war was very insignificant with a p -

value of 0.40. This is not surprising since the curve is relatively flat throughout the war. The last variable, the Great Depression, is more significant than WWII with a p -value of 0.0016. The last piece of information of note is that the intercept is extremely significant with the minimum p -value that can be generated by R.

Figure 1

Marriage Rate vs Year in the US



Coefficients

The Great Depression has a negative coefficient of about -1.5. The coefficient for the start/end of WWII is 1.5, and the duration has a coefficient of 1.1. The Vietnam War has a coefficient of -1.4 for the duration and -0.6 for the start/end. Afghanistan is unique in that the values for both the duration and the start/end are almost the same coming to -3.2. The Roe v Wade coefficient is -1.7. The Time coefficient is slightly positive at 0.02. It should be noted here

that the intercept is estimated at approximately 9. The exact values for all these numbers can be referenced in Table 1 in the Appendix.

An Aggregate Model

It was of interest to see how the model would react if the chosen wars were considered in aggregate. To this end, a single war variable was created that was “on” while any of the four wars was “on”, and the analysis was done with this variable, time, and Roe as the only other regressors. This model had an adjusted R^2 of 0.3311. This is much lower than the previous model, leading to the conclusion that each war has a different effect and considering them all as the same makes for a worse model. On an intuitive level this makes sense; there is much reason to believe that the effect that WWII had on the US would be much different from the effect that something like US involvement in either of the other two wars would have. In fact, Afghanistan, Vietnam, the Great Depression, and Roe all have negative coefficients. When considering them in aggregate the negative effect of some wars and the positive effect of the others will impact the ability of the variable to predict the effect. It would seem leaving the wars as separate regressors allows for a better model.

UK Analysis

The data for the United Kingdom was much easier to find than that for the US. The data for the UK was taken directly from the Office for National Statistics in the United Kingdom. Because the data came from the Office for National Statistics, it was possible to separate the data according to country within the UK. This would include Scotland, England, Wales, and Northern Ireland; however, Northern Ireland was excluded because the recorded population dropped from over four million to one-and-a-quarter million from 1910-1911 for no apparent reason, without a

proportional change in the number of marriages that occurred. Among other things this meant that its marriage rate went from being much smaller than the others to being comparable. Since this drop was drastic, and there was no justification, and the number of marriages did not change, it was deemed erroneous and excluded. The remaining countries considered are considered in aggregate, just as the individual states in the US were considered in aggregate.

Notes on the Marriage Rates

In 1872, the beginning of the data available, the marriage rate is 8.56 per thousand people per year. The average marriage rate for the entire data set (1879-2014) is 7.43, the ending marriage rate being 4.4. The average rate during WWII is 9.75, and the average rate during WWI is 8.32. The maximum rate is 11.72, occurring in 1942. The minimum, 4.3, occurs in 2009.

Wars Chosen

Since there is much less familiarity with the wars in the UK and which are culturally significant, and because they fought many more wars than the US did, both the starting and ending lists were much longer. The same process was used as was used for the US analysis. A list of candidate wars was taken from the timeline given by the Imperial War Museum, an English museum system funded by the British government. AIC was again used and a list of twelve wars was obtained: the war in Afghanistan, WWII, WWI, Kosovo, the Jewish Insurgency, the Spanish Civil War, Vietnam, Gulf, Bosnian, the Russian Civil War, the Anglo-Zulu war, and the Korean War. Just as in the US model, time was considered as an additional factor but no corollary to Roe was included. At this point some background will be given to the British involvement in these wars.

Anglo-Zulu War (1879)

The first war on this list is the Anglo-Zulu War. This war was significant in that it saw a military disaster for the British at the battle of Isandlwana, as well as the much reported stand at Rorke's Drift (Smith, 2014). This war lasted only for about six months, and was a British victory in the end.

WWI (1914-1918)

The population in the UK dropped by close to two and a half million from the start of the war to the end (Office for National Statistics [UK], 2015). The casualties were high. This war was a war of attrition, material, and endurance (Watson, 2008). It had a devastating impact on the culture: the suffering and loss caused by the war caused widespread disillusionment and a rejection of the idea that civilization would inevitably advance (MacMillan, 2013).

Russian Civil War (1918-1922)

The significance of the Russian Civil War is perhaps a surprising addition to the list. The Russian Civil War took place from the end of WWI until 1922. With the overthrow of the Tsar, and the ensuing treaty between the Bolsheviks under Lenin and the Central Powers, the Germans were able to transfer large numbers of troops to the Western Front (Wright, 2017). This almost had the effect of changing the outcome of the war. In response to this, the British landed Royal Marines in Russia to assist the Whites. They were ultimately unsuccessful and ended up withdrawing.

The Spanish Civil War (1936-1939)

The next war is the Spanish Civil War. Despite Britain being neutral, there was certainly British involvement in the Spanish civil war. The British government in Gibraltar favored the nationalist party over the republican, communist party (Ponce, 2016). Essentially, the British

authorities in Gibraltar framed the conflict so that Spain, as a neutral country, could not receive military aid, but with loopholes that the nationalists could take advantage of. As a result of British policy, the nationalists won the civil war, as the British had intended (Ponce, 2016). However, the Nationalist party did not have most of the public support in the war. At least one MP resigned because Britain did not act on the side of the republicans (Deacon, 2008). Also of note is that the news in both the US and the UK leaned in favor of the republicans. This war was very heavily reported and was very much “big news”.

WWII (1939-1945)

The next war in the model is WWII. After declaring war in 1939, the UK was in an exhausting war with Germany that lasted until 1945. During the second World War, extensive rationing was introduced in England. In addition, there were many air raids conducted against cities in England. During this war the UK was under extreme duress.

The Jewish Insurgency (1944-1948)

The next war on the docket is the Jewish Insurgency in Palestine. The British had ruled Palestine from after WWI to this insurgency. Their time there was not peaceful. An Arab revolt took place there from the years 1936-1939 (Imperial War Museums, 2022). After WWII they faced a similar problem with the Jews. In the wake of WWII the dismantlement of the empire that began in WWI accelerated; in this context the main goal of the British commissioner in Palestine was for Britain to withdraw from Palestine with minimal cost and with honor intact (Golani, 2013). Not many British troops were actually involved in this struggle, Britain’s role was mainly political.

The Korean War (1950-1953)

After the Jewish insurgency, the next significant war in chronology is the Korean War. The Korean War, though small, caused several small social crises in early 1950s Britain, though the war had passed out of public discourse by the time it had ended (Huxford, 2018). Unlike the Jewish Insurgency, this war involved several international powers; both the US and communist China became involved. There were worries that this war might precipitate another mass mobilization or a nuclear war. However, these feelings soon passed, and the war fell into relative obscurity. While there was some conscription for this war, it was not nearly to the extent of the World Wars.

The Vietnam War (1955-1975)

After the Korean War, the next significant conflict was the Vietnam War. Like several of the previous wars in this list, Britain's main role was political. The British tried to use their "special relationship" with the US to try to influence the US to end the war through negotiation (Tarling, 2017). Of course, the British were unable to bring a peaceful resolution that both parties could agree with. Britain had no military presence in Vietnam making the effect this war had on them purely a cultural one.

The Gulf War (1990 - 1991)

After the Vietnam war came the Gulf War. The Gulf war was sparked when Iraq invaded Kuwait; the UN forces, including over fifty thousand from the UK, responded quickly (Imperial War Museums, 2022). The UK was not a particularly major player in this war as the coalition was led by the US, however the war was of political and cultural significance.

The Bosnian War (1992-1995)

The Bosnian war only involved the UK insofar as it involved NATO. The UK only deployed 2400 troops in this war (Imperial War Museums, 2022). Despite the UK's limited involvement, the results of the war were considered disastrous. The number of civilians displaced, and the lack of desired results led to this perception.

The Kosovo War (1998-1999)

After the Bosnian war the next significant war is the Kosovo war. Kosovo was yet another NATO intervention. One of the motivations for British involvement in this war was that they wanted to avoid something like that which happened in the Bosnian war, after which he was criticized for not acting decisively enough (Daddow, 2009). This war was not significant for the number of troops deployed, but rather because of the political implications. Many of the modern wars happened in a world that the citizenry of first world countries considered to be settled, and safe.

The Afghanistan War (2001-2014)

The next war, and the last included in the model, is the war in Afghanistan. For the UK, the war in in Afghanistan was the most costly, in terms of lives and money, since the Korean War (Ledwidge, 2013). The war in Afghanistan was part of the larger war on terror. As in the other modern wars, the UK was not in Afghanistan alone. The US and other NATO countries were also involved. Several of the wars listed may seem to be of little significance, but most had significant cultural or political impact even if they were not large-scale military operations.

Significance

The adjusted R^2 for the model was 0.8173. This is somewhat higher than expected, though in part explained by the sheer number of factors. Given this and the fact that it is not

anticipated that these variables should explain a high level of variance, this adjusted R^2 value should not be weighted too heavily in the final valuation of the model.

p-values

The p -values for the start/end of the Jewish Insurgency, the Spanish Flu, the start/end of the Vietnam War, start/end of WWI, the start/end of the Korean War, the start/end of the Russian Civil War, the Anglo-Zulu War, and the Gulf War all had insignificant p -values ($p > 0.05$) despite being included in the model. The Bosnian War, the duration of WWI, the duration of the Korean War, and the duration of the Russian Civil War were all of intermediate significance ($0.05 > p > 0.01$). The rest of the wars were all of significance ($p < 0.01$). The p -value for the intercept was the lowest p -value that R records.

Coefficients

The Afghanistan, Kosovo, Bosnian, Anglo-Zulu, and Gulf wars are all associated with negative coefficients. Time and the start/end of the Russian Civil War are also negative. All other factors have a positive coefficient, including the Spanish Flu. The intercept is estimated at approximately 8. All the exact values can be seen in Table 2 in the Appendix.

Aggregate model

The aggregate model was considered for the UK, as it was for the US. The R^2 value was 0.3795. This is much lower than the model with each war as its own distinguishable regressor. The conclusion is the same as it was for the US model: the model has better predictive capabilities when each war is considered individually. This seems to be a reasonable approach to take because not all the wars lasted for as long or were conducted on the same scale, thus they should have a different effect. Just as in the US model, the different wars have coefficients with

different signs. The Anglo-Zulu War, the Gulf War, the Bosnian Civil War, the Kosovo War, and the Afghanistan War are all associated with a negative coefficient. This includes every significant war that occurred after the Vietnam War. The rest of the wars all have positive coefficients. It should be noted that the Anglo-Zulu war is the first war chronologically that is on the list. The start/end of the Russian Civil war is also associated with a very slightly negative coefficient.

A Qualitative Comparison Between the UK and the US

Before comparing and analyzing the quantitative results between the two countries it is of importance to make some caveats. One common misconception is that because the US and the UK speak the same language, the cultures are practically the same. First, as will be demonstrated, the cultures of the US and the UK are very different, both in political structure and in philosophical background. The histories of both countries also define them to a great extent.

The Difference in Wartime

One of the key areas where the differences between the US and the UK can be seen is in their political systems. Both countries ceded much special wartime power to their respective central governments during World War II (Owens, 2012). Of interest is the difference in how this was done, and in the lasting effects this had on the political structure in each country. Owens (2012) points out that during this war not only did the British parliament turn a wartime government out of office, but there was also a failed confidence vote to remove Churchill later in the war.

This is not to say Congress was not adversarial towards Roosevelt. Both Congress and Parliament criticized the wartime government and had a strong influence on policy (Owens,

2012). One event that is of particular interest is that in 1942 Congress gave Roosevelt powers that he did not request, even overriding his veto to do so (Owens, 2012). This is very much an example of the difference between the two.

Political Similarities and Differences

There were several political movements that were similar between the US and the UK, both in timing and in content. One set of political events that were similar in substance and time in the two countries was when the seventeenth amendment was added to the US constitution, and the liberals in the Parliament curtailed the veto power of the House of Lords (Keller, 1980). The seventeenth amendment to the US constitution changed the senators from being appointed by the state legislatures to being directly elected by the people. Both of these acts had the effect of putting power more directly in the hands of the people. There was a common theme in both countries, that of a movement towards democracy. Unlike how the Senate of US is now elected, most of the MPs in the House of Lords are appointed by the British political parties. The ideal political composition in Britain is one with a strong opposing political party to the one that is in power. Their system works best when there are two closely matched parties in opposition; thus when parties become aligned the system is not working as intended. In the US, the system is designed differently. Rather than two opposing parties being the main curtailment on each other, the three distinct branches of government are supposed to fulfill this task.

The British Idea of Citizenship

As with all countries, the idea of what it meant to be a citizen has changed over the past hundred years. At the beginning of the twentieth century, citizenship was closely related to duty. According to Freedman (2004), citizenship was considered an acquired skill and a moral virtue.

Over time, as the secularism of the Enlightenment became more popular, the view of citizenship and society changed (Grimley, 2004). Rather, citizenship was viewed as a product of how well one served the state. As Freedman puts it, “individual right is purchased by the good social behavior of that individual” (p. 290). Instead of citizenship being a result of a duty towards God, it became a duty to the state. British culture remains deeply rooted in duty, and deviation from that perceived duty is met with vituperation. This was exemplified during the COVID-19 crisis, when anyone who questioned the state’s decisions was severely censured.

A Quantitative Comparison Between the US and the UK

With a rough background of the two cultures presented, a quantitative comparison can be made. To make this comparison the two final models will be compared in how well they predicted the marriage rates. This is not a prediction of future marriage rates; rather, it is a test to see how well each model predicted the data contained within it. Once the models are compared, the significance of any wars that were fought by both countries will be compared. The purpose of this comparison is to see if perhaps one country or the other was more affected by a war that both participated in, and if so what are some possible reasons for the observed difference. Of interest is that of the three wars that appear in the US model (namely WWII, Vietnam, and Afghanistan) all three appear in the UK model. The effects of each of these wars will be compared.

Comparison of the Full Models

To compare the full models the p -value and the adjusted R^2 were compared, and residual analysis was conducted on both with any important conclusions noted. The p -value given by R was the same for both models, namely 2.2×10^{-16} . This is the minimum result that R can give. The graphs for the residuals vs the fitted values were rather clumpy for both models. This was to

be expected because war is not a perfect predictor and was not expected to be. The qq -norm plots looked as they should for both models. The value of the R^2 was perhaps the most interesting. For the US model it was 0.5302 compared to the 0.8173 of the UK model. This would seem to suggest that wars predict a greater amount of variability in the UK than they do in the US. At this point a useful comparison was made with the aggregate models. When considering the prediction intervals that these aggregate models provided, war in the US aggregate model was associated with a decline in marriage rates, while in the UK aggregate model it was associated with marriage rates positively. The reasons for all this become apparent when looking at the coefficients of the individual wars in the distinct-war models. In the US, every war except WWII has a negative coefficient, meaning that marriage rates are declining during that time. Something similar is occurring in the UK model, but with closer to half the wars associated with a positive coefficient. In the UK model, the positive coefficients tend to have a larger magnitude than the negative ones. One war before 1970 and all the ones afterwards have negative coefficients, the rest are positive. It is hard to draw definite conclusions from this, but it is possible that some of the later wars did not have a significant effect on the marriage rate and are negatively correlated because the rate is declining at that time. This would make sense given how the graphs look. In both models the coefficient of time is very close to zero. In the UK model it is very slightly negative, and in the US model it is very slightly positive. Time was the only numerical variable as opposed to a factor. Its magnitude is such that its influence on the other variables is likely minimal.

Comparison of World War II

Graphically, it certainly seems that World War II had a significant effect on marriage rates in both areas of interest. Given this to be the case, some comparisons can be made between the US's and the UK's responses to this war. Looking at the coefficients, all are positive. The coefficients in the UK model are 2.01 for the duration and 1.39 for the start/end. In the US model the start/end has a coefficient of 1.48 and the duration has a coefficient of 1.08. The difference is of note. The start/end of involvement in the war seems to have made a bigger difference to the US, while the duration of the war seemed to affect the UK more strongly. One reason for this could be that the UK was in the war for three more years than the US was. A greater proportion of the British population was directly affected by the war when compared with the proportion of the population in the US affected by the war. The bombing of England as well as its proximity to German-held lands contribute to this. This is not to say that the US population was not directly affected by the war. Two such examples of note would be the attack on Pearl Harbor and the internment of the Japanese Americans. Another difference is that the UK was in the war for two years longer than the US, and for most of those two years it fought the war alone. Yet another difference between the two is how they entered the war. The UK was woefully unprepared for a land war, whereas the US was relatively more prepared for the war with Japan. Given all this, it makes intuitive sense that the UK would be more affected by the duration of the war than the US would be.

Comparison of the Vietnam War

Looking at the graph, in this case, does not provide much information. There is a drop when the war began in both countries, though a smaller drop in the UK. From there the rate steadily increases until the end of the war where it again drops. In the UK the coefficients are

both slightly positive, at 0.75 for the duration and 0.74 for the start/end. In the US the coefficients are negative, at -1.43 for the duration and -0.6 for the start/end. The p -values for the duration are significant in both countries, while the p -values for the start/end is close to insignificant for both. It should be remembered that this time in the US roughly coincides with the sexual revolution. This, combined with the passing of Roe in 1973, would have had a significant impact on marriage, though the full impact wouldn't be realized for several decades. Public opinion was against the war for much of the time. A lack of results contributed to this: the war dragged on much longer than anybody in the US wanted it to, without any discernable benefit to anyone. The British involvement in this war was political rather than militaristic. It is somewhat surprising that the war is as significant in the UK model as it is in the US model.

Comparison of the Afghanistan War

Graphically, no effect can be seen on the US marriage rates. The downward trend continues. In the UK, the war starts and ends at peaks. The coefficients in both models are all negative: around -3.2 in the US model, and close to -2.1 in the UK model. These values hold for both the duration and start/end factors. This war was sparked by the terror attacks on the World Trade Center on September 11, 2001. This was a watershed moment in US history. Up until this point the left was primarily the antiwar party, as in the Vietnam war. After this point, there was no longer a significant political party in the US that could be considered an antiwar party. Significantly, something similar also happened in the UK. The antiwar party in the UK ceased to exist for the most part. One event of significant interest in the US was the passage of the Patriot Act. This act granted significant power to the federal government at the expense of the privacy and freedom of the American people, the supposed benefit being increased security. On the

whole, the war and the surrounding events and policies had a massive impact in the US. The UK, however, was not unaffected. The UK primarily became involved in the war because the US was involved. For the reasons listed here and above it should not come as a surprise that this war was significant to both countries. Neither should it be a surprise that it seems to have more effect in the US, given that the coefficient is approximately fifty-percent greater than the coefficient in the UK model.

Conclusion

There are some things that can be concluded from these analyses. War probably affects the marriage rate when it is conducted on a large enough scale. In both World Wars a significant portion of the American and British populations were involved directly in the wars, and an even greater portion indirectly. There are most certainly underlying cultural movements that also affect the marriage rate that are not captured in this analysis. Even the smaller wars are likely to have some effect on the marriage rate, however, even if it is too small to determine statistically. Of further note, the effect that the wars have is not necessarily consistent. Some of the wars, especially the earlier ones, have a positive effect on the marriage rate and others have a negative effect. This is one of the more interesting findings of the analysis. An explanation for this could most likely be found within the cultural shift that occurred during the 20th century. This shift, given the historical observations, seems to be a religious one more than anything else. Ever since World War I, the credibility of Christianity in the west, and especially in Europe, has suffered many setbacks. These setbacks usually stem from some sort of compromise from within the church, or the church supporting something disastrous, such as the first World War. How a culture will respond to a war is determined by that culture's beliefs, especially as they pertain to

war. A culture's view of the future will also affect their view of war, and also of marriage. If the world is believed to be soon ending in a cataclysm, whether from nuclear holocaust or global warming, fear will keep people from building things which last, including families. Thus, instead of war being seen as a means to spread civilization and order, as it was seen by the British for the longest time, it is instead seen as the harbinger of doom. In the time leading to World War I, war was considered to be beneficial to the world, a view informed in large part by Darwinism and nationalism (MacMillan, 2013). On the other hand, prime minister Tony Blair was worried that his getting the UK involved in Kosovo would cause him to lose the support of the public (Daddow, 2009). With these changing perceptions of war, people react to them differently. Both of these views are overly simplistic and fail to capture the nuance of war. Death and strife are both results of the fall, and war makes these unavoidable. But because there is evil in the world, war sometimes becomes necessary, which is why Christians spent much ink on determining what makes a war just. Delving into Just War theory is beyond the scope of this analysis however.

Comparisons

In the comparison of the two countries, the conclusions are less certain but still of interest. The country most affected by any particular war seems to change between the two. The UK responded more to WWII, but even if the cultures had been identical this should have been the case given that their experience was much more harrowing than that of the US. Again in the Vietnam War the effects are different, but the nature of each country's involvement was also very different. The US was involved militarily while the UK was involved solely on the political level. As for the last war fought by both, the Afghanistan War, the US is more heavily influenced. This can again be explained by the events. The 9/11 attacks that sparked the war

happened on US soil, and the US was the main player in that war in terms of troops and money. No war was fought by both countries where the cost and the cultural significance were roughly equivalent. As such it cannot really be said with certainty that one is more effected by war than the other. Both countries show a downward trend in marriage rates starting in the late 60s and early 70s. Some of the possible reasons for this have been mentioned. Whatever the case, this trend does not seem to be related to the wars fought by either country.

Further Study

To further examine the marriage rates as well as the factors associated with them a more socio-historical approach would be helpful. An examination of why people got married throughout the century would be especially important. Along with that, what role religion plays in marriage as well as the culture's view on religion should be examined. How a culture views religion will be closely related to its perspective on marriage and war. In addition to that both the institutions of marriage and religion have substantially changed over the century. One only has to point to *Obergefell*, when the Supreme Court of the US essentially codified same-sex marriage as law, to see that what the culture means by marriage has changed in a fundamental way (*Obergefell v. Hodges*, 2015). Like all such changes, it is one that happens gradually, and finding the root of it will certainly help to explain what affects the marriage rate. Something similar could be said of religion, Christianity in particular. While what the Bible says remains constant, what the churches teach and how their members interact with the culture do not. Other factors to consider would be the economic well-being of the country. The Great Depression was already included in the US model and shows as significant. It is likely that both economic disasters and general economic status affect marriage rates. How does wealth effect people as they make the

decision of if and when to marry? Such things as natural disasters, epidemics, and significant law changes should also be taken into consideration for future studies. Preliminary data on the marriage rates during the COVID lockdowns shows a massive drop. Is this drop temporary or is it permanent? With the changing views on marriage, it could be either temporary or permanent, but it will take several years before enough data is accumulated to know for certain.

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Appendix

Figure 2

Marriage Rate vs Year in the UK

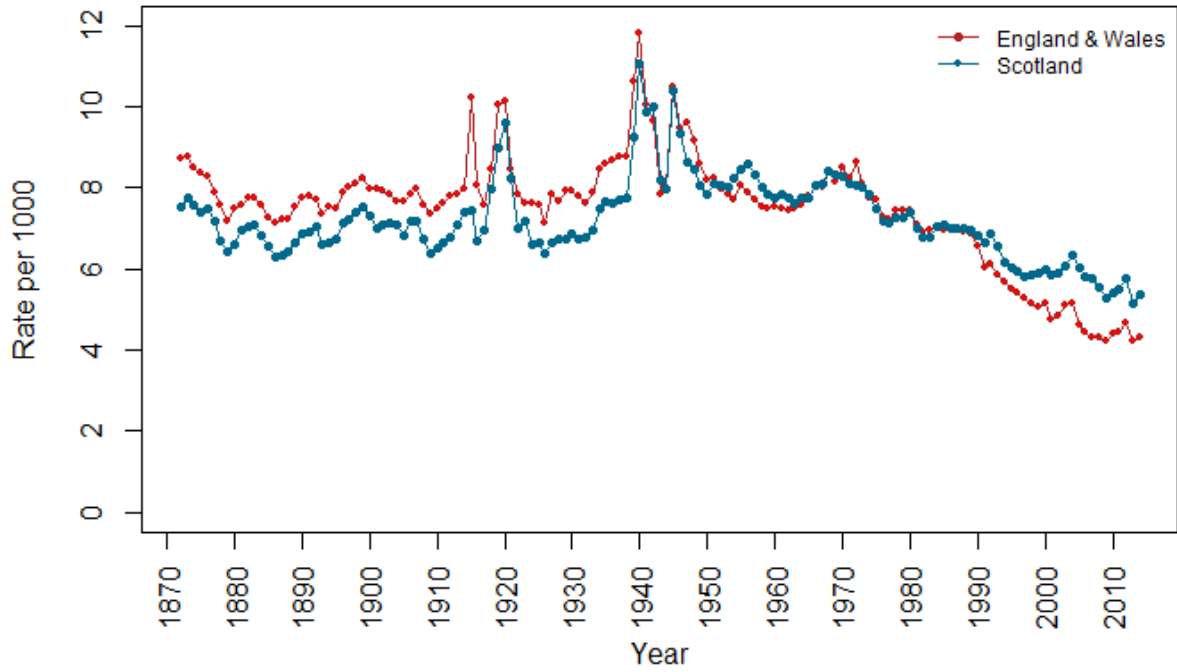


Figure 3

Marriage Rate vs Year for UK and US, with Median Lines

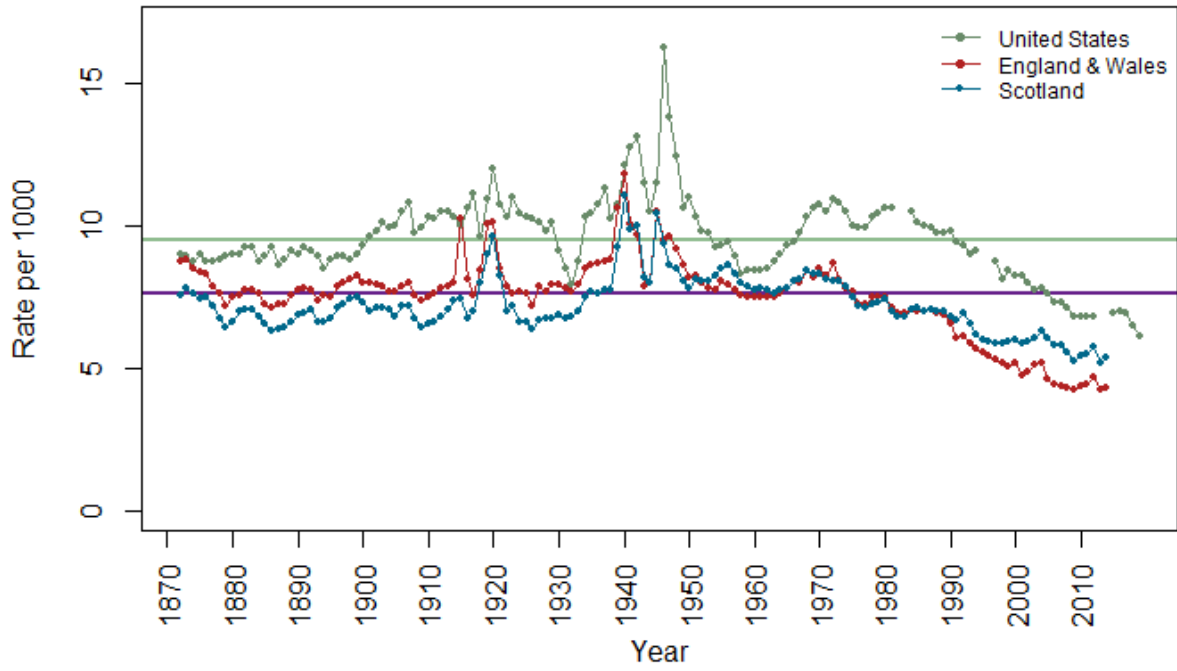


Table 1*Coefficients and p-values for the US model.*

Coefficients:	Estimate	Std. Error	t-value	Pr(> t)
(Intercept)	9.019242	0.205985	43.786	< 2e-16
Afghanistan1	-3.224002	0.348863	-9.241	5.46e-16
Afghanistan2	-3.237874	0.737706	-4.389	2.31e-05
WWII1	1.077282	0.596867	1.805	0.07337
WWII2	1.477282	0.720112	2.051	0.04220
Vietnam.War1	-1.425045	0.320002	-4.453	1.78e-05
Vietnam.War2	-0.595578	0.712562	-0.836	0.40476
Great.Depression	-1.491708	0.463557	-3.218	0.00162
Time	0.022584	0.004341	5.202	7.32e-07
Roe	-1.747983	0.380174	-4.598	9.87e-06

Note. A 1 indicates the duration factor while a 2 denotes the start/end factor.

Table 2*Coefficients and p-values for the UK model.*

Coefficients	Estimate	Std. Error	t-value	Pr(> t)
(Intercept)	7.963307	0.108632	73.305	2.00E-16
Afghanistan1	-2.11148	0.229227	-9.211	1.38E-15
Afghanistan2	-2.140647	0.434556	-4.926	2.74E-06
WWII1	2.079134	0.27745	7.494	1.30E-11
WWII2	1.388058	0.529506	2.621	0.0099
Kosovo	-1.659864	0.429718	-3.863	0.000183
Spanish.Flu	1.130671	0.572363	1.975	0.050532
Bosnian1	-1.058873	0.427244	-2.478	0.0146
Bosnian2	-1.018873	0.427244	-2.385	0.01867
JewishInsurg1	2.035349	0.382363	5.323	4.88E-07
JewishInsurg2	0.198468	0.428683	0.463	0.644229
SpanishCivWar1	1.268219	0.41066	3.088	0.002506
SpanishCivWar2	1.43419	0.488587	2.935	0.003999
Vietnam1	0.753167	0.163912	4.595	1.08E-05
Vietnam2	0.735272	0.416177	1.767	0.079838
Time	-0.008802	0.001699	-5.182	9.10E-07

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WWI1	0.857311	0.337042	2.544	0.012252
WWI2	0.025623	0.507198	0.051	0.959793
Korean1	0.826446	0.412818	2.002	0.047563
Korean2	0.726446	0.412818	1.76	0.081024
RussianCivWar1	1.178738	0.510951	2.307	0.022787
RussianCivWar2	-0.053961	0.507053	-0.106	0.915427
AngloZulu	-0.821693	0.580523	-1.415	0.159552
Gulf	-0.585279	0.425833	-1.374	0.17189

Note. A 1 indicates the duration factor while a 2 denotes the start/end factor.