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in house" -**

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(C18-C19 Germany) and some thoughts on
the evolution of postgenerative female life**

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“The husband’s mother is the devil in house” –
Data on the impact of the mother-in-law on stillbirth mortality in historical
Krummhörn (C18-C19 Germany) and some thoughts on the evolution of
postgenerative female life

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“Twee Wiefen over een Deel, is een to vööl”
(Hibben 1919: 49)

Introduction

There is growing evidence that grandmothers are helpful towards their adult daughters in different ways, depending on the opportunities that the local socio-ecology offers (cf. various chapters in this volume). Thinking of the helping grandmother thus usually means thinking of the maternal one. With respect to the paternal grandmother, things are a bit more complicated. All relevant studies so far report that the impact of the paternal grandmother on familial reproduction is either less pronounced than the support provided by the maternal grandmother, or is not even detectable or it is even negative (Beise & Voland 2002, Bereczkei & Dunbar 1997, Sorenson Jamison et al. 2002, Sear et al. 2000, 2002, 2003, Voland & Beise 2002 ... this volume). In this article we aim to trace this finding on the not so helpful grandmother and try to put it into an evolutionary framework.

Intrafamilial conflicts of interests

The difference between maternal and paternal grandmothers with regard to their support of the reproduction of their adult offspring has to be thought of as an adaptive difference which, in our opinion, is based on evolved intrafamilial conflicts of interests. Whereas the reproductive interests of postmenopausal mothers and their adult daughters overlap for the most part (and only conflict, if a mother has to divide her support among several adult daughters), the reproductive interests of mothers and the mates of their adult sons are different and only run parallel to each other under certain circumstances. Darwinian theory predicts

that mothers are shaped by natural selection to promote the reproductive interests of their adult sons, while the mates of these sons can be expected to pursue their own reproductive interests. Consequently, within a family, both sexual and also dynastic conflicts of interest are bundled. Hence, the interest of mothers-in-law in their daughters-in-law only stretches as far as the latter contribute to the former's dynastic interest. In contrast to real mothers, mothers-in-law have no ultimate reason for assuming a perspective regarding the daughter-in-laws' long well-being. Their ultimate interest is limited to the stage of life in which the daughter-in-law is married to their son. In demographic regimes with significant pre-senile mortality, marriages only last for a relatively short time on average. Second marriages or phases of widowhood are correspondingly probable. Thus, the reproductive interests of mothers-in-law in their daughters-in-law are limited to a much narrower period of time than that of the latter's own mother. Considerate treatment has, therefore, a much lower chance of becoming a mother-in-law's behavioural motive than a mother's motive. In brief: There is ample room for severe intrafamilial behavioural conflicts, as folk wisdom is well aware of.

Psychological and anthropological studies show that this in-law conflict manifests itself under the most varied ethno-historical conditions (e.g. in Israel: Linn & Breslerman 1996; in the Bolivian highlands: Van Vleet 2002; in rural Taiwan: Gallin 1994; in central Sudan: Kenyon 1994). The obviously transcultural dissemination of this potential for conflict (Adler et al. 1989) supports the assumption that this could be a species-specific genetic conflict of *Homo sapiens*, for the resolution of which mothers-in-law and daughters-in-law have developed adaptive psychological mechanisms and behavioural strategies. What is interesting is that there are signs that the relationship between mothers- and daughters-in-law is characterized by latent bilateral mistrust even if the living conditions do not provide any grounds for an open conflict. Even under the conditions of modern age (Apter 1999) daughters-in-law not infrequently report emotional tension when visiting their mothers-in-law, even if the areas of life do not overlap geographically, economically or socially. The odds are in favour of an evolved background for this conflict, which can appear even if the adaptive logic of its evolution has long disappeared.

In-law conflicts generate costs: The Krummhörn case

In an earlier study, we were able to show by a family reconstitution study of the population of the Krummhörn region (Ostfriesland, Germany) of the 18th and 19th centuries, that the existence of the paternal grandmother significantly increased neonatal mortality. i.e. the risk of dying in the first month of life. This effect was very drastic, if the mother of the

infant's mother (i.e. the maternal grandmother) was no longer alive and the young woman was exposed to the influence of her husband's mother without the protection of her own mother. And this effect increased even more, if the mother-in-law's family and the woman's own family lived in the same parish, i.e. if the families were close to each other geographically. Under these circumstances, the risk of a newborn's dying within the first month after birth rose to 2.48 times that of the situation in which the paternal grandmother no longer lived at the time of the child's birth (Voland & Beise 2002). We have interpreted this increased mortality as being primarily caused endogenously. One reason could have been an escalation of the in-law conflict, which was so stressful that it led to prenatal damage and reduced viability of the children. This interpretation has been given new nourishment through additional analyses of differential stillbirth mortality, which we report here.

The basis for this study is the reconstitution of the families of the Krummhörn population during the 18th and 19th centuries. The entries in the church registers of this coastal region in Northwest Germany, when taken together with the information provided by the tax lists and a few other historical sources, form the basis for the reconstitution of the lineage histories that overlapped individuals, families and residences (cf. Voland 2000 on the methods and applications of family reconstitution studies in evolutionary anthropology, and Voland 1995 on the specifications of the socio-ecological features of the Krummhörn population and a few earlier main results of this study). Stillbirths are notoriously underregistered in the parish records, what makes an estimate of their incidence very difficult (Hart 1998). This applies in particular to the pietistic population of the Krummhörn, in which stillbirths were traditionally considered to be hardly worth mentioning. In the early days of recordkeeping by Krummhörn pastors, stillbirths were only registered in a very sketchy way. However, statistics show that such underregistration noticeably decreased as of the 1750s. The documented stillbirth rate then increases to values of approximately 3 %, which lies within the expected range in view of historical comparative data. Therefore, we only begin our analysis with the birth cohort of 1750, but still have to take into account occasional underregistration in the first few years after that. However, this possible sample bias is neutral in view of the hypothesis being tested and can probably be neglected here.

From the database of the reconstituted Krummhörn families, we have extracted 6206 legitimate births from all social groups during the period from 1750 to 1874. Of these, $n = 202$ (= 3.3 %) were stillbirths. The type of birth (live birth or stillbirth) was subjected to a logistic regression as an independent variable. After statistically controlling for the age of the mothers and the cohort effects, it becomes evident that the circumstance whether the paternal

grandmother was still alive at time of birth or not had a significant influence on stillbirth mortality (Tab. 1). Whereas the existence of one's own mother did not have any impact on the risk of a stillbirth, the existence of the mother-in-law elevated the stillbirth mortality by 34.9 % ($p = 0.034$) in comparison with the situation when the mother-in-law was no longer alive. As expected, the existence or non-existence of both grandfathers did not have any impact on stillbirth mortality, so that we have removed this variable from the models.

[table 1]

The impact of mothers-in-law on stillbirth mortality is not evenly distributed across the duration of the marriage (Fig. 1). After controlling for cohort effects and the age of the mother at marriage, the incidence of stillbirth mortality shows a J shape across the duration of the marriage. At the beginning of a marriage and once again after many years of marriage, stillbirth mortality is increased to an above-average level. This very likely reflects the well-known age distribution of stillbirth mortality (Reid 2001). Interestingly, the relative risk of having a mother-in-law also has a similar course. It is elevated in all phases of a marriage, but particularly high at the beginning of a marriage (1.62) and once more, after 12 or more years of marriage (1.53). The high value at the beginning of a marriage seems easy to understand. The social constellation after marriage is new and correspondingly stressful for young women. The elevated level after many years of marriage deserves more interest, however. This observation does not indicate that mothers-in-law reduced their pressure or that the daughters-in-law developed habituated or suitable coping strategies over time. On the contrary, the stress-induced effects appear to accumulate with the length of the marriage. This observation allows long-term effects of the conflict to be expected, which could possibly even adversely affect life expectancy (cf. Skinner 1997).

[figure 1]

Psychological studies also do not favour a kind of "habituation effect". For example, in an Israeli study, 49% of the mothers-in-law interviewed shared the opinion that their relationship with their daughters-in-law had improved over the years, while 51% believed that they had noticed a worsening of the relationship. On the part of the daughters-in-law, 45% see an improvement and 55% do not see any change or a worsening (Linn & Breslerman 1996).

Interestingly, the geographical proximity between the mother-in-law and the daughter-in-law models the relative risk of stillbirth mortality. Church register entries permit the ascertainment of the centre of life for every reconstituted family (see Beise 2001 for the method). This variable (place of residence) provides an indication of in which parish the family members primarily resided and spent their lives. If the place of residence of the mother-in-law and the daughter-in-law was identical, the relative risk of stillbirth mortality in the case of the living mother-in-law increased by 45% ($p = .033$) (Tab. 2). If, on the other hand, the places of residence were different, the effect disappears below the threshold of statistical significance (Tab. 3). In the models depicted in both Tab. 2 and Tab. 3, the impact of geographical proximity to the natal family, i.e. to the family of the maternal grandmother, has been statistically controlled.

[table 2]

[table 3]

Unfortunately, the data do not permit any further differentiation of the impact of geographical proximity on the intensity of the in-law conflict. Presumably, the conflicts became more severe when the families not only lived in the same parish, but in the same house or even in the same household. A contemporary proverb says: “Twee Wiefen over een Deel, is een to vööl” (Hibben 1919: 49). The gist of this proverb is that two women in the same household will not get along. Another proverb, which has provided the title of this paper, makes clear that this is a reference to the in-law conflict: namely: “Mann’s Moo’r is de Düvel over de Floo’er” (Hibben 1919: 46). [The husband’s mother is the devil in the house]. The fact that the relationship between mother-in-law and daughter-in-law was not unproblematic, but filled with latent tension, appears to have been widespread folk wisdom in the Krummhörn and in Ostfriesland in general..

As far as the grandchildren are concerned, the costs of the paternal grandmother are limited to stillbirth and neonatal mortality. Post-neonatal mortality is not affected (Volland & Beise 2002). The correlates and causes for stillbirth and neonatal mortality are regarded very similar (Reid 2001), so that it is hardly surprising that the mother-in-law effect is found in both forms of mortality. However, why no positive effect of the paternal grandmother becomes visible once the grandchildren have survived the risks of stillbirth und neonatal mortality (Volland & Beise 2002) still needs to be explained.

What is this about then?

There are at least three different fields of conflict in which the genetic interests of mothers clash with the interests of their sons' mates. They revolve around strategies for the sexual monopolization of women, around strategies to increase the mating success of the sons and around strategies to increase economic exploitation.

First, as indicated by Pashos (2000) for patrilocal populations in rural Greece, by Leonetti et al (this volume) for patrilocal Bengali and by Nosaka & Chasiotis (this volume) for traditionally patrilocal Turkish immigrants to Germany, the authority of the mother-in-law could also have contributed in the Krummhörn to increase paternity certainty. It could be conceivable that the "harassing" mothers-in-law in pre-modern Krummhörn exerted pressure on their daughters-in-law in the interest of their sons and thus ultimately in their own interests, in order to compel marital faithfulness and virtue, i.e. they helped their sons with mate guarding. A majority of the Krummhörn population was Calvinistic, and if religious history (Hollweg 1978) and folkloric (Ohling 1963) literature is to be believed, they were also strict believers. We do not have any indications whatsoever that sexual liberty could have lowered the probability of paternity to any significant degree. Only towards the end of the 19th century are the morals likely to have loosened up a bit here and elsewhere in Europe during the course of a generally emerging sexual liberalization. There were surely occasional episodes of marital infidelity previously to this time - like everywhere in the world, even under the strictest of sexual moral codes – but it appears to be most unlikely in view of the Krummhörn cultural history, that the lethal impact of mothers-in-law affected mainly children who were conceived in extramarital relationships. Instead, the mate guarding tendencies of the mother-in-law very likely had a more prophylactic effect.

We would have to deal with a naturally selected distrust, i.e. kind of a sensor, which (like a smoke detector) recognises risks and reacts promptly. Such a sensor can make two types of mistakes. It can react too quickly and too frequently with a false alarm or it can be adjusted so that it is not sensitive enough and therefore, not detect a real risk. Which error is more serious with regard to the consequences? In the case of the smoke detector, the answer is clear: Frequent false alarms are annoying, but ultimately do not have any consequences. A non-detected fire, on the other hand can be fatal, which is why smoke detectors should be adjusted to be hypersensitive (and they are). Perhaps the situation regarding a mother-in-law's distrust is similar. Raising false alarms too quickly strains family relations, and can, as the Krummhörn data teach us, also occasionally generate costs. On the other hand, indifference to

the sexual behaviour of daughters-in-law and their family loyalty will be even more expensive, on average, because some of the grandchildren would not be one's own.

It can not be ruled out that the Krummhörn mothers-in-law could have become the victims of their own morality. The extremely strict sexual morality of the 18th and the 19th centuries, that was moulded by Calvinism tried to prevent unclear paternities, and with quite a bit of success, too. The evolutionarily built-in "daughter-in-law monitoring sensor" had to react more and more sensitively in accordance with the predominant morals of the time, which could have led to the result that, in some cases, this "continuous alarm" made the women ill. Seen from this perspective, "evil mothers-in-law" are exaggerated executors of that adaptive distrust which is peculiar to their role evolutionarily.

The extremely high strain to which the daughters-in-law were subjected by their mothers-in-law at the beginning of a marriage (Fig. 1) indicates that the Krummhörn in-law conflict may serve to increase paternity certainty, especially because there might be some lack of clarity concerning the young wife's loyalty, especially at the beginning of a marriage. Mothers-in-law could be particularly motivated to exercise discipline during this phase, in order to set things straight from the very beginning. With the increasing duration of the marriage and security regarding the marital relationship, the pressure should diminish. The fact that this obviously did not happen persistently, however, allows the surmise to be made that the in-law conflicts in the Krummhörn population only partially corresponded to the logic of mate-guarding scenarios.

Secondly, mothers-in-law could tend to increase the mating success of their sons, whereas the daughters-in-law would have an interest to continue reproductive cooperation with their husbands. The hostility of mothers-in-law would be directed at weakening the emotional bond between their sons and their daughters-in-law and at finally pushing them out of the family or to a less important position in order to create additional mating opportunities for their sons. Of course, the success of such a strategy would be subject to specific demographic and sociobiological conditions which are hardly present in the Krummhörn situation. The predominance of monogamy alone, which practically did not allow for divorce and did not tolerate extramarital affairs, made strategies of mating enhancement more difficult here than in many other societies.

The third type of conflict centres around the contribution the daughter-in-law is expected to make to the economy of the family. A mother-in-law would, provided her intrafamilial power position is strong enough, tend to pressure her daughter-in-law to do more work than her own daughter in order to divert the proceeds of work from non-kin women to

their own lineage. Concretely, this could have meant that the mother-in-law unduly compelled the daughters-in-law to do work in the house, garden or business. It is well known that the workload of pregnant women has an impact on stillbirth and neonatal mortality (e.g. Reid 2001). Generally, in historical and traditional societies, the stillbirth rate is considered to be an indicator of maternal condition (Hart 1998). Being kind to daughters-in-law during their pregnancy or after they gave birth may ultimately not have paid. Even if the economic exploitation of daughters-in-law occasionally cost unborn or just born grandchildren, the strategy could have been worth it in the long run under certain socio-economic conditions, because deceased grandchildren were able to be quickly replaced, as a rule. Even a deceased daughter-in-law was not irreplaceable. We are dealing with a system of exploitation here, in which the workload of the daughters-in-law was demanded just as matter-of-factly as their fertility was.

Historical family sociologists have repeatedly developed the theme that in the agrarian societies of Western Europe the relations amongst family members are solely characterised by the concept of possession (e.g. Sabean 1990). Emotional distance in farmer families is deemed to be a truism in historical family research. There is no doubt that in a pragmatic and emotionally icy family context, in which the economic balances are valued more than the emotional ones, in-law conflicts can easily thrive.

And regional research into epics also provides indications that particularly the “exploitation” motive promotes in-law conflicts. The “ballad of the evil mother-in-law” is a folk song in many parts of Europe, with numerous regional variations (Stein 1979). Seemann (cited in Stein 1979: 7-8) writes as follows: “There are numerous European folk songs describing how havoc is wreaked for the family due to the hatred which the mother-in-law fuels against the daughter-in-law who has come into her life. According to such songs, she attempts to poison her son’s bride with the welcoming drink; or she sows lethal seeds of discord between husband and wife through malicious slander; she slowly torments her daughter-in-law to death with her tyrannical personality; or she contributes to this death by failing to provide assistance in need. She also attempts to achieve her criminal goal through the use of magic: She prevents birth, so that the eight-year-old twins finally have to be cut out of her daughter-in-law’s body, or she transforms the young woman into a tree and orders her son to cut the tree down. [our translation]” This reflects poetic interpretations with a highly metaphorical charge. The detailed analysis of this song material shows however, that the topos of the “evil mother-in-law” frequently also deals with everyday motives that are plausible in terms of evolutionary psychology. The motive of exploitation in particular is

repeatedly varied: The son has to leave the house and asks his mother to take care of his young wife: She does the opposite, however: She forces her to do heavy work or perform menial services, or gives her bad food and bad clothing (Stein 1979: 8). In another variant, the young woman changes into a bird after ordered to do heavy-duty field work by her mother-in-law and flies to her relatives to tell them all her woes. The mother-in-law's influence on reproductive failure is also dealt with in an epic fashion: The mother-in-law does not help with the birth; on the contrary: She places a monster into the cradle instead of the child (Stein 1979: 9), or she attempts to inhibit the birth through magic (Stein 1979: 10).

Trade-offs

In all of the three variants of the in-law conflict discussed, the dominant mother-in-law runs the risk of generating too high a cost and thus reducing her own fitness. Thus, the mother-in-law is faced with a typical trade-off problem. Other things being equal, the pressure by the mother-in-law should be all the stronger, when the costs are lower for her. Costs are low, for example, when the predominant mating system does not provide for divorce, or if divorce is out of the question for the daughter-in-law for other reasons, e.g. because she lacks the support of her natal family. The more autonomously the daughter-in-law is able to make biographical decisions, the riskier and thus more costly the escalation of dominance claims by the mother-in-law becomes.

Secondly, the costs of the conflict for the mother-in-law are relatively low, if the reproductive losses (stillbirths, infants who die young) can quickly be compensated for. This succeeds all the more easily, the younger, and thus the more fecund, the daughters-in-law are. In fact, a "replacement strategy", i.e. the attempt to replace deceased offspring is well known from the Krummhörn population (Straka-Geiersbach & Volland 1988).

According to the logic of the "mate-guarding scenario", furthermore, the dominance of the mother-in-law should increase to the same degree as her help and support is valuable. This consideration is, to a certain degree, an extension of the sociobiological model on the correlation between the prevailing degree of paternity uncertainty and paternal investment (Hartung 1985). The higher the paternal investment is, on average, the more sustainedly fathers are able to impact the fate of their children. In brief, the more patriarchal and the more resource-stratified a society is, the more the men are going to act in a sexually monopolizing way. This correlation can easily be transferred to grandmotherly investment: The more grandmothers are able to do for their adult children and grandchildren, the more certain they want to be that their grandchildren really are their grandchildren. Accordingly, we can expect

an additive effect: The more grandmothers develop an interest in supporting not only their adult daughters, but also the families of their adult sons, i.e. the more patrifocal a society is and the more really helpful grandmothers can be, the more pronounced the in-law conflicts will be.

According to the logic of the “exploitation scenario”, the behavioral dominance of mothers-in-law should increase to the degree that young women can productively contribute to the household economy. For this could happen, opportunities and economic incentives must exist. This was doubtlessly the case in the Krummhörn (as probably in all pre-industrial rural societies in Europe). Both in the farmer and non-farmer segments of society, there were many opportunities for women to profitably contribute to the family economy. The more extended the opportunities were, the more developed the familial expectations were to actually utilize these economic possibilities. And all the more so, the fewer other family members there were, who were available to harvest from the economic opportunities.

Without being able to achieve final certainty on this issue, the “exploitation scenario” appears to us to be the one which best reflects the Krummhörn circumstances. The sociological prerequisites for a “mating-enhancement scenario” are lacking. The “mate-guarding scenario” could have existed “in the background” in the mentality and in the basic convictions of the population, but primarily the “exploitation scenario” was the one which determined behaviour and induced stress at that time in the Krummhörn population, with its Calvinistic appreciation for work, production and property.

Two evolutionary routes to female longevity?

How do the foregoing considerations affect the issue of the evolution of postmenopausal longevity? If the hypothesis that the in-law conflict has to be interpreted as a genetic conflict is correct and the behavioural strategies of mothers-in-law and daughters-in-law are strategic adaptations to this conflict, then the following question arises. Are we dealing with a consequence or even a cause of the evolution of female longevity? In order to be able to answer this question with any certainty, the cost-benefit ratio of the in-law conflict in the milieu of its evolution would have to be reconstructed. This is not possible, of course. Due to the notorious hypercomplexity of social strategies, even exhaustive modern data do not permit empirically secure statements on the reproductive consequences of the in-law conflict to be made. Thus the adaptive status of the in-law conflict remains unexplained to date.

A non-adaptive interpretation of the in-law conflict could assume approximately the following argumentation structure. People have the adaptive motive of socially dominating

others, especially non-kin. Due to an extended lifespan for whatever reasons and to patrilocal lifestyles, the spheres of life in which mothers and the mates of their adult sons find themselves overlap. Consequently, intrafamilial conflicts arise due to the adaptive dominance motive which has evolved in other social contexts. This conflict causes costs, namely for all of the parties involved, and is therefore non-functional. However, as a by-product of an adaptive social striving for dominance, it is very difficult to suppress.

Even if this non-functional interpretation can not be ruled out, a functional interpretation appears to us to be more likely. In line with Darwinian theory, it is not improbable for costly behavioural strategies to persist only because they also provide benefits which more than compensate for the costs on average. Therefore, it does not appear to be ruled out *a priori*, that it paid off for historical mothers-in-law on average to manipulate their daughters-in-law, both socially and reproductively. The more the older women were able to exert influence in their own interest on the production and reproduction behaviour of their daughters-in-law, the greater the genetic reward for growing older. The „genes for longevity“ were able to assert themselves evolutionarily to the degree that the postmenopausal lifespan was associated with positive fitness gains for adult sons and daughters, because Lee (2003) is right when he states that “Transfers, not births, shape senescence in social species”. However, transfers can come ontologically in two shapes, namely help and manipulation.

Whereas help characterises the mother-daughter relationship and is the basis for Hawkes’ version of the grandmother hypothesis (cf. Hawkes in this volume) social manipulation is added to the mother-son relationship. Not that help does not play a role here, but it is not the only possibility for postgenerative women to maximize their reproductive fitness. By increasing the reproductive success of her son, possibly even at the expense of her daughter-in-law, the exploitative manipulation of the mother-in-law has the potential to transport “genes for longevity”. The historical and quantitative relationship between the two strategies of assistance and manipulation depends on the predominant forms of families. The help strategy is an adaptation to the matrilocality lifestyle, in which older women and their adult daughters share a common living space. Matrilocality can be perfectly understood to be the evolutionary result of the help strategy (Holden et al. 2003). In patrilocal societies, there is hardly any possibility of daughter-biased help, because older women are more likely to live with their daughters-in-law than their own daughters due to female exogamy. The help strategy can not lastingly manifest itself here. Instead, social manipulation becomes the predominant strategy of fitness maximization during senescence.

It does not appear to be completely improbable for patrilocal lifestyles to have also played a phylogenetically significant role. Most of the contemporary hunter-gatherer societies (in remarkable continuity with chimpanzees and bonobos) favour male philopatry and female dispersal. Kayser et al. (2003) have shown the same contrasting pattern for Papuan populations in Melanesia: The diversity of Y-chromosomes is very much reduced, while that of mitochondrial DNA is not, i.e. historically, a limited number of genetically related men have been the fathers whereas the mothers came into those clan-exogamous, virilocal groups from outside. In such social systems, however, it is unlikely, but not impossible, that many elderly women are living in the same house or settlement as their adult daughters or other of their kin. From all of this, it follows that the evolution of the grandmother can not be conceived of without the evolution of the mother-in-law, therefore two social strategies, namely “help” and “social manipulation” could have favoured the evolution of female postgenerative life.

Summary

We have argued that the psychology of the mother-in-law and daughter-in-law conflict traces back to a genetic conflict of interests. This conflict generates reproductive costs on the part of the daughters-in-law. We demonstrate this by statistics on differential stillbirth mortality in the Krummhörn population (Ostfriesland, Germany, 1750-1874). Whether or not mothers-in-law also incur costs remains unclear. The costs of the conflict are particularly high at the beginning of a marriage, but also increase once again after many years of marriage. We discussed three scenarios which could have led to the evolution of the in-law conflict, In the “mate-guarding scenario”, the mother-in-law wants to achieve the best possible increase in her son’s paternal certainty, thus increasing her genetic relationship with her grandchildren. In the “mating-enhancement scenario”, mothers-in-law break up strong emotional bonds between their sons and the latter’s mates in order to facilitate additional mating opportunities for their sons. In the “exploitation scenario”, mothers-in-law strive to transfer economic earnings from the work done by daughters-in-law to their own family’s economy. We argue that the Krummhörn in-law conflicts most likely correspond to the logic of the “exploitation scenario”. We conclude with the hypothesis that the social and reproductive manipulation of daughters-in-law by their mothers-in-law could be another evolutionary route to female longevity. Whereas the “help strategy” in matrilineal situations has had an impact on the evolution of the grandmother, in patrilocal societies, it was the strategy of reproductive manipulation.

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Tab. 1: Risk of stillbirth (Krummhörn, Ostfriesland, 1750 – 1874). Logistic regression with the type of birth (live birth = 0, still birth = 1) as a dependent variable.

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
MATERNAL GRANDMOTHER						
dead						1.000
alive	-0.025	0.141	0.033	1	0.857	0.975
PATERNAL GRANDMOTHER						
dead						1.000
alive	0.299	0.141	4.492	1	0.034	1.349
AGE OF MOTHER						
			24.359	3	0	
< 25	-0.284	0.294	0.931	1	0.335	0.753
25-30						1.000
30-35	0.193	0.204	0.895	1	0.344	1.213
35+	0.727	0.187	15.091	1	0	2.069
BIRTH COHORT						
			6.746	3	0.08	
1750-1800	-0.6	0.239	6.311	1	0.012	0.549
1800-25	-0.048	0.192	0.064	1	0.801	0.953
1825-50	-0.06	0.168	0.127	1	0.722	0.942
1850-74						1.000
Constant	-3.627	0.222	267.92	1	0	0.027
N = 6206						

Tab. 2: As in Tab. 1, only cases with the same place of residence for mother-in-law and daughter-in-law

Variable	B	S.E.	Wald	Df	Sig.	Exp(B)
MATERNAL GRANDMOTHER						
dead						1.000
alive	-0.025	0.171	0.021	1	0.884	0.975
PATERNAL GRANDMOTHER						
dead						1.000
alive	0.371	0.174	4.569	1	0.033	1.450
AGE OF MOTHER						
			14.925	3	0.002	
< 25	-0.144	0.344	0.175	1	0.676	0.866
25-30						1.000
30-35	0.116	0.25	0.216	1	0.642	1.123
35+	0.700	0.226	9.595	1	0.002	2.014
BIRTH COHORT						
			12.422	3	0.006	
1750-1800	-1.092	0.332	10.833	1	0.001	0.336
1800-25	0.029	0.224	0.017	1	0.897	1.029
1825-50	-0.211	0.206	1.052	1	0.305	0.810
1850-74						1.000
RESIDENCE WITH MATERNAL GRANDMOTHER						
not identical						1.000
identical	0.143	0.184	0.598	1	0.439	1.153
Constant	-3.599	0.272	175.389	1	0	0.027
N = 4100						

Tab. 3: As in Tab. 1, only cases with different places of residence for mother-in-law and daughter-in-law

Variable	B	S.E.	Wald	Df	Sig.	Exp(B)
MATERNAL GRANDMOTHER						
dead						1.000
alive	-0.087	0.267	0.106	1	0.745	0.917
PATERNAL GRANDMOTHER						
dead						1.000
alive	0.158	0.268	0.346	1	0.556	1.171
AGE OF MOTHER						
			9.365	3	0.025	
< 25	-0.748	0.651	1.318	1	0.251	0.473
25-30						1.000
30-35	0.388	0.377	1.059	1	0.303	1.474
35+	0.809	0.362	4.978	1	0.026	2.245
BIRTH COHORT						
			5.508	3	0.138	
1750-1800	0.478	0.41	1.36	1	0.244	1.613
1800-25	-0.15	0.437	0.117	1	0.732	0.861
1825-50	0.601	0.34	3.119	1	0.077	1.824
1850-74						1.000
RESIDENCE WITH MATERNAL GRANDMOTHER						
not identical						1.000
identical	-0.039	0.261	0.022	1	0.882	0.962
Constant	-3.942	0.471	70.159	1	0	0.019
N = 1747						

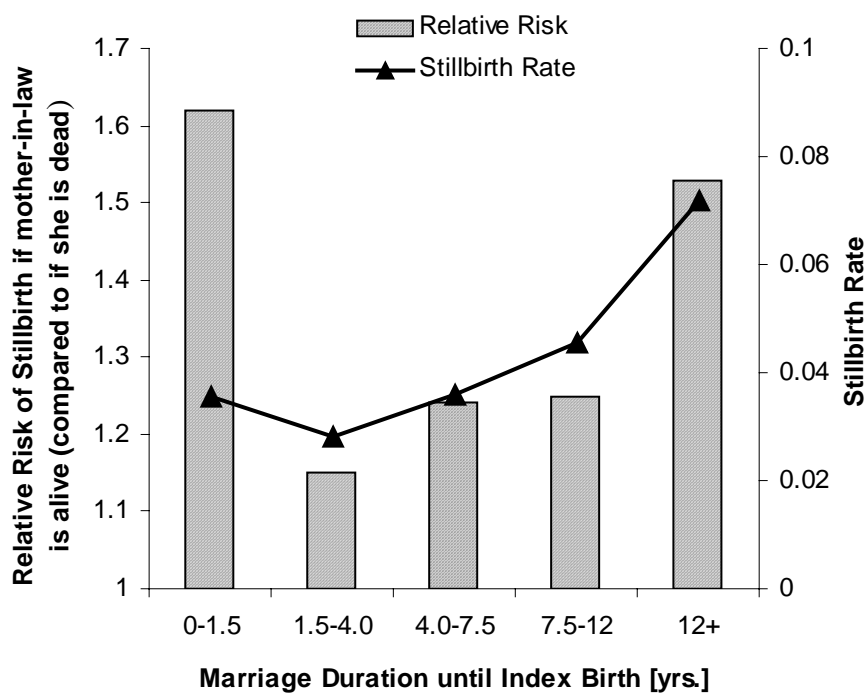


Fig.. 1: The relative risk of a living mother-in-law on stillbirth mortality depending on the duration of the marriage (Krummhörn 1750-1874). The birth cohort effects and the age of the mother at marriage were statistically controlled.